Niagara
On-The-Lake
HYDRO

September 25, 2014

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
P.O. Box 2319
2300 Yonge Street
Toronto ON M4P 1E4

Via RESS and two hard copies by courier

Niagara-on-the-Lake Hydro Inc. 2015 IRM Rate Application

OEB Case EB-2014-0097

Dear Ms. Walli

Niagara-on-the-Lake Hydro Inc. is pleased to submit the enclosed 2015 IRM Rate Application.

In addition, the following files are being submitted via RESS:

- **Tariff**
  - NOTL_2015 IRM_Current Tariff Sheet_20140929.pdf
  - NOTL_2015 IRM_Proposed Tariff 2015_20140929.xlsx
  - NOTL_2015 IRM_Proposed Tariff 2015_20140929.pdf

- **Rate Generators and other models**
  - NOTL_2015_IRM_Rate_Generator_V1.1_20140929.xlsm
  - NOTL_2015_IRM_Rate_Generator_V1.1_20140929.pdf
  - NOTL_2015_Incremental_Capital_Project_V1.0_20140929.xlsm
  - NOTL_2015_Incremental_Capital_Project_V1.0_20140929.pdf
  - NOTL_2015_Incremental_Capital_Wrkfrm_V1.1_20140929.xlsm
  - NOTL_2015_Incremental_Capital_Wrkfrm_V1.1_20140929.pdf
  - NOTL_ICM RR Calc_20140929.xlsx
  - NOTL_ICM RR Calc_20140929.pdf

We would be pleased to provide any further information or details that you may require for this application.

Yours truly

Tim Curtis, President
Encl.

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Niagara On-The-Lake HYDRO

2015 IRM Rate Application

EB-2014-0097

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NIAGARA-ON-THE-LAKE HYDRO INC.

EB-2014-0097

APPLICATION FOR DISTRIBUTION RATES EFFECTIVE MAY 1, 2015

MANAGER'S SUMMARY

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1. INTRODUCTION

Publication

Niagara-on-the Lake Hydro's notice of application will be appearing in the local weekly newspaper, "The Niagara Advance", which is not a paid publication and has a circulation of approximately 8,000 per week. This publication is appropriate because it is delivered to all those affected, i.e. all residences and businesses in Niagara-on-the-Lake.

Those Affected

Those who are affected by this application are all residences, businesses and other electricity users within the municipal boundaries of the Town of Niagara-on-the-Lake.

Application Contact

The contact for this application is:

Philip Wormwell
Director of Corporate Services
Phone: 905.468.4235 x380
E-mail: pwormwell@notlhydro.com

Revenue-Cost Ratio Adjustments

There were no revenue-cost ratio adjustments in NOTL's 2014 re-basing. Hence there are no such adjustments required in this 2015 rates application.

Summary of What Rates are Changing

- Current items with no proposed change

  In this application, the following items are requested to be continued without change:

  - Rate classes
  - Loss factors

- Allowances and specific service charges
- Retail Service charges
- microFIT service charge
- Rate Riders for Smart Metering Entity Charges - effective until October 31, 2018
- Rate Riders for Disposition of Account 1576 – effective until April 30, 2019

- <u>Sunset Items</u>

The following current rate riders are effective until April 30, 2015 and are requested to be discontinued at that time:

- Rate Riders for Recovery of Stranded Meter Assets
- Rate Riders for Deferral/Variance Accounts disposition (2014)
- Rate Riders for Global Adjustment Account disposition (2014)

- <u>New Items</u>

The following are new items requested to be effective from May 1, 2015 until April 30, 2016:

- Rate Riders for Deferral/Variance Accounts disposition (2015)
- Rate Riders for Global Adjustment Account disposition (2015)
- Incremental Capital Rate Riders

- <u>Adjusted Items</u>

The following items are requested to be adjusted:

- Distribution service charges (except microFIT)
- Distribution volumetric charges
- Retail transmission rates – Network
- Retail transmission rates – Line and Transformation Connection

2. RETAIL TRANSMISSION SERVICE RATES ("RTSRs")

NOTL's application to adjust RTSRs is in accordance with Revision 4.0 of Guideline G-2008-0001, issued June 28, 2012 and uses the 2015 IRM Rate Generator Model provided by the OEB to calculate the proposed rates.

Historical Network and Connection Costs

NOTL's historical costs (2013) consist of only IESO-invoiced costs for network and line connection. NOTL owns its own transformer stations and consequently has no IESO-invoiced transformation costs. NOTL also has no Hydro One-invoiced transmission costs. Table 2.1 below, from Sheet 16 of the OEB model represents the historical network and line connection costs for the year 2013:

Table 2.1 – Historical Network and Connection Costs

IESO	Network			Line Connection		
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount
January	27,342	$3.63	$ 99,251	28,604	$0.75	$ 21,453
February	26,371	$3.63	$ 95,727	27,287	$0.75	$ 20,465
March	24,804	$3.63	$ 90,039	25,438	$0.75	$ 19,079
April	21,166	$3.63	$ 76,833	22,732	$0.75	$ 17,049
May	31,243	$3.63	$ 113,412	32,105	$0.75	$ 24,079
June	35,281	$3.63	$ 128,070	35,374	$0.75	$ 26,531
July	42,328	$3.63	$ 153,651	42,490	$0.75	$ 31,868
August	35,210	$3.63	$ 127,812	36,618	$0.75	$ 27,464
September	37,057	$3.63	$ 134,517	37,470	$0.75	$ 28,103
October	21,250	$3.63	$ 77,138	24,633	$0.75	$ 18,475
November	25,140	$3.63	$ 91,258	29,509	$0.75	$ 22,132
December	28,353	$3.63	$ 102,921	30,013	$0.75	$ 22,510
Total	355,545	$ 3.63	$ 1,290,628	372,273	$ 0.75	$ 279,205

Forecast Costs with new Uniform Transmission Rates ("UTRs")

When the most recent Board approved UTRs[1] from Sheet 15 of the OEB IRM Generator model are applied against the above historical billing, the historical network and line connection costs adjusted for the new UTR levels are as shown in Table 2.2 below, from Sheet 18 of the OEB model:

[1] Appendix B of Rate Order in case EB-2012-0031, dated January 9, 2014

Table 2.2 – Forecast Network and Connection Costs

IESO	Network			Line Connection		
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount
January	27,342	$ 3.8200	$ 104,446	28,604	$ 0.8200	$ 23,455
February	26,371	$ 3.8200	$ 100,737	27,287	$ 0.8200	$ 22,375
March	24,804	$ 3.8200	$ 94,751	25,438	$ 0.8200	$ 20,859
April	21,166	$ 3.8200	$ 80,854	22,732	$ 0.8200	$ 18,640
May	31,243	$ 3.8200	$ 119,348	32,105	$ 0.8200	$ 26,326
June	35,281	$ 3.8200	$ 134,773	35,374	$ 0.8200	$ 29,007
July	42,328	$ 3.8200	$ 161,693	42,490	$ 0.8200	$ 34,842
August	35,210	$ 3.8200	$ 134,502	36,618	$ 0.8200	$ 30,027
September	37,057	$ 3.8200	$ 141,558	37,470	$ 0.8200	$ 30,725
October	21,250	$ 3.8200	$ 81,175	24,633	$ 0.8200	$ 20,199
November	25,140	$ 3.8200	$ 96,035	29,509	$ 0.8200	$ 24,197
December	28,353	$ 3.8200	$ 108,308	30,013	$ 0.8200	$ 24,611
Total	355,545	$ 3.82	$ 1,358,182	372,273	$ 0.82	$ 305,264

It is noted that In the OEB model available at the time of NOTL Hydro's application, the wholesale billing forecast rates (effective Jan 1, 2015) in Sheet 18 are shown as being the same as the current rates effective Jan 1, 2014.

Billing Determinants for RTSRs

The billing determinants used to calculate the revenue are from the 2013 actual data, as reported in RRR 2.1.5, originally in April 2014 with subsequent revisions submitted to the Board. These determinants are per Table 2.3 below taken from Sheet 14 of the OEB model:

Table 2.3 – Billing Determinants

Rate Class	Rate Description	Unit	Non-Loss Adjusted Metered kWh	Non-Loss Adjusted Metered kW	Applicable Loss Factor
RESIDENTIAL	Network Service Rate	$/kWh	67,121,534	-	1.0379
RESIDENTIAL	Line and Transformation Connection Service Rate	$/kWh	67,121,534	-	1.0379
GENERAL SERVICE LESS THAN 50 KW	Network Service Rate	$/kWh	34,819,170	-	1.0379
GENERAL SERVICE LESS THAN 50 KW	Line and Transformation Connection Service Rate	$/kWh	34,819,170	-	1.0379
GENERAL SERVICE 50 TO 4,999 KW	Network Service Rate	$/kW	35,856,874	100,252	-
GENERAL SERVICE 50 TO 4,999 KW	Line and Transformation Connection Service Rate	$/kW	35,856,874	100,252	-
GENERAL SERVICE 50 TO 4,999 KW	Network Service Rate - Interval Metered	$/kW	42,724,121	90,561	-
GENERAL SERVICE 50 TO 4,999 KW	Line and Transformation Connection Service Rate -	$/kW	42,724,121	101,972	-
UNMETERED SCATTERED LOAD	Network Service Rate	$/kWh	236,038	-	1.0379
UNMETERED SCATTERED LOAD	Line and Transformation Connection Service Rate	$/kWh	236,038	-	1.0379
STREET LIGHTING	Network Service Rate	$/kW	1,160,024	3,238	-
STREET LIGHTING	Line and Transformation Connection Service Rate	$/kW	1,160,024	3,238	-

Please note that the difference between the kW determinants for network versus connection GS > 50kW interval customers reflects that the demand applicable to network charges is "7-7" demand[2], whereas the regular demand definition is applicable to connection charges. Due to the interval and non-interval customers being in the same GS>50kW rate class for NOTL Hydro, the RRR submission form 2.1.5 did not allow for the data specific to interval customers to be input. However, the data specific to interval customers is provided in Table 2.3 above.

Proposed RTSR Rates

The following summary Table 2.4 of the proposed rates to recover forecast network and connection costs based on the billing determinants in Table 2.3 is taken from Sheet 23 of the OEB model:

[2] Demand based on peak kW from 07:00 to 19:00 hours on non-Holiday weekdays

Table 2.4 – Proposed RTSR Rates

Rate Class	Rate Description	Unit	Proposed Retail Transmission Rate
RESIDENTIAL	Network Service Rate	$/kWh	$ 0.0076
RESIDENTIAL	Line and Transformation Connection Service Rate	$/kWh	$ 0.0013
GENERAL SERVICE LESS THAN 50 KW	Network Service Rate	$/kWh	$ 0.0070
GENERAL SERVICE LESS THAN 50 KW	Line and Transformation Connection Service Rate	$/kWh	$ 0.0013
GENERAL SERVICE 50 TO 4,999 KW	Network Service Rate	$/kW	$ 2.8486
GENERAL SERVICE 50 TO 4,999 KW	Line and Transformation Connection Service Rate	$/kW	$ 0.4714
GENERAL SERVICE 50 TO 4,999 KW	Network Service Rate - Interval Metered	$/kW	$ 3.0788
GENERAL SERVICE 50 TO 4,999 KW	Line and Transformation Connection Service Rate - Interval Metered	$/kW	$ 1.1337
UNMETERED SCATTERED LOAD	Network Service Rate	$/kWh	$ 0.0070
UNMETERED SCATTERED LOAD	Line and Transformation Connection Service Rate	$/kWh	$ 0.0013
STREET LIGHTING	Network Service Rate	$/kW	$ 2.1480
STREET LIGHTING	Line and Transformation Connection Service Rate	$/kW	$ 0.3645

NOTL understands that the OEB will adjust each applicant's model to reflect any UTR changes on Jan 1, 2015 when they are determined.

The IRM rate generator incorporating the RTSR calculations is being submitted separately in Excel and pdf formats.

3. INCREMENTAL CAPITAL MODULE

Summary of the Request

NOTL Hydro proposes rate riders resulting from an incremental capital module (ICM), incorporated into the 4th Generation IRM, to recover an incremental capital amount eligible for recovery of $1,950,854 resulting from replacement and upsizing of a transformer unit at MTS#2, which is one of NOTL Hydro's two transformer stations[3] (York TS known as MTS#1 and NOTL TS known as MTS#2). The project has a capital cost of $2,577,000[4]. Details of this project cost are provided in Appendix A.

NOTL Hydro requests that the project's incremental annual revenue requirement of $164,263:

- be shared on the same basis as the recovery of transmission connection costs, i.e. rate class shares of transmission connection revenue[5], based on cost causality;
- be recovered with variable rate riders in effect from May 1, 2015 to April 30, 2019, which is the remaining four years of NOTL Hydro's current IRM period until the next scheduled rebasing (2019). In the 2019 rebasing, the net book value of the transformer upgrade at that time will be incorporated in the 2019 rate base.

Distribution System Plan

The project was included in the "System Renewal" category in 2015 in NOTL Hydro's Distribution System Plan[6] ("DSP"), submitted with NOTL Hydro's 2014 cost-of-service application[7]. With the information available at the time of that application, the cost was estimated at $3,000,000 which, combined with the other projects of $1,250,000 in the 2015 capital plan, resulted in a total planned capital

[3] Both deemed as distribution assets as stated in EB-2013-0155, Exhibit 1, Tab 5, Schedule 16
[4] Excluding internal costs of $50,000 for which recovery is not being requested.
[5] See "Incremental Revenue Requirement – Allocation" on Page 28
[6] See page 38 of the DSP
[7] EB-2013-0155

expenditure of $4,250,000[8]. With the revised cost of the MTS#2 project at $2,577,000[9], the total capital expenditure plan for 2015 is reduced accordingly to $3,877,000, with the other projects remaining at $1,250,000 with some adjustments among projects. Table 3.1 below outlines the current overall capital plan for 2015 with these adjustments.

Table 3.1 – 2015 Capital Plan

			2015 DSP			
		Drivers				
				2015 per 2014 CoS Settlement	Adjusted 2015	Change
System Access		Mandated service obligations	**New Customer Connections**	$ 35,000	$ 75,000	$ 40,000
		Mandated service obligations	**New revenue meters**	$ 10,000	$ 20,000	$ 10,000
		Customer service requests	**Property development/expansions**	$ 55,000	$ 55,000	$ -
			CCRAs for subdivisions and expansions			
			Subtotal	$ 100,000	$ 150,000	$ 50,000
System Renewal		Project to replace aging assets with new cables, transformers, switches	**Old Town Rebuild Phase 4** Johnson - Dorchester to Palatine	$ 385,000	$ 365,000	-$ 20,000
		replace aging meters	**Replacement revenue meters** Polyphase >50 kW	$ 30,000	$ 20,000	-$ 10,000
		Replace asset at end of useful life and upgrade unit	**Replace Unit at MTS#2** (50 mVA unit proposed) External costs	$ 3,000,000	$ 2,577,000	-$ 373,000
			Internal costs		$ 50,000	
		Project to replace aging assets with new poles, transformers, switches	**Rural O/H Projects**	$ 615,000	$ 580,000	-$ 35,000
			Subtotal	$ 4,030,000	$ 3,592,000	-$ 438,000
System Service		Miscellaneous customer-driven extensions/improvements	**Miscellaneous upgrades/extensions** Customer driven projects/upgrades	$ 5,000	$ -	-$ 5,000
						$ -
		Improve reliability, functionality	**SCADA/GIS upgrades, automation**	$ 50,000	$ -	-$ 50,000
			System integration (GIS/FIS/CIS/ODS)	$ -	$ 100,000	$ 100,000
			Subtotal	$ 55,000	$ 100,000	$ 45,000
General Plant		Replace aging units	**Replacement office computers**	$ 5,000	$ 5,000	$ -
		Business operations efficiency	**Software Upgrades (CIS, FIS etc.)** Northstar, Great Plains etc. upgrades	$ 40,000	$ 10,000	-$ 30,000
		Business operations efficiency	**Computer and Office equipment**	$ 10,000	$ 5,000	-$ 5,000
		Non system physical plant	**Stores and Building equipment**	$ 10,000	$ 15,000	$ 5,000
			Subtotal	$ 65,000	$ 35,000	-$ 30,000
TOTALS				$ 4,250,000	$ 3,877,000	-$ 373,000
				Less internal costs for MTS#2 Project	$ 50,000	
				Total 2015 Capital for ICM	**$ 3,827,000**	

Project Details

NOTL Hydro dates back to 1972 when the area was taken over from Ontario Hydro. The area load was originally supplied by Niagara Stanley Auto TS at

[8] See Capital Expenditure Summary Table on page 31 of the DSP
[9] Plus $50,000 in internal costs not being claimed for recovery)

27.6kV, which had a peak capacity of 20MW. This point of supply has been decommissioned. NOTL Hydro currently has 2 transformer stations.

In 1985 Hydro One constructed NOTL TS (MTS#2), which has two transformers with a total nameplate capacity of 50 MVA. NOTL Hydro purchased NOTL TS from Hydro One in 2005.

In 2003 NOTL Hydro constructed York TS (MTS#1), which has a single transformer with a nameplate capacity of 41.7 MVA.

NOTL Hydro's electrical system feeder network is set up for full redundancy in case of a transformer station contingency in case of loss of supply from Hydro One, planned outages or transformer failure.

As stated in the DSP[10], a professional condition assessment of the two 15/25 mVA units at MTS#2 revealed that the units will be approaching the end of their useful life in an estimated 5-10 years. The newer MTS#1 station consists of a single 25/42 mVA unit. NOTL Hydro's system load continues to approach or exceed 50 mVA during the critical summer tourism peak and air conditioning load periods. A catastrophic failure of the MTS #1 unit during a peak load period would result in the ageing MTS #2 units supplying load at or beyond their rated capacity. Accordingly, NOTL Hydro began the process of applying for the purchase and installation of a larger unit (i.e. 30/40/50 mVA) to replace the most critical 15/25 mVA unit at MTS#2. The capacity configuration with a larger unit will not only provide longer-term supply capacity but will also allow for the removal of any unit for servicing without compromising supply capacity. The project is currently targeting May 2015 for completion. The second unit at MTS#2 is deemed to be in a slightly better condition and is targeted for replacement in or around 2022.

In discussions with NOTL Hydro's transmitter and neighbouring LDCs, the MTS#2 project was not deemed to have any Regional Planning implications.

[10] For example, in DSP, Page 7, 2nd paragraph of Section 5.2.2

NOTL Hydro has obtained approval from the transmitter and the IESO to increase the unit's capacity.

Project Eligibility

NOTL Hydro has reviewed the eligibility criteria set out on Page 14 of Chapter 3 of the Filing Requirements for 2015 Electricity Distribution Rate Applications, issued on July 25, 2014 as follows:

Criteria	Description
Materiality	The amounts must exceed the Board-defined materiality threshold and clearly have a significant influence on the operation of the distributor; otherwise they should be dealt with at rebasing.
Need	Amounts should be directly related to the claimed driver, which must be clearly non-discretionary. The amounts must be clearly outside of the base upon which rates were derived.
Prudence	The amounts to be incurred must be prudent. This means that the distributor's decision to incur the amounts must represent the most cost-effective option (not necessarily least initial cost) for ratepayers.

NOTL Hydro submits that each of these criteria have been met as discussed below.

Materiality[11]

NOTL Hydro has used the Board's 2015 Capital Workform model and the relevant parameters in the Board-approved Settlement in our 2014 rebasing, case EB-2013-0155, to calculate a materiality threshold of $1,876,146. NOTL Hydro's total non-discretionary 2015 capital expenditures of $3,827,000[12] exceed this materiality threshold by $1,950,855. Thus, $1,950,855 is the material incremental capital amount for the ICM rate rider calculation.

Table 3.2 below provides the detailed calculation of the threshold of $1,876,146 from Sheet E2.1 of the capital workform. Following Table 3.2 are explanations of

[11] See also "Total Incremental Capital Amount" on page 23
[12] Shown at the bottom of Table 3.1 above with internal costs of the MTS#2 project excluded from the ICM.

the sources of the amounts in the Table, such as Fixed Assets, Accumulated Depreciation, Working Capital Allowance, Growth et cetera:

Table 3.2 – Materiality Threshold

Threshold Test			
Year	**2014**		
Price Cap Index	**1.40%**	**A**	
Growth	**1.32%**	**B**	
Dead Band	**20%**	**C**	
Average Net Fixed Assets			
Gross Fixed Assets Opening	$44,938,119		
Add: CWIP Opening	$ -		
Capital Additions	$ 1,285,000		
Capital Disposals	-$ 477,000		
Capital Retirements	$ -		
Deduct: CWIP Closing	$ -		
Gross Fixed Assets - Closing	$45,746,119		
Average Gross Fixed Assets	$45,342,119		
Accumulated Depreciation - Opening	$23,010,427		
Depreciation Expense	$ 1,005,631	**D**	
Disposals	-$ 447,000		
Retirements	$ -		
Accumulated Depreciation - Closing	$23,569,057		
Average Accumulated Depreciation	$23,289,742		
Average Net Fixed Assets	$22,052,377	**E**	
Working Capital Allowance			
Working Capital Allowance Base	$22,105,278		
Working Capital Allowance Rate	11%		
Working Capital Allowance	$ 2,431,581	**F**	
Rate Base	**$24,483,958**	**G = E + F**	
Depreciation	**D $ 1,005,631**	**H**	
Threshold Test	**186.56%**	**I = 1 + (G / H) * (B + A * (1 + B)) + C**	
Threshold CAPEX	$ 1,876,146	**J = H *I**	

The Fixed Asset, Working Capital Allowance, Rate Base and Depreciation data in Table 3.2 above are calculated from NOTL Hydro's approved 2014 cost of service data as reflected in the approved 2014 Revenue Requirement Workform and input into sheet B1.4 of the capital workform.

The Price Cap Index of 1.40% and Growth parameter of 1.32% in Table 3.2 above are taken from Sheet E1.1 of the capital workform as shown in Table 3.3 below:

Table 3.3 – Threshold Parameters

Threshold Parameters			
Price Cap Index			
Price Escalator (GDP-IPI)	1.70%		
Less Productivity Factor	0.00%		
Less Stretch Factor	-0.30%		
Price Cap Index		**1.40%**	
Growth			
ICM Billing Determinants for Growth - Numerator : 2014 Re-Based Forecast		$4,481,462	A
ICM Billing Determinants for Growth - Denominator : 2013 Actual		$4,423,271	B
Growth		**1.32%**	C = A / B

The Stretch Factor of -0.30% in Table 3.3 above results from the Board's placement of NOTL Hydro in Stretch Factor Group III as indicated in Sheet A1.1 of the capital workform.

The Billing Determinants establishing the Growth rate of 1.32% are based on 2014 and 2013 data as follows:

- 2014 data are taken from the approved Appendix 2-V Revenue Reconciliation in NOTL Hydro's rebasing case EB-2013-0155, reproduced below, and are shown in Sheet B1.3 of the capital workform as per Table 3.4 below.

Appendix 2-V
Revenue Reconciliation

Rate Class	Customers/ Connections	Number of Customers/Connections			Test Year Consumption		Proposed Rates			Revenues at Proposed Rates	Class Specific Revenue Requirement	Transformer Allowance Credit	Total	Difference
		Start of Test Year	End of Test Year	Average	kWh	kW	Monthly Service Charge	Volumetric						
								kWh	kW					
Residential	Customers	7,008	7,158	7,083	67,753,410		$ 17.94	$0.0126		$ 2,378,592	$ 2,381,452		$ 2,381,452	$ 2,860
GS < 50 kW	Customers	1,245	1,338	1,291	37,260,698		$ 37.28	$0.0112		$ 994,961	$ 994,528		$ 994,528	-$ 433
GS > 50 to 4,999 kW	Customers	122	128	125		201,178	$266.42		$ 2.1025	$ 822,324	$ 800,431	$ 21,894	$ 822,325	$ 1
Streetlighting	Connections	2,003	2,058	2,031		3,377	$ 7.42		$29.0338	$ 278,919	$ 278,919		$ 278,919	-$ 0
USL*	Customers	22	22	22	240,322		$ 20.05	$0.0060		$ 6,666	$ 6,670		$ 6,670	$ 4
Total										$ 4,481,462	$ 4,462,000	$ 21,894	$ 4,483,893	$ 2,431

(Unmetered Scattered Load)*

Table 3.4 – 2014 Billing Determinants

Rate Class	Re-based Billed Customers or Connections A	Re-based Billed kWh B	Re-based Billed kW C
Residential	7,083	67,753,410	0
General Service Less Than 50 kW	1,291	37,260,698	0
General Service 50 to 4,999 kW	125	0	201,178
Unmetered Scattered Load	22	240,322	0
Street Lighting	2,031	0	3,377

- 2013 data for customers/connections are the averages for the year (i.e. average of year end 2012 and year-end 2013), consistent with the averaging approach in the 2014 data, and taken from the 2012 and 2013 Yearbooks which are based on NOTL Hydro's RRR reports. The consumption data for 2013 reflects the 2013 Yearbook delivered kWh data and is shown in Sheet C1.1 of the capital workform as per Table 3.5 below. Please note that the rate-class billed kWh in Table 3.5 are calculated from the billed data in RRR 2.1.5 data by adjusting for unbilled/accrued consumption to obtain the delivered kWh. The total kWh in Table 3.5 matches the Yearbook total delivered kWh of 183,801,851 kWh.

Table 3.5 also shows the calculation of the total 2013 revenue of $4,423,271 , also shown in Sheet C1.1 of the capital workform, using the 2013 billing determinants and 2013 service and volumetric charges.

Table 3.5 - 2013 Billing Determinants and Revenue

Load Actual - 2013 Actual

Rate Class	Fixed Metric	Vol Metric	Billed Customers or Connections A	Billed kWh B	Billed kW C
Residential	Customer	kWh	7,061	67,855,093	0
General Service Less Than 50 kW	Customer	kWh	1,226	35,118,069	0
General Service 50 to 4,999 kW	Customer	kW	127	79,438,754	202,224
Unmetered Scattered Load	Customer	kWh	22	222,197	0
Street Lighting	Connection	kW	1,981	1,167,738	3,238

Load Actual - 2013 Actual

Rate Class	Fixed Metric	Vol Metric	Billed Customers or Connections A	Billed kWh B	Billed kW C	Base Service Charge D	Base Distribution Volumetric Rate kWh E	Base Distribution Volumetric Rate kW F	Service Charge Revenue 12	Distribution Volumetric Rate Revenue kWh H = B * E	Distribution Volumetric Rate Revenue kW I = C * F	Total Revenue by Rate Class J = G + H + I
Residential	Customer	kWh	7,061	67,855,093	0	$17.94	$0.0126	$0.0000	$1,519,984	$854,974	$0	$2,374,959
General Service Less Than 50 kW	Customer	kWh	1,226	35,118,069	0	$37.28	$0.0112	$0.0000	$548,463	$393,322	$0	$941,786
General Service 50 to 4,999 kW	Customer	kW	127	79,438,754	202,224	$266.42	$0.0000	$2.1025	$404,426	$0	$425,176	$829,602
Unmetered Scattered Load	Customer	kWh	22	222,197	0	$20.05	$0.0060	$0.0000	$5,172	$1,333	$0	$6,505
Street Lighting	Connection	kW	1,981	1,167,738	3,238	$7.42	$0.0000	$29.0338	$176,406	$0	$94,014	$270,420
									$2,654,451	**$1,249,630**	**$519,191**	**$4,423,271**

Need

- ***Outside the Rate Base***

NOTL Hydro's current rate base was approved on the basis of actual capital expenditures up to 2013 and forecasted capital expenditures in 2014 for projects completed and in service in 2014. Interim payments in 2014 and 2015 for the MTS#2 project are being recorded in the construction work in process (CWIP) account until such time as the project is complete and the transformer is in service in 2015. CWIP amounts were not included in the 2014 rate base calculations. Consequently, the MTS#2 project is not in the current rate base upon which current rates are derived.

- ***Non-Discretionary***

In 2011, Raven Engineering was contracted to recommend a Long Term Supply plan for NOTL Hydro[13]. The study involved analyzing the existing load, load growth and transformer stations capacity. The study recommended increasing station capacity at both York TS and NOTL TS to permit each station to supply peak utility load to avoid rotational load shedding in the event of a station loss during peak load periods (summer). It also recommended to assess the remaining life of NOTL TS transformers. When NOTL TS was operated by Hydro One, they used a 10 day Limited Time Rating (LTR) which loaded the transformer beyond its capacity. This approach assumed an acceptable loss of service life to the transformer from overloading. Therefore detailed transformer testing was performed in May, 2012 by Ascent[14]. The results showed elevated gas levels and degradation of cellulose insulation. Overall, both transformers at NOTL TS showed signs of approaching end of life and it was recommended to replace them within 5 years. Since peak load reached 50.7 MVA in 2011, if these transformers fail, NOTL Hydro's other transformer station, York TS, will not be able to supply the peak utility load.

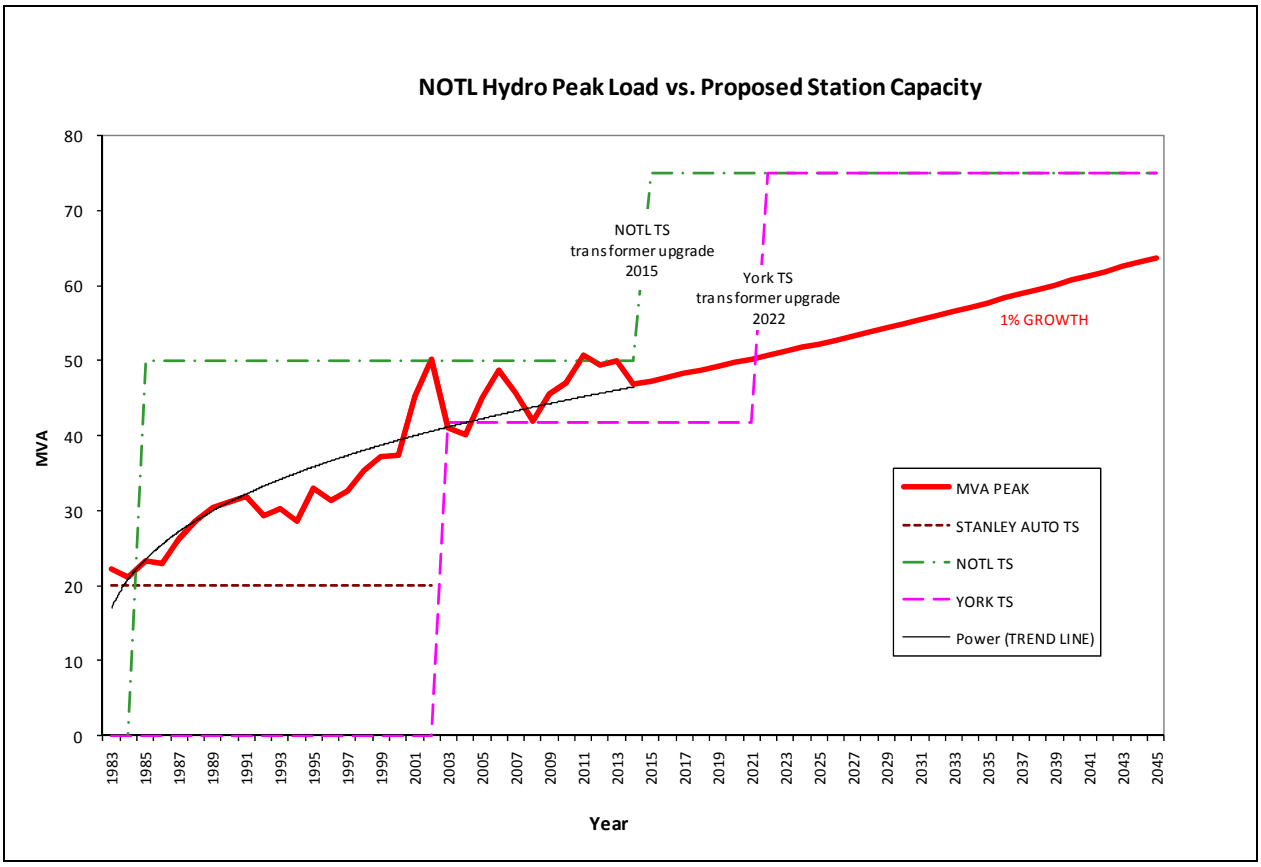
Since the study, the Town of Niagara on the Lake has welcomed a new Outlet Mall with a peak load capability of 8 MVA and average expected load of 3 MVA. With the Outlet Mall and 1% annual forecasted load growth, the base load will definitely go beyond 50MVA and none of the stations will be able to supply the peak utility load if the other one fails. Therefore overall we have the need to address two main issues:

- replace the aging transformer(s) at NOTL TS; and
- increase overall station capacity as a contingency in case of the failure of one station.

[13] See Appendix B
[14] See Appendix C

The study pointed out that if nothing is done about the above issues, the utility would continue to be exposed to the risk of rotating blackouts in the event of a total station outage during peak load periods.

- The following graph shows NOTL Hydro actual system peak load and forecasted load vs. the proposed station capacity assuming an average annual peak load growth rate of 1%. The system peak load exceeded the peak capacity of 50 mVA of NOTL station in 2002 (50.2 mVA) and 2011 (50.7 mVA) and almost reached the peak capacity in 2012 (49.4 mVA) and 2013 (49.9 mVA).



Prudence

The Long Term Supply plan report offered various options to increase the station capacity which included upgrading stations to Dual Element Spot Network (DESN), replacing/refurbishing existing NOTL TS transformers, constructing a new supply station, adding static capacitors to existing stations, adding a fourth substation transformer at York Station and the last option of doing nothing. The study recommended adding the fourth station transformer at York to be the best option, however it assumed that upgrading a transformer at NOTL Station would require a major civil work, which would not make it very cost effective.

In light of these recommendations, IBI Group was contracted to explore these options further and to prepare a budgetary cost estimate for different options.

Option	Cost Estimate
1 – Upgrading NOTL Station by replacing 1 old transformer with a 30/40/50 MVA transformer	$2, 564,240
2 – Upgrading York Station with a new identical 42MVA unit	$6,436,800
3 - Upgrading York Station with a refurbished 25MVA unit from NOTL	$5,673,780

Even though option # 2 above to upgrade York station was the recommended option, it was not the most cost effective. It also did not address the issue of replacement of aging transformers at NOTL station. It was determined that no major civil work had to be done at NOTL station to upgrade a transformer, thus making it most cost effective option. All of the above options were presented to the Board of Directors of Niagara on the Lake Hydro in April 2013. The Board approved Option 1 with a 50mVA transformer in October 2013. With this option, NOTL Hydro's contingency plan will be to use the old replaced 25 MVA transformer on a new concrete pad as a backup for any station transformer

failure. This plan provides a very good use of existing assets which still have remaining useful life. Also, instead of choosing like to like replacement of the 25 MVA transformer, it was determined that upgrading to a 50MVA peak transformer to increase the capacity of the station, supply the future load growth and provide peak utility load in case of York Station failure would be a better long-term solution. To supply the peak load, a fourth feeder will also be added to the NOTL station as part of this project.

Project Status

Transformer Manufacturer selection:

In May 2014, NOTL Hydro issued a tender to transformer manufacturers to bid on the new 30/40/50 MVA transformer[15]. A total of six transformer manufacturers were invited: ABB, Siemens, CG Power Systems, Hyundai, Prolec GE and Waukesha.

Bids were evaluated based on recommendation from the consultant, NOTL Hydro management and the Board of Directors[16].

The following weighting factors were used:

Item	Criteria	Points
1	Base Bid Price	50
2	Loss Evaluation	10
3	Delivery	30
4	Experience	30
5	Technical Compliance	30
6	Warranty	10
7	Manufacturing Facility in Canada	5
	Total	165

Price (50 points):

- Assume low bid gets a full 50 points.
- Calculate difference between each other bid and low bid.

[15] See Appendix D
[16] See Attachment E

- Weight difference in cost with a certain percentage per cost deduction
- i.e. Each $20,000 difference = 1 point deduction.

Loss Evaluation (10 points):

- Propose to add Transformer Unit Cost bid price to loss evaluation costs for a total evaluated cost.
- Suggest that lowest evaluated cost gets 10 points
- Weight difference in cost with a certain percentage per cost reduction
- i.e. Each $10,000 difference = 1 point reduction (up to 10 maximum of point reduction)

Delivery (30 points):

- May 2015 delivery is critical.
- Earlier delivery reduces project risk, and should be scored higher

Experience (30 points):

- Bidders that demonstrated experience with units built for Hydro One or another Ontario LDC from the same factory get full points (i.e. 30).
- Bidders who have built similar units get reduced points.
- Bidders with no Hydro One or Ontario LDC experience for proposed unit get 0 points.

Technical Compliance (30 points):

- The specifications are very detailed and complex.
- Full points for good adherence to the specifications (i.e. 30)
- Part points for moderate compliance
- No points for basically disregarding the specifications, or reject the bid

Warranty (10 points)

- Bidders must meet the standard 12/18 month warranty that is specified.
- Bidders that meet the basic requirements get no points. Bonus points are awarded to bidders that offer extended warranties at no additional cost – two points per year of warranty, up to five additional years.

Manufacturing Facility in Canada (5 points):

- Bonus points are awarded to bidders with a significant Canadian Content and presences, up to five additional points

Two vendors did not submit a proposal. Bids were evaluated using the criteria above for the four other vendors who submitted proposals. Results were presented to the NOTL Hydro Board of Directors in May, 2014 and CG Power Systems was selected as it had the highest score.

Approvals

In June 2014, NOTL Hydro requested its shareholder, the Town of Niagara on the Lake, for permission to proceed with this project. Permission was granted in form of a Council resolution[17] dated June 23, 2014 stating:

> THAT Niagara-on-the-Lake Hydro Inc. be authorized to replace one 25MVA Niagara-on-the-Lake station transformer with a new 50MVA transformer.

After this approval, CG Power Systems was awarded the contract to deliver the 30/40/50 MVA power transformer.

NOTL Hydro signed a CCRA agreement with Hydro One in June, 2014[18] which estimates a total cost of $104,000 plus HST for engineering, modifications, commissioning and outage planning at Hydro One facilities related to this project.

[17] See Appendix F
[18] See Appendix G

IESO conducted its System Impact Assessment and submitted their draft report in July 2014[19].

Engineering, Procurement and Construction ("EPC") Contract:

In August 2014, NOTL Hydro issued a tender to firms that specialized in transformer station design/build to bid on the transformer station design and construction[20]. A total of four firms were invited: Eptcon, K-Line, Black and Macdonald and Whitby Hydro Services. Eptcon's bid was under the project's estimate ($750,000) for EPC and they were awarded this contract.

Since detailed engineering will begin after the award of this project, NOTL Hydro's consultant has added $159,300 as a contingency for this project[21].

Details of the total cost estimate of $2,577,000 before taxes are provided in Appendix A.

Expected in service date is May 31, 2015. A detailed schedule of the project is provided in Appendix I.

Total Incremental Capital amount

Table 3.6 below shows the eligible incremental capital amount of $1,950,855 as calculated in sheet E3.1 of the Board's capital workform model. This eligible amount is the difference between NOTL Hydro's 2015 non-discretionary capital budget of $3,827,000 outlined in the 2015 capital plan in Table 3.1 above[22] and the threshold of $1,876,146 shown in Table 3.2. Because the project cost exceeds the eligible amount, the total incremental capital amount for the rate rider calculation equals the eligible amount of $1,950,855.

[19] The final report is expected in the near future.
[20] See Appendix H
[21] See Table 3.7A – 5% of transformer component and 10% of structure component
[22] Excluding internal costs of the MTS#2 project not being claimed

Table 3.6 – Incremental Capital Amount

Summary of Incremental Capital Projects (ICPs)

Calculation of Eligible Incremental Capital Amount

2015 Non-Discretionary Capital Budget (Including ICM Projects)		$3,827,000.00	A
Threshold CAPEX (as calculated on sheet E2.1)		$1,876,145.56	B
Eligible Incremental Capital Amount	=	$1,950,854.44	C = A - B

Summary of Proposed Incremental Capital Projects

Number of ICPs: 1

Update Sheet

Project ID #	Incremental Capital Non-Discretionary Project Description	Incremental Capital CAPEX	Amortization Expense	CCA
ICP 1	To replace one 25 mVA transformer at MTS#2 with a 50 mVA transformer	$2,577,000.00	$53,854.55	$206,160.00
	Total Proposed Incremental Capital CAPEX	$2,577,000.00	$53,854.55	$206,160.00
	Total Incremental Capital Amount for ICM Rate Rider Calculation	$1,950,854.44		

The proposed incremental capital and associated amortization expense and capital cost allowance (CCA) shown in Table 3.6 above are calculated in the "incremental capital summary" sheet of the Board's capital project model, as shown in Table 3.7 below.

Table 3.7 – Incremental Capital Summary

Using the pull-down menu below, please identify what year of the IRM cycle you are in.

1st year of IRM cycle

Name or General Description of Project

NOTL TS Transformer Station (MTS#2) Upgrade

Details of Project

To replace one 25 mVA transformer at MTS#2 with a 50 mVA transformer

Asset Component	Capital Cost	Depreciation Rate	CCA Class	CCA Rate
1 Power transformer	1,732,500	2%	47	8%
2 Structure	844,500	2%	47	8%
3				
4				
5				

	2015	2016	2017	2018	2019
Closing Net Fixed Asset	2,523,145	2,469,291	2,415,436	2,361,582	2,307,727
Amortization Expense	53,855	53,855	53,855	53,855	53,855
CCA	206,160	189,667	174,494	160,534	147,692

Table 3.7A – Asset Components

	Transformer	Structure	Total
	$	$	$
Transformer	1,381,000		1,381,000
Hydro One Study, CIA & CCRA	149,000		149,000
Construction		732,700	732,700
IESO SIA	20,000		20,000
Specifications and drawings	25,000	10,000	35,000
Engineering consultation	75,000	25,000	100,000
Project management	-	-	-
	1,650,000	767,700	2,417,700
Contingency	*5%*	*10%*	
	82,500	76,800	159,300
Total	1,732,500	844,500	2,577,000

Consistent with NOTL Hydro's IFRS Policies set out in the 2014 cost of service application[23], and consistent with the componentization of NOTL Hydro's two transformer stations in that application[24], the components in this project are as shown as Asset Components 1 and 2 in Table 3.7 above, with costs derived as in Table 3.7A above:

- Component 1 - Power transformer – cost $1,732,500
    - Asset life 45 years; depreciation rate 2.22%[25]
    - CCA class 47; CCA rate 8%[26]
- Component 2 - Structure - cost $844,500
    - Asset life 55 years; depreciation rate 1.82%[27]
    - CCA class 47; CCA rate 8%[28]

[23] Exhibit 1, Appendix 1F – IFRS Policies, Pages 3-4, TS Stations
[24] Exhibit 2, Tab 2, Schedule 1, Table 2.2.6 - Fixed Asset Continuity Schedule – 2014, USoA 1815
[25] Displayed as 2% in the capital project model
[26] Exhibit 4, Tab 4, Schedule 2, Table 4.4.5 – 2014 CCA/UCC Continuity Schedule – Distribution system – post 22-Feb-2005
[27] Displayed as 2% in the capital project model
[28] Exhibit 4, Tab 4, Schedule 2, Table 4.4.5 – 2014 CCA/UCC Continuity Schedule – Distribution system – post 22-Feb-2005

Incremental Revenue Requirement - Calculation

Using the calculation of the Incremental Revenue Requirement from sheet E4.1 of the capital workform model, NOTL Hydro requests approval of an annual revenue requirement of $164,263 as shown in Table 3.8 on the following page.

In keeping with the Chapter 3 Filing Guidelines, NOTL Hydro advises that:

- *Half-Year Rule*
  Because this ICM application does not coincide with the final year of NOTL Hydro's current IRM term, the half-year rule has not been applied.
- *Cost of Capital*
  The NOTL Hydro ICM application uses the deemed 60/40 debt/equity ratio

  The cost-of-capital parameters are those determined during NOTL Hydro's last (2014) rebasing, namely short-term interest at 2.11%, long-term interest at 4.96% and return on equity at 9.36%.
- *PILS*
  The calculation uses the current tax rate of 15.50% taken from cell N32 of sheet 11-STS Tax Change in the 2015 IRM Rate Generator model.
- *Working Capital Allowance (WCA)*
  The calculation uses the WCA rate of 11% approved in NOTL Hydro's last (2014) rebasing.

Table 3.8 – Calculation of Incremental Revenue Requirement

Incremental Capital Adjustment

Current Revenue Requirement				
Current Revenue Requirement - Total			$4,483,893	**A**
Return on Rate Base				
Incremental Capital CAPEX			$1,950,854	**B**
Depreciation Expense			$ 53,855	**C**
Incremental Capital CAPEX to be included in Rate Base			$1,897,000	**D = B - C**
Deemed ShortTerm Debt %	4.0%	**E**	$ 75,880	**G = D * E**
Deemed Long Term Debt %	56.0%	**F**	$1,062,320	**H = D * F**
Short Term Interest	2.11%	**I**	$ 1,601	**K = G * I**
Long Term Interest	4.96%	**J**	$ 52,693	**L = H * J**
Return on Rate Base - Interest			$ 54,294	**M = K + L**
Deemed Equity %	40.0%	**N**	$ 758,800	**P = D * N**
Return on Rate Base -Equity	9.36%	**O**	$ 71,024	**Q = P * O**
Return on Rate Base - Total			$ 125,318	**R = M + Q**
Amortization Expense				
Amortization Expense - Incremental		**C**	$ 53,855	**S**
Grossed up PIL's				
Regulatory Taxable Income		**O**	$ 71,024	**T**
Add Back Amortization Expense		**S**	$ 53,855	**U**
Deduct CCA			$ 206,160	**V**
Incremental Taxable Income			-$ 81,282	**W = T + U - V**
Current Tax Rate (F1.1 Z-Factor Tax Changes)	15.5%	**X**		
PIL's Before Gross Up			-$ 12,599	**Y = W * X**
Incremental Grossed Up PIL's			-$ 14,910	**Z = Y / (1 - X)**
Ontario Capital Tax				
Incremental Capital CAPEX			$1,950,854	**AA**
Less : Available Capital Exemption (if any)			$ -	**AB**
Incremental Capital CAPEX subject to OCT			$1,950,854	**AC = AA - AB**
Ontario Capital Tax Rate (F1.1 Z-Factor Tax Changes)	0.000%	**AD**		
Incremental Ontario Capital Tax			$ -	**AE = AC * AD**
Incremental Revenue Requirement				
Return on Rate Base - Total		**Q**	$ 125,318	**AF**
Amortization Expense - Total		**S**	$ 53,855	**AG**
Incremental Grossed Up PIL's		**Z**	-$ 14,910	**AH**
Incremental Ontario Capital Tax		**AE**	$ -	**AI**
Incremental Revenue Requirement			$ 164,263	**AJ = AF + AG + AH + AI**

Incremental Revenue Requirement - Allocation

NOTL Hydro proposes that based on cost causality, the allocation of transformer costs such as the MTS#2 project in this application should be on the same basis as the recovery of transmission connection costs, i.e. rate class shares of trasnmission connection revenue[29]. Thus, the allocations of the Incremental Revenue Requirement (IRR) are as shown in Table 3.9 below, which uses data from the IRM Rate Generator model RTSR calculations to apportion the IRR. The Table also shows the requested rate riders.

This Table is filed via RESS as NOTL_ICM RR Calc_20140929.xlsx and NOTL_ICM RR Calc_20140929.pdf

Table 3.9 – Allocation of Incremental Revenue Requirement and Requested Rate Riders

Rate Class	Total Transmission Costs by Rate Class	Total % Costs by Rate Class	Allocation of Incremental Revenue Requirement	Billed kWh	Billed kW	kWh Volumetric Rate Rider	kW Volumetric Rate Rider
	From IRM Sheet 22 RTSR		*Total From Sheet E4.1 ICM Workform*	*From Sheet F1.1 ICM Workform*	*From Sheet F1.1 ICM Workform*		
RESIDENTIAL	$ 92,767.98	30.39%	$ 49,918.57	67,753,410	-	$ 0.0007	
GENERAL SERVICE LESS THAN 50 KW	$ 48,123.22	15.76%	$ 25,895.16	37,260,698	-	$ 0.0007	
GENERAL SERVICE 50 TO 4,999 KW	$ 162,866.33	53.35%	$ 87,638.58	-	201,178		$ 0.4356
UNMETERED SCATTERED LOAD	$ 326.23	0.11%	$ 175.54	240,322	-	$ 0.0007	
STREET LIGHTING	$ 1,180.10	0.39%	$ 635.02	-	3,377		$ 0.1881
Total	*$ 305,263.86*	*100.00%*	*$ 164,262.88*				

Incremental Revenue Requirement - Recovery

As indicated in Table 3.9, NOTL Hydro is proposing only variable rate riders for recovery, rather than both fixed and variable riders. This variable-only approach

[29] This method of allocation is the same as the approach approved by the Board in case EB-2011-0207 involving an ICM request by Woodstock Hydro for transmission station costs, and in which Board staff submitted that an allocation using the rate class share of transmission connection revenues would be more appropriate than using distribution revenues since the latter includes, for example, the allocation of billing and other customer-related costs that are not relevant to the allocation of transformer station costs.

is intended to avoid additional complexities and is consistent with decisions in other cases[30].

Deemed Asset

Pursuant to section 84(a) of the OEB Act, NOTL Hydro requests that the Board deems the transformer upgrade at MTS#2 to be a distribution asset.

[30] For example, EB-2011-0207.

4. GROUP 1 DEFERRAL AND VARIANCE ACCOUNTS

OVERVIEW

The information contained in this exhibit includes the status and description of NOTL Hydro's Group 1 deferral and variance accounts ("DVAs"), the proposed disposition of certain account balances, and the rate riders required for recovery or refund of the account balances.

Please note that the 2015 IRM Rate Generator model submitted with this application has been used in such a way that the totals claimed for recovery and the rate riders are calculated appropriately and correctly based on the evidence provided. This approach has required adjustment amounts to be entered in various columns in the Excel model in order to get the correct result. These adjustments are described in this Section when relevant to the specific DVAs.

PREVIOUS GROUP 1 DEFERRAL AND VARIANCE ACCOUNT DISPOSITION

The previous approvals which affect the calculation in Sheet 5 of the 2015 Rate Generator model from the December 2012 audited balances through to the claimed amounts are provided below.

2013 IRM Approval – Group 1 Accounts

On April 4, 2013, the Ontario Energy Board's Decision and Order EB-2012-0063 approved a one year disposition for NOTL Hydro's December 31, 2011 Group 1 deferral and variance account balances in the debit amount of $333,073, which includes a debit balance of $433,645 in the 1588 global adjustment sub-account.

In 2013, the approved balances were transferred to a sub-account of 1595 in accordance with the Decision and Order EB-2012-0063. The corresponding rate riders for the refund of the approved balances were effective until April 30, 2014. Table 9.1.1 below from Exhibit 9 of the 2014 CoS application summarizes the

2013 IRM approved Group 1 accounts and amounts disposed. The disposed amounts are entered in Columns AN and AV in Sheet 5 of the 2015 Rate Generator model.

Table 9.1.1: 2013 IRM Approved Group 1 Amounts for Disposition

Account Name	Account Number	Principal Balance A	Interest Balance B	Total Claim C = A + B
LV Variance Account	1550	$0	$0	$0
RSVA - Wholesale Market Service Charge	1580	-$564,693	-$18,360	-$583,054
RSVA - Retail Transmission Network Charge	1584	$12,838	-$88	$12,750
RSVA - Retail Transmission Connection Charge	1586	-$73,231	-$2,743	-$75,974
RSVA - Power (excluding Global Adjustment)	1588	$556,870	$15,082	$571,952
RSVA - Power – Global Adjustment Sub-Account	1588	$423,287	$10,358	$433,645
Recovery of Regulatory Asset Balances	1590	$0	$0	$0
Disposition and Recovery of Regulatory Balances (2010)	1595	-$22,790	-$3,456	-$26,246
Total Group 1 Excluding Global Adjustment Sub-Account		**-$91,006**	**-$9,566**	**-$100,572**
Total Group 1		**$332,281**	**$792**	**$333,073**

2014 Cost of Service Approval – Group 1 Accounts

On April 3, 2014, the Board issued a Decision and Order in case EB-2013-0155 which accepted the Settlement Proposal in its entirety. The Settlement Proposal included a one year disposition for the December 31, 2012 Group 1 deferral and variance account balances as submitted in the 2014 application as follows:

- a credit amount of $814,400 in Group 1 Accounts excluding 1589; and
- a credit amount of $170,381 in Account 1589.

The following Tables 9.3.1 and 9.3.3 from Exhibit 9 of the 2014 application provide the details of these approved balances:

Table 9.3.1: Group 1 Deferral/Variance Accounts – Excluding 1589 GA

Table 9.3.1

Account Description		Audited Financial Statements and RRR 2.1.7	Including Dispositions during 2013 instructed by Board. Also includes other NOTL Hydro adjustments described in Exhibit 9, Tab 2 Schedule 1.				
		Total Balance at Dec 31, 2012	Adjusted Principal Balance at Dec 31, 2012	Adjusted Interest Balance at Dec 31, 2012	Adjusted Total Balance at Dec 31, 2012	Projected Interest on adjusted principal balance from Jan 1 2013 to Apr 30 2014	Total Claim
Group 1 Accounts							
RSVA - Wholesale Market Service Charge	1580	($896,405)	($313,895)	$543	($313,352)	($6,152)	($319,505)
RSVA - Retail Transmission Network Charge	1584	$106,277	$92,929	$598	$93,527	$1,821	$95,348
RSVA - Retail Transmission Connection Charge	1586	($71,382)	$4,259	$332	$4,592	$83	$4,675
RSVA - Power (excluding Global Adjustment)	1588	($27,867)	($591,362)	($13,082)	($604,444)	($11,591)	($616,035)
Disposition and Recovery/Refund of Regulatory Balances (2010)	1595	($26,119)	$0	$0	$0	$0	$0
Disposition and Recovery/Refund of Regulatory Balances (2011)	1595	$20,714	$20,543	$170	$20,714	$403	$21,116
Total		**($894,783)**	**($787,525)**	**($11,439)**	**($798,964)**	**($15,435)**	**($814,400)**

Table 9.3.3: 1589 - Global Adjustment

Account Description		Audited Financial Statements and RRR 2.1.7	Including Dispositions during 2013 instructed by Board. Also includes other NOTL Hydro adjustments described in Exhibit 9, Tab 2 Schedule 1.				
		Total Balance at Dec 31, 2012	Adjusted Principal Balance at Dec 31, 2012	Adjusted Interest Balance at Dec 31, 2012	Adjusted Total Balance at Dec 31, 2012	Projected Interest on adjusted principal balance from Jan 1 2013 to Apr 30 2014	Total Claim
Group 1 Accounts							
RSVA - Global Adjustment	1589	$266,466	($163,385)	($3,794)	($167,179)	($3,202)	($170,381)

In 2014, the approved balances were transferred to a sub-account of 1595. The corresponding rate riders are effective until April 30, 2015.

The disposed amounts are entered in Columns AY and AZ in Sheet 5 of the 2015 Rate Generator model.

DEFERRAL AND VARIANCE ACCOUNT CLAIMS:

This section sets out the Claims for the Group 1 Accounts. It also references Account 1568 (for which no claim is being made in this application).

Please note that in the continuity schedule in Sheet 5 of the Rate Generator model, the starting point for entries is the balance sheet date for which approval was received in the 2014 CoS, i.e. December 31, 2012.

Interest Rates

The interest rates that have been used to calculate actual and forecast carrying charges on the accounts are shown in Table 4.1 and are in accordance with the methodology approved by the Board in EB-2006-0117 on November 28, 2006.

Table 4.1: Interest Rates Applied to Deferral and Variance Accounts (%)

	Approved Deferral and Variance accounts
Quarter by Year	Prescribed interest Rate
Q2 2015	1.47%
Q1 2015	1.47%
Q4 2014	1.47%
Q3 2014	1.47%
Q2 2014	1.47%
Q1 2014	1.47%
Q4 2013	1.47%
Q3 2013	1.47%
Q2 2013	1.47%
Q1 2013	1.47%
Q4 2012	1.47%
Q3 2012	1.47%
Q2 2012	1.47%
Q1 2012	1.47%
Q4 2011	1.47%
Q3 2011	1.47%
Q2 2011	1.47%
Q1 2011	1.47%
Q4 2010	1.20%
Q3 2010	0.89%
Q2 2010	0.55%
Q1 2010	0.55%

GROUP 1 ACCOUNT CLAIMS

The total Group 1 Accounts claim is a credit amount of $503,742 as per cell BE40 of Sheet 5 of the 2015 IRM Rate Generator model and summarized in Table 4.2 below. Details of each account are shown following Table 4.2.

Table 4.2 Summary of Claims

Group 1 Accounts		CLAIM
LV Variance Account	1550	0
Smart Metering Entity Charge Variance	1551	4,190
RSVA - Wholesale Market Service Charge	1580	(206,858)
RSVA - Retail Transmission Network Charge	1584	59,593
RSVA - Retail Transmission Connection Charge	1586	(3,591)
RSVA - Power (excluding Global Adjustment)	1588	173,550
RSVA - Global Adjustment	1589	(539,161)
Recovery of Regulatory Asset Balances	1590	0
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595	0
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595	11,006
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595	0
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595	(80)
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595	(2,391)
		0
RSVA - Global Adjustment	**1589**	(539,161)
Total Group 1 Balance excluding Account 1589 - Global Adjustment		35,419
Total Group 1 Balance		(503,742)
		0
LRAM Variance Account	**1568**	0
		0
Total including Account 1568		(503,742)

1550 Retail Settlement Variance Account – Low Voltage Variance Account

NOTL Hydro has had no transactions and a zero balance in this account since disposition of the account in NOTL Hydro's 2009 cost of service application, EB-2008-0237. NOTL Hydro is not an embedded Distributor.

1551 Smart Metering Entity Charge Variance Account

NOTL Hydro had no transactions prior to 2013 in this account. For 2015, NOTL Hydro is requesting disposition of the December 31, 2013 audited debit balance of $4,098 principal and $11 interest plus the forecasted interest through April 30, 2015. The claim is a debit balance of $4,190.

1580 Retail Settlement Variance Account - Wholesale Market Service Charges

This account is used to record the net of the amount charged by the Independent Electricity System Operator (IESO) based on the settlement invoices for the operation of the IESO-administered markets and the operation of the IESO-controlled grid, and the amount billed to customers using the OEB-approved Wholesale Market Service Rate. NOTL Hydro uses the accrual method.

For 2015, NOTL Hydro is requesting disposition of the December 31, 2013 audited balance, less the 2014 CoS approved disposition amounts plus the forecasted interest through April 30, 2015 for account 1580. The claim is a credit balance of $206,858.

1584 Retail Settlement Variance Account - Retail Transmission Network Charges

This account is used to record the net of the amount charged by the IESO, based on the settlement invoice for transmission network services, and the amount billed to customers using the OEB-approved Retail Transmission Network Charge. NOTL Hydro uses the accrual method.

For 2015, NOTL Hydro is requesting disposition of the December 31, 2013 audited balance, less the 2014 CoS approved disposition amounts plus the forecasted interest through April 30, 2015 for account 1584. The claim is a debit balance of$59,593.

1586 Retail Settlement Variance Account - Retail Transmission Connection Charges

This account is used to record the net of the amount charged by the IESO, based on the settlement invoice for transmission connection services, and the amount billed to customers using the OEB-approved Transmission Connection Charge. NOTL Hydro uses the accrual method.

For 2015, NOTL Hydro is requesting disposition of the December 31, 2013 audited balance, less the 2014 CoS approved disposition amounts plus the forecasted interest through April 30, 2015 for account 1586. The claim is a credit balance of $3,591.

1588 Retail Settlement Variance Account – Power

This account is used to recover the net difference between the energy amount billed to customers and the energy charge to NOTL Hydro using the settlement invoices from the IESO. NOTL Hydro uses the accrual method.

For 2015, NOTL Hydro is requesting disposition of the December 31, 2013 audited balance, less the 2014 CoS approved disposition amounts plus the forecasted interest through April 30, 2015 for account 1588. The resulting claim is a debit balance of $173,550.

1589 Retail Settlement Variance Account - Global Adjustment

This account is used to recover the net difference between the provincial benefit amount billed to customers and the global adjustment charge to NOTL Hydro using the settlement invoices from the IESO. NOTL Hydro uses the accrual method.

For 2015, NOTL Hydro is requesting disposition of the December 31, 2013 audited balance, less the 2014 CoS approved disposition amounts plus

the forecasted interest through April 30, 2015 for account 1589 Global Adjustment through a separate non-RPP rate rider. The claim is a credit balance of $539,161.

1590 Recovery of Regulatory Asset Balances

Account 1590 has been previously approved for disposition. There are no longer any transactions or balance to dispose of.

1595 Disposition and Recovery of Regulatory Balances

This account includes the regulatory asset or liability balances authorized by the Board for recovery in rates or payments/credits made to customers. Separate sub-accounts are maintained for expenses, interest, and recovery amounts for each Board-approved recovery.

- **2008 EB-2007-0813**

  NOTL did not have any disposition of balances in the 2008 rates process that required use of account 1595. Therefore, no values are entered in row 32 in Sheet 5 of the Rate Generator model.

- **2009 EB-2008-0237**

  The four-year recovery period for this account ended on April 30, 2013. For 2015, NOTL Hydro is requesting disposition of the residual December 31, 2013 audited balance plus the forecasted interest through April 30, 2015. The resulting claim is an interest-only debit balance of $11,006.

  The Sheet 5 continuity schedule shows adjustments in the amount of $7,429 in cells AP33 (debit) and AW33 (credit). These adjustments were done in the 2nd quarter of 2013 in compliance with Q.6/A.6 of the "Ontario Energy Board – Accounting Procedures Handbook – Frequently Asked Questions October 2009". That is, rate rider

recoveries were applied to the interest sub-accounts after the principal balance was settled.

- **2010 EB-2009-0237:**

The 2011 year-end credit balance of $26,246 in the 1595-2010 sub-account was transferred to the 1595-2013 sub-account in 2013 in accordance with the Decision and Order EB-2012-0063. Consequently, no further disposition of the 1595-2010 sub-account is required.

- **2011 EB-2010-0101:**

On April 3, 2014, the Board issued a Decision and Order in case EB-2013-0155 which accepted the Settlement Proposal in its entirety. The Settlement Proposal included a one year disposition for the December 31, 2012 Group 1 deferral and variance account balances as submitted in the 2014 application. These balances included a debit balance of $21,116 for 1595 sub-account 2011. In accordance with the Decision and Order, this balance was transferred to sub-account 2014 in the 2nd quarter of 2014.

NOTL is requesting disposition of a residual credit balance of $80 in sub-account 2011 due to recoveries and interest which has occurred subsequent to completion of the recovery period and settlement of this sub-account.

- **2012 EB-2011-0186**

Disposition of Account 1521

On March 22, 2012, the Ontario Energy Board's Decision and Order EB-2011-0186 on NOTL Hydro's 2012 IRM application approved, on a final basis, the disposition of a credit balance of $2,743 in Account #1521 as of December 31, 2010, plus the

amounts recovered in 2011, plus projected carrying charges to April 30, 2012. The Board directed that Account 1521 be closed effective May 1, 2012. The Board also directed NOTL to record the SPC balance in Account 1595 for disposition in a future rate setting. In May 2012, the principal credit balance at that time of $2,993 and the interest debit balance of $169 at that time were transferred to a subaccount of 1595 in accordance with the Decision and Order EB-2011-0186. To date, disposition of this sub-account of 1595 has not occurred.

NOTL Hydro is requesting in the current application the disposition of the above principal credit balance of $2,993, plus the above interest debit balance of $169, plus credit interest of $26 in 2012, plus credit interest of $44 in 2013, for a total audited debit interest amount of $99, plus the forecasted interest through April 30, 2015. The total claim is a credit amount of $2,952.

Disposition of Account 1572

On March 22, 2012, the Ontario Energy Board's Decision and Order EB-2011-0186 on NOTL Hydro's 2012 IRM application approved the applied-for Z-factor of $76,074 relating to storm recovery costs recorded in Account # 1572. The Board approved the recovery over a one-year period from May 1, 2012 to April 30, 2013. In 2012, the approved balance was transferred to a subaccount of 1595 in accordance with the Decision and Order EB-2011-0186.

The one-year recovery period for this account ended on April 30, 2013. For 2015, NOTL Hydro is requesting disposition of the residual December 31, 2013 audited balance plus the forecasted

interest through April 30, 2015. The resulting claim is an interest-only debit balance of $561. There is no forecasted interest through April 30, 2015 as the principal balance is zero.

The Sheet 5 continuity schedule shows adjustments in the amount of $757 in cells AP36 (debit) and AW36 (credit). These adjustments were done in the 2nd quarter of 2013 in compliance with Q.6/A.6 of the "Ontario Energy Board – Accounting Procedures Handbook – Frequently Asked Questions October 2009". That is, rate rider recoveries were applied to the interest sub-accounts after the principal balance was settled.

[NOTE: Disposition of Account 1562 (EB-2012-0026):

- *On September 20, 2012, the Ontario Energy Board's Decision and Order EB-2012-0026 approved a disposition balance for Account 1562 of a credit balance of $230,864, representing a credit principal balance of $202,991 to April 30, 2006 and carrying charges of $27,873 to August 31, 2012. The Board also approved a 19-month disposition period, commencing October 1, 2012 and ending April 30, 2014. In 2012, the approved balance was transferred to a subaccount of 1595. Although the disposition period is complete, the residual balance in this sub-account is not yet audited. Hence, NOTL Hydro will defer a claim regarding the residual balance until the 2016 IRM process.*

- *To ensure a correct calculation of the claim for 1595 (2012) resulting only from 1521 and 1572, the entry in cells AE36 and AJ36 exclude this sub-account related to 1562. As a result, there is a variance between RRR 2.1.7 and the 2013 year-end balance in Sheet 5 cell BG36 which reflects the audited credit*

balance of $75,088 in the 1562 sub-account of 1595 at December 31, 2013.]

Summary: 2012 EB-2011-0186

The following Table 4.3 summarizes the claim of a credit amount of $2,391 for 1595 2012 in cell BE36 based on the above details:

Table 4.3: Summary of Claim for 1595 (2012)

Sub-Accounts of 1595 (2012)	Principal at Dec 31-13	Interest at Dec 31-13	Projected Interest in 2014	Projected interest Jan 1-15 to Apr 30-15	Total Claim
From 1521	($2,993)	$99	($44)	($15)	($2,952)
From 1572	$0	$561	$0	$0	$561
Total	($2,993)	$660	($44)	($15)	($2,391)

1568 LRAM Variance Account (no claim)

On April 3, 2014, the Board issued a Decision and Order in case EB-2013-0155 which accepted the Settlement Proposal in its entirety. The Settlement Proposal included a one year recovery of a principal amount of $26,936 plus the associated forecasted interest of $726 through to April 30, 2014. This amount represented savings in 2011 from 2011 programs, savings in 2012 from persistence of 2011 programs and savings in 2012 from 2012 programs. The resulting total claim approved was a debit amount of $27,622. This approval is represented in cells AE42 (principal) and AJ42 (interest). In May 2014, the approved balance was transferred to a sub-account of 1595, as represented by the entries in cells AY42 (principal) and AZ42 (interest).

NOTL Hydro is not applying for disposition of savings in 2013 from 2011, 2012 or 2103 programs at this time as the balance is not deemed

significant. Hence, no further entries beyond those in the previous paragraph have been made in row 42 so that the claim amount in cell BE42 correctly calculates as zero.

The variance of $9,883 between RRR 2.1.7 and the 2013 balance in row 42 represents entries that have been made to date to reflect 2013 savings, which are not deemed to be significant, as stated above.

DETERMINANTS

The determinants for calculating rate riders are entered in Sheet 6 of the 2015 IRM Rate Generator model.

The volumetric forecasts are those approved in NOTL Hydro's 2014 CoS EB-2013-0155.

The non-RPP kWh data are those used in the approved cost of power calculation in the 2014 CoS.

The 1595 recovery share proportions for 2009, 2011 and 2012 are equal to the share proportions used in the respective approved dispositions for those years.

The numbers of residential and GS<50kW customers for use in allocating account 1551 are the averages of the 2013 and 2014 year-end numbers approved in the 2014 CoS.

PROPOSED RATE RIDERS

The proposed rate riders for disposition of the Group 1 accounts claims are as shown below in Table 4.4, reflecting Sheet 8 of the Rate Generator model, with a proposed recovery period of one year:

Table 4.4: Proposed Rate Riders

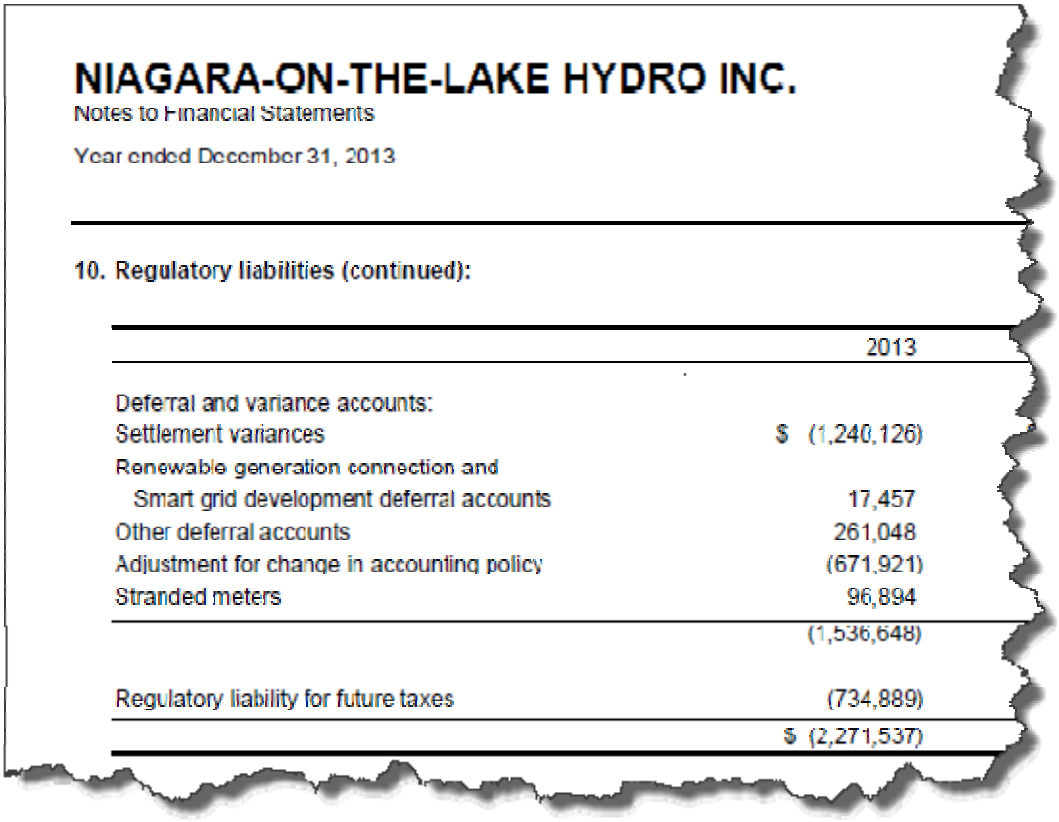
Please indicate the Rate Rider Recovery Period (in		1						
Rate Class	**Unit**	**Billed kWh**	**Billed kW or kVA**	**Balance of Accounts Allocated by kWh/kW (RPP) or Distribution Revenue**	**Deferral/Variance Account Rate Rider**	**Allocation of Balance in Account 1589**	**Billed kWh or Estimated kW for Non-RPP Customers**	**Global Adjustment Rate Rider**
RESIDENTIAL	$/kWh	67,753,410	0	15,518	0.0002	(15,326)	2,345,576	(0.0065)
GENERAL SERVICE LESS THAN 50 KW	$/kWh	37,260,698	0	6,998	0.0002	(20,887)	3,196,489	(0.0065)
GENERAL SERVICE 50 TO 4,999 KW	$/kW	81,473,856	201,178	12,450	0.0619	(495,503)	187,247	(2.6463)
UNMETERED SCATTERED LOAD	$/kWh	240,322	0	260	0.0011	0	0	0.0000
STREET LIGHTING	$/kW	1,248,464	3,377	193	0.0573	(7,445)	3,082	(2.4157)
microFIT								
Total	0	**187,976,750**	**204,555**	**35,420**		**(539,161)**	**5,732,394**	

Please note that the column for 1568 is not shown in Table 4.4 as no claim for 1568 is being made at this time.

OTHER MATTERS

Reconciliation RRR vs. Financial Statements

Note 10 of the 2013 audited financial statements reported the following regulatory liability account balances as of December 31, 2013:



NIAGARA-ON-THE-LAKE HYDRO INC.
Notes to Financial Statements
Year ended December 31, 2013

10. Regulatory liabilities (continued):

	2013
Deferral and variance accounts:	
Settlement variances	$ (1,240,126)
Renewable generation connection and Smart grid development deferral accounts	17,457
Other deferral accounts	261,048
Adjustment for change in accounting policy	(671,921)
Stranded meters	96,894
	(1,536,648)
Regulatory liability for future taxes	(734,889)
	$ (2,271,537)

The following Table 4.5 provides the reconciliation between the Financial Statements and 2.1.7 RRR for the Group 1 Accounts being claimed:

Table 4.5: Reconciliation RRR vs Financial Statements

2013 Audited Financial Statements vs 2.1.7 RRR							
Account	Settlement variances	Renewable generation connection and Smart grid development deferral accounts	Other deferral accounts	Adjustment for Change in Accounting Policy	Stranded Meters	Regulatory Liability for Future Taxes	RRR Totals
1508			$70,478				$70,478
1518	$85,079						$85,079
1532		$17,457					$17,457
1548	$174,439						$174,439
1551					$4,110		$4,110
1555					$92,784		$92,784
1568			$37,545				$37,545
1572			$55,564				$55,564
1576				($671,921)			($671,921)
1580	($522,456)						($522,456)
1582	$12,571						$12,571
1584	$153,796						$153,796
1586	$1,143						$1,143
1588	($445,577)						($445,577)
1580	($699,129)						($699,129)
1595 (2008)							$0
1595 (2009)			$11,006				$11,006
1595 (2010)							$0
1595 (2011)			$21,036				$21,036
1595 (2012)			($77,421)				($77,421)
1595 (2013)			$142,842				$142,842
1595 total	*$0*	*$0*	*$97,463*	*$0*	*$0*	*$0*	*$97,463*
Sub-Totals	($1,240,135)	$17,457	$261,049	($671,921)	$96,894	$0	($1,536,657)
2320						($734,889)	($734,889)
Grand Totals	($1,240,135)	$17,457	$261,049	($671,921)	$96,894	($734,889)	($2,271,546)
Financial Statement Totals	($1,240,126)	$17,457	$261,048	($671,921)	$96,894	($734,889)	($2,271,537)
*Difference**	*$9*	*$0*	*($1)*	*$0*	*$0*	*$0*	*$9*

** Totals may not equal Financial Statements exactly due to rounding in Statements*

Account Specific Filing Requirements

- **RSVA Accounts 1580, 1584, 1586, 1588, 1589**

  Pursuant to the account specific filing requirements in the EDDVAR report, NOTL states that it has used the accrual approach for the RSVA Accounts and that this approach has been used consistently over time and among RSVA Accounts for the applicable period.

- **Accounts 1588 and 1598 (RSVA Power and RSVA Global Adjustment)**

  NOTL confirms that the variance between Board-approved and actual line losses is reflected in Accounts 1588 and 1589 on NOTL's books for the applicable period.

5. DISTRIBUTION RATES

Calculation of rates

The requested Service Charges and Distribution Volumetric Rates are calculated by completing the OEB 2015 IRM rate generator model.

IRM Model Parameters

The driver parameters determining the requested adjustments to the distribution rates are determined in the OEB model in Sheet 24:

Price Escalator	1.70%
Productivity Factor	0.00%
Stretch Factor for NOTL (Stretch Factor Group III)	0.30%
Price Cap Index = 1.70% - 0.00% - 0.30%	1.40%

As stated in Section 1 - Introduction, NOTL does not have any required revenue to cost ratio adjustments.

Proposed Rates

The following Table 5.1 summarizes the proposed rates as calculated in Sheet 24 of the OEB model:

Table 5.1 – Proposed Rates

Rate Class	Current MFC	MFC Adjustment from R/C Model	Current Volumetric Charge	DVR Adjustment from R/C Model	Price Cap Index to be Applied to MFC and DVR	Proposed MFC	Proposed Volumetric Charge
RESIDENTIAL	$ 17.94	0	$ 0.0126	0	1.40%	$ 18.19	$ 0.0128
GENERAL SERVICE LESS THAN 50 KW	$ 37.28	0	$ 0.0112	0	1.40%	$ 37.80	$ 0.0114
GENERAL SERVICE 50 TO 4,999 KW	$ 266.42	0	$ 2.1025	0	1.40%	$ 270.15	$ 2.1319
UNMETERED SCATTERED LOAD	$ 20.05	0	$ 0.0060	0	1.40%	$ 20.33	$ 0.0061
STREET LIGHTING	$ 7.42	0	$ 29.0338	0	1.40%	$ 7.52	$ 29.4403
microFIT	$ 5.40					$ 5.40	

The Rate Generator model is also being submitted separately in Excel and pdf formats.

6. PROPOSED RATES TARIFF

The proposed rates tariff is provided in Sheet 27 of the rate generator model.

The proposed Tariff is also being submitted separately in Excel and pdf formats as generated by Sheet 27.

7. BILL IMPACTS

Summary

Using sheet 28 of the 2015 IRM rate generator, the total bill impacts for NOTL customer classes are all less than 10%, as summarized in Table 7.1 below.

Table 7.1 – Summary of Bill Impacts

Rate Class	Bill	% increase (Decrease)	$ Increase (Decrease)
Residential	Total bill on TOU (including OCEB)	1.69%	$1.97
GS<50 kW	Total bill on TOU (including OCEB)	2.06%	$5.71
GS>50 kW (non-interval; RPP)	Total bill on TOU (including OCEB)	1.39%	$88.24
Unmetered Scattered Load	Total bill on TOU (including OCEB)	2.92%	$3.59
Streetlighting	Total bill	1.01%	$0.17

Mitigation Measures

NOTL submits that bill impact mitigation measures are not required for any class.

Details of Bill Impacts

Details of the bill impacts for each class for representative usage levels are provided on the following pages, as generated by the model. The representative usage levels are the same as was used in the Draft Rate Order for the NOTL Hydro's 2014 cost of service application, namely:

- 800 kWh per month per residential customer
- 2,000 kWh per month per GS<50 kW customer;
- 56,000 kWh and 150 kW per month per GS>50 kW customer;
- 50 kWh and 0.14 kW per month per Street Lighting connection; and
- 900 kWh per month per Unmetered Scattered Load customer.

Residential

Rate Class	**RESIDENTIAL**	
Loss Factor		**1.0379**
Consumption	**kWh**	**800**
If Billed on a kW basis:		
Demand	**kW**	

Update Bill Impacts

	Current Board-Approved			Proposed			Impact	
	Rate ($)	**Volume**	**Charge ($)**	**Rate ($)**	**Volume**	**Charge ($)**	**$ Change**	**% Change**
Monthly Service Charge	$ 17.94	1	$ 17.94	$ 18.19	1	$ 18.19	$ 0.25	1.39%
Distribution Volumetric Rate	$ 0.0126	800	$ 10.08	$ 0.0128	800	$ 10.24	$ 0.16	1.59%
Fixed Rate Riders	$ 0.48	1	$ 0.48	$ -	1	$ -	-$ 0.48	-100.00%
Volumetric Rate Riders	-0.0010	800	-$ 0.80	-0.0003	800	-$ 0.24	$ 0.56	-70.00%
Sub-Total A (excluding pass through)			$ 27.70			$ 28.19	**$ 0.49**	**1.77%**
Line Losses on Cost of Power	$ 0.0839	30	$ 2.54	$ 0.0839	30	$ 2.54	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-0.0012	800	-$ 0.96	0.0002	800	$ 0.16	$ 1.12	-116.67%
Low Voltage Service Charge		800	$ -		800	$ -	$ -	
Smart Meter Entity Charge	$ 0.7900	1	$ 0.79	$ 0.7900	1	$ 0.79	$ -	0.00%
Sub-Total B - Distribution (includes Sub-Total A)			**$ 30.07**			**$ 31.68**	**$ 1.61**	**5.35%**
RTSR - Network	$ 0.0072	830	$ 5.98	$ 0.0076	830	$ 6.31	$ 0.33	5.56%
RTSR - Connection and/or Line and Transformation Connection	$ 0.0013	830	$ 1.08	$ 0.0013	830	$ 1.08	$ -	0.00%
Sub-Total C - Delivery (including Sub-Total B)			**$ 37.13**			**$ 39.07**	**$ 1.94**	**5.23%**
Wholesale Market Service Charge (WMSC)	$ 0.0044	830	$ 3.65	$ 0.0044	830	$ 3.65	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0013	830	$ 1.08	$ 0.0013	830	$ 1.08	$ -	0.00%
Standard Supply Service Charge	$ 0.2500	1	$ 0.25	$ 0.2500	1	$ 0.25	$ -	0.00%
Debt Retirement Charge (DRC)	$ 0.0070	800	$ 5.60	$ 0.0070	800	$ 5.60	$ -	0.00%
TOU - Off Peak	$ 0.0670	512	$ 34.30	$ 0.0670	512	$ 34.30	$ -	0.00%
TOU - Mid Peak	$ 0.1040	144	$ 14.98	$ 0.1040	144	$ 14.98	$ -	0.00%
TOU - On Peak	$ 0.1240	144	$ 17.86	$ 0.1240	144	$ 17.86	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 114.85**			**$ 116.79**	**$ 1.94**	**1.69%**
HST	13%		$ 14.93	13%		$ 15.18	$ 0.25	1.69%
Total Bill (including HST)			$ 129.78			$ 131.98	$ 2.19	1.69%
Ontario Clean Energy Benefit [1]			-$ 12.98			-$ 13.20	-$ 0.22	1.69%
Total Bill on TOU (including OCEB)			**$ 116.80**			**$ 118.78**	**$ 1.97**	**1.69%**

GS < 50kW

Rate Class	**GENERAL SERVICE LESS THAN 50 KW**	
Loss Factor		**1.0379**
Consumption	**kWh**	**2,000**
If Billed on a kW basis:		
Demand	**kW**	

Update Bill Impacts

	Current Board-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 37.28	1	$ 37.28	$ 37.80	1	$ 37.80	$ 0.52	1.39%
Distribution Volumetric Rate	$ 0.0112	2,000	$ 22.40	$ 0.0114	2,000	$ 22.80	$ 0.40	1.79%
Fixed Rate Riders	$ 3.34	1	$ 3.34	$ -	1	$ -	-$ 3.34	-100.00%
Volumetric Rate Riders	-0.0010	2,000	-$ 2.00	-0.0003	2,000	-$ 0.60	$ 1.40	-70.00%
Sub-Total A (excluding pass through)			$ 61.02			$ 60.00	**-$ 1.02**	**-1.67%**
Line Losses on Cost of Power	$ 0.0839	76	$ 6.36	$ 0.0839	76	$ 6.36	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-0.0027	2,000	-$ 5.40	0.0002	2,000	$ 0.40	$ 5.80	-107.41%
Low Voltage Service Charge		2,000	$ -		2,000	$ -	$ -	
Smart Meter Entity Charge	$ 0.7900	1	$ 0.79	$ 0.7900	1	$ 0.79	$ -	0.00%
Sub-Total B - Distribution (includes Sub-Total A)			**$ 62.77**			**$ 67.55**	**$ 4.78**	**7.61%**
RTSR - Network	$ 0.0066	2,076	$ 13.70	$ 0.0070	2,076	$ 14.53	$ 0.83	6.06%
RTSR - Connection and/or Line and Transformation Connection	$ 0.0013	2,076	$ 2.70	$ 0.0013	2,076	$ 2.70	$ -	0.00%
Sub-Total C - Delivery (including Sub-Total B)			**$ 79.17**			**$ 84.78**	**$ 5.61**	**7.09%**
Wholesale Market Service Charge (WMSC)	$ 0.0044	2,076	$ 9.13	$ 0.0044	2,076	$ 9.13	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0013	2,076	$ 2.70	$ 0.0013	2,076	$ 2.70	$ -	0.00%
Standard Supply Service Charge	$ 0.2500	1	$ 0.25	$ 0.2500	1	$ 0.25	$ -	0.00%
Debt Retirement Charge (DRC)	$ 0.0070	2,000	$ 14.00	$ 0.0070	2,000	$ 14.00	$ -	0.00%
TOU - Off Peak	$ 0.0670	1,280	$ 85.76	$ 0.0670	1,280	$ 85.76	$ -	0.00%
TOU - Mid Peak	$ 0.1040	360	$ 37.44	$ 0.1040	360	$ 37.44	$ -	0.00%
TOU - On Peak	$ 0.1240	360	$ 44.64	$ 0.1240	360	$ 44.64	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 273.09**			**$ 278.70**	**$ 5.61**	**2.05%**
HST	13%		$ 35.50	13%		$ 36.23	$ 0.73	2.05%
Total Bill (including HST)			$ 308.59			$ 314.93	$ 6.34	2.05%
Ontario Clean Energy Benefit [1]			-$ 30.86			-$ 31.49	-$ 0.63	2.04%
Total Bill on TOU (including OCEB)			**$ 277.73**			**$ 283.44**	**$ 5.71**	**2.06%**

GS > 50kW

Rate Class		**STREET LIGHTING**
Loss Factor		**1.0379**
Consumption	**kWh**	**50**
If Billed on a kW basis:		
Demand	**kW**	**0.14**

Update

	Current Board-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 7.42	1	$ 7.42	$ 7.52	1	$ 7.52	$ 0.10	1.35%
Distribution Volumetric Rate	$ 29.0338	0	$ 4.06	$ 29.4403	0	$ 4.12	$ 0.06	1.40%
Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Volumetric Rate Riders	-0.3511	0	-$ 0.05	-0.1630	0	-$ 0.02	$ 0.03	-53.57%
Sub-Total A (excluding pass through)			$ 11.44			$ 11.62	**$ 0.18**	**1.60%**
Line Losses on Cost of Power	$ 0.0839	2	$ 0.16	$ 0.0839	2	$ 0.16	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-2.1319	0	-$ 0.30	-2.3584	0	-$ 0.33	-$ 0.03	10.62%
Low Voltage Service Charge		0	$ -		0	$ -	$ -	
Smart Meter Entity Charge		1	$ -		1	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 11.30**			**$ 11.45**	**$ 0.15**	**1.34%**
RTSR - Network	$ 2.0249	0	$ 0.28	$ 2.1480	0	$ 0.30	$ 0.02	6.08%
RTSR - Connection and/or Line and Transformation Connection	$ 0.3558	0	$ 0.05	$ 0.3645	0	$ 0.05	$ 0.00	2.45%
Sub-Total C - Delivery (including Sub-Total B)			**$ 11.63**			**$ 11.80**	**$ 0.17**	**1.46%**
Wholesale Market Service Charge (WMSC)	$ 0.0044	52	$ 0.23	$ 0.0044	52	$ 0.23	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0013	52	$ 0.07	$ 0.0013	52	$ 0.07	$ -	0.00%
Standard Supply Service Charge	$ 0.2500	1	$ 0.25	$ 0.2500	1	$ 0.25	$ -	0.00%
Debt Retirement Charge (DRC)	$ 0.0070	50	$ 0.35	$ 0.0070	50	$ 0.35	$ -	0.00%
TOU - Off Peak	$ 0.0670	32	$ 2.14	$ 0.0670	32	$ 2.14	$ -	0.00%
TOU - Mid Peak	$ 0.1040	9	$ 0.94	$ 0.1040	9	$ 0.94	$ -	0.00%
TOU - On Peak	$ 0.1240	9	$ 1.12	$ 0.1240	9	$ 1.12	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 16.72**			**$ 16.89**	**$ 0.17**	**1.02%**
HST	13%		$ 2.17	13%		$ 2.20	$ 0.02	1.02%
Total Bill (including HST)			$ 18.90			$ 19.09	$ 0.19	1.02%
Ontario Clean Energy Benefit [1]			-$ 1.89			-$ 1.91	-$ 0.02	1.06%
Total Bill on TOU (including OCEB)			**$ 17.01**			**$ 17.18**	**$ 0.17**	**1.01%**

Unmetered Scattered Loads

Rate Class	**UNMETERED SCATTERED LOAD**	
Loss Factor		**1.0379**
Consumption	**kWh**	**900**
If Billed on a kW basis:		
Demand	**kW**	

Update Bill Impacts

	Current Board-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 20.05	1	$ 20.05	$ 20.33	1	$ 20.33	$ 0.28	1.40%
Distribution Volumetric Rate	$ 0.0060	900	$ 5.40	$ 0.0061	900	$ 5.49	$ 0.09	1.67%
Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Volumetric Rate Riders	-0.0010	900	-$ 0.90	-0.0003	900	-$ 0.27	$ 0.63	-70.00%
Sub-Total A (excluding pass through)			$ 24.55			$ 25.55	**$ 1.00**	**4.07%**
Line Losses on Cost of Power	$ 0.0839	34	$ 2.86	$ 0.0839	34	$ 2.86	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-0.0013	900	-$ 1.17	0.0011	900	$ 0.99	$ 2.16	-184.62%
Low Voltage Service Charge		900	$ -		900	$ -	$ -	
Smart Meter Entity Charge		1	$ -		1	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 26.24**			**$ 29.40**	**$ 3.16**	**12.04%**
RTSR - Network	$ 0.0066	934	$ 6.17	$ 0.0070	934	$ 6.54	$ 0.37	6.06%
RTSR - Connection and/or Line and Transformation Connection	$ 0.0013	934	$ 1.21	$ 0.0013	934	$ 1.21	$ -	0.00%
Sub-Total C - Delivery (including Sub-Total B)			**$ 33.62**			**$ 37.16**	**$ 3.53**	**10.51%**
Wholesale Market Service Charge (WMSC)	$ 0.0044	934	$ 4.11	$ 0.0044	934	$ 4.11	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0013	934	$ 1.21	$ 0.0013	934	$ 1.21	$ -	0.00%
Standard Supply Service Charge	$ 0.2500	1	$ 0.25	$ 0.2500	1	$ 0.25	$ -	0.00%
Debt Retirement Charge (DRC)	$ 0.0070	900	$ 6.30	$ 0.0070	900	$ 6.30	$ -	0.00%
TOU - Off Peak	$ 0.0670	576	$ 38.59	$ 0.0670	576	$ 38.59	$ -	0.00%
TOU - Mid Peak	$ 0.1040	162	$ 16.85	$ 0.1040	162	$ 16.85	$ -	0.00%
TOU - On Peak	$ 0.1240	162	$ 20.09	$ 0.1240	162	$ 20.09	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 121.02**			**$ 124.56**	**$ 3.53**	**2.92%**
HST	13%		$ 15.73	13%		$ 16.19	$ 0.46	2.92%
Total Bill (including HST)			$ 136.76			$ 140.75	$ 3.99	2.92%
Ontario Clean Energy Benefit [1]			-$ 13.68			-$ 14.08	-$ 0.40	2.92%
Total Bill on TOU (including OCEB)			**$ 123.08**			**$ 126.67**	**$ 3.59**	**2.92%**

Street Lighting

Rate Class	**STREET LIGHTING**	
Loss Factor		**1.0379**
Consumption	**kWh**	**50**
If Billed on a kW basis:		
Demand	**kW**	**0.14**

Update

	Current Board-Approved			Proposed			Impact	
	Rate ($)	Volume	Charge ($)	Rate ($)	Volume	Charge ($)	$ Change	% Change
Monthly Service Charge	$ 7.42	1	$ 7.42	$ 7.52	1	$ 7.52	$ 0.10	1.35%
Distribution Volumetric Rate	$ 29.0338	0	$ 4.06	$ 29.4403	0	$ 4.12	$ 0.06	1.40%
Fixed Rate Riders	$ -	1	$ -	$ -	1	$ -	$ -	
Volumetric Rate Riders	-0.3511	0	-$ 0.05	-0.1630	0	-$ 0.02	$ 0.03	-53.57%
Sub-Total A (excluding pass through)			$ 11.44			$ 11.62	**$ 0.18**	**1.60%**
Line Losses on Cost of Power	$ 0.0839	2	$ 0.16	$ 0.0839	2	$ 0.16	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-2.1319	0	-$ 0.30	-2.3584	0	-$ 0.33	-$ 0.03	10.62%
Low Voltage Service Charge		0	$ -		0	$ -	$ -	
Smart Meter Entity Charge		1	$ -		1	$ -	$ -	
Sub-Total B - Distribution (includes Sub-Total A)			**$ 11.30**			**$ 11.45**	**$ 0.15**	**1.34%**
RTSR - Network	$ 2.0249	0	$ 0.28	$ 2.1480	0	$ 0.30	$ 0.02	6.08%
RTSR - Connection and/or Line and Transformation Connection	$ 0.3558	0	$ 0.05	$ 0.3645	0	$ 0.05	$ 0.00	2.45%
Sub-Total C - Delivery (including Sub-Total B)			**$ 11.63**			**$ 11.80**	**$ 0.17**	**1.46%**
Wholesale Market Service Charge (WMSC)	$ 0.0044	52	$ 0.23	$ 0.0044	52	$ 0.23	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0013	52	$ 0.07	$ 0.0013	52	$ 0.07	$ -	0.00%
Standard Supply Service Charge	$ 0.2500	1	$ 0.25	$ 0.2500	1	$ 0.25	$ -	0.00%
Debt Retirement Charge (DRC)	$ 0.0070	50	$ 0.35	$ 0.0070	50	$ 0.35	$ -	0.00%
TOU - Off Peak	$ 0.0670	32	$ 2.14	$ 0.0670	32	$ 2.14	$ -	0.00%
TOU - Mid Peak	$ 0.1040	9	$ 0.94	$ 0.1040	9	$ 0.94	$ -	0.00%
TOU - On Peak	$ 0.1240	9	$ 1.12	$ 0.1240	9	$ 1.12	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 16.72**			**$ 16.89**	**$ 0.17**	**1.02%**
HST	13%		$ 2.17	13%		$ 2.20	$ 0.02	1.02%
Total Bill (including HST)			$ 18.90			$ 19.09	$ 0.19	1.02%
Ontario Clean Energy Benefit [1]			-$ 1.89			-$ 1.91	-$ 0.02	1.06%
Total Bill on TOU (including OCEB)			**$ 17.01**			**$ 17.18**	**$ 0.17**	**1.01%**

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX A

Details of Project Cost

Niagara-on-the-Lake Hydro
NOTL MTS No.2

Cost Estimate

IESO System Impact Assessment [IESO SIA]		$ 20,000
Hydro One		
● Study Agreement	$ 35,000	
● Connection Impact Assessment [Hydro One CIA]	$ 10,000	
● Connection Cost Recovery Agreement [CCRA]	$ 104,000	$ 149,000
Pre-Purchase Power Transformer Specifications & Drawings		$ 35,000
● Technical Specification & Drawings		
● Pre-Purchase Power Transformer RFP Submission Review and Recommendation		
● Manufacturer's (Shop) Drawings and Documentation Review		
Pre-Purchase Power Transformer Unit (30/40/50MVA 115kV-27.6kV Rated Unit)		
● Power Transformer Unit (30/40/50MVA 115kV-27.6kV Rated Unit)	$ 1,306,000	
● Installation	$ 75,000	$ 1,381,000
General Contract (Engineer, Procure, Construct)		
● Revisions and Upgrade of NOTL MTS No. 2	$ 364,100	
● Power Transformer Storage Area in the Transformer Station for the relocation and storage of the existing power transformer	$ 159,700	
● New Remote Terminal Unit (RTU) System	$ 64,500	
● New Medium Voltage Re-Closer Unit System, Identification: F3	$ 135,600	
● Soil Resistivity Test, Ground Grid Resistance Test and Driving-Point Impedance Test	$ 4,100	
● Engineering Study to Analyze and evaluate the existing Transformer Station standalone Ground Grid System	$ 4,700	$ 732,700
Engineering Consultation		$ 100,000
● Transformer Station Condition Assessment		
● Engineering Consultation		
Project Management		
● Internal NOTL Hydro resources - cost of $50,000 not being claimed as part of ICM		$ -
Sub-Total		**$ 2,417,700**
Contingency		$ 159,300
Total (Not Including Taxes)		**$ 2,577,000**

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX B

Long Term Supply Report

Long Term Supply Plan

Niagara-on-the-Lake Hydro

Niagara-on-the-Lake, ON

Prepared by
Raven Engineering Inc.

For
Niagara-on-the-Lake Hydro

Rev. 0 – January, 2012

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Table of Contents

1. Executive Summary

This section to be completed after review.

Andrew Durward, P.Eng.
Raven Engineering Inc.

2. Background

NOTL Hydro dates back to 1972 when the area was taken over from Ontario Hydro. The area load was originally supplied by Niagara Stanley Auto TS at 27.6kV, which had a peak capacity of 20MW. This point of supply has been decommissioned.

In 1985 Hydro One constructed NOTL DS, which has two transformers with a total nameplate capacity of 50 MW.

In 2003 NOTL Hydro constructed York TS, which has a single transformer with a nameplate capacity of 41.7 MW.

Peak loads in 2010/2011 reached 51 MVA. The utility has adequate capacity to meet peak loads with all stations in service, but can no longer meet peak demand with one station alone.

The purpose of this report is to provide a plan to allow the utility to increase the capacity of the stations to supply peak load under contingency, to meet future load growth and to replace aging assets as they reach end of life.

3. Existing Supply

3.1. NOTL DS

NOTL DS is supplied from a single 115kV line Q11S, tapped off the main tower line and continuing approximately 4.5km on wood poles.

The station is equipped with two transformers, rated 15/20/25 MW. The transformers are normally operated in a split bus arrangement, supplying load individually.

There is land owned by the utility outside the station fence to expand the station if required.

There are three feeders, supplied from McGraw Edison Type KVSO reclosers.

Relaying for the station was upgraded in 2009 with the addition of SEL relays. The SCADA RTU is a GE Harris D20 (1996).

There are no known equipment deficiencies at the station.

3.2. York TS

York TS is located adjacent to the Hydro One right-of-way and supplied at 115kV from a line tap to circuit Q12S.

There is a single transformer rated 25/33/41.7 MVA.

There is land available to the west for future expansion of the station.

The station has three feeders at 27.6kV supplied by G&W Viper reclosers.

The relaying for the station is all SEL relays and the SCADA RTU is a GE Harris D25.

There are no known equipment deficiencies at the station.

3.3. Station Capacity

The existing transformers have nameplate ratings that include self cooled and two stages of fans, or ONAN/ONAF/ONAF. The highest ONAF rating assumes all fans are running.

Hydro One uses a transformer rating system to produce a Limited Time Rating, or LTR. The LTR is higher than the nameplate rating, and requires that the transformer was built to the Hydro One specification. This rating permits a certain loss of life to the transformer from overloading for a period of time while relief transformation is obtained. The 10 day LTR rating is used where relief transformation facilities can be put in service within 10 days.

The NOTL DS transformers were built to Hydro One Spec. M-111SM-80 and were loaded within the LTR of 31.8 MVA when owned by Hydro One. Since the utility does not have access to relief transformation facilities within 10 days, this would not be a prudent option for NOTL Hydro and the transformer loading should be limited to its nameplate rating. This provides a station peak capacity of 50 MVA.

The York TS transformer was built to CSA specifications and should be limited to its rating of 41.7 MVA.

The combined station capacity is 91.7 MVA.

3.4. Station Locations

NOTL DS is conveniently located near the centre of the service territory, able to supply load throughout. York TS is located near the southeast corner of the service territory, further from the load centre in the old Town but closer to the anticipated development near the Glendale-QEW interchange.

The 27.6kV distribution voltage allows long feeder lengths and the existing locations do not present a problem.

3.5. Feeder Loading

There are currently six feeders, three supplied from each station. Each feeder is constructed for a 600 amp rating at the station exit.

Due to configuration of the stations, the feeders have the following capacity:

NOTL DS			York TS		
T1		T2	T1		
25 MVA		25 MVA	41.7 MVA		
F1	F2	F4	M1	M2	M3
12.5 MVA	12.5 MVA	25 MVA	13.9 MVA	13.9 MVA	13.9 MVA
261 Amps	261 Amps	522 Amps *	290 Amps	290 Amps	290 Amps

Note that the feeder load assumes balancing the load between feeders.

* The relay settings on the feeders limit loading to 448 Amps.

3.6. Reliability of Supply

Both NOTL Hydro stations are supplied from a single 115kV line and operated as a single transformer supplying load. At NOTL DS there are two transformers side by side operating independently. This system is typical for rural supply areas in Ontario. There is no redundancy in the supply and should the station experience a catastrophic failure customers will be without power. Fortunately, such total station failures are rare.

The two stations are supplied from different 115kV Hydro One owned transmission lines on common towers. NOTL DS is supplied from Q11S and York TS from Q12S. A 115kV circuit outage would only affect one station.

The 115kV lines can be supplied from either end and line switches exist to isolate the line sections on either side of the station tap. A line failure on one of the 115kV lines could be isolated by switching, and service to the NOTL station restored from the healthy section. This provides good reliability of the 115kV supply.

A failure on the 4.5km wood pole 115kV line from the Q11S line tap to NOTL DS would interrupt supply until the pole line could be repaired.

The worst case failure for customer supply would be a transformer outage. Currently, a transformer outage at York TS would interrupt all load supplied from the station. A long term outage would require transferring all load from York TS to NOTL DS. Adequate 27.6kV feeders exist for such a transfer, and it is routinely done for maintenance in the off peak season.

A transformer failure at NOTL DS would have less impact since there are two transformers. Load could be transferred to the second transformer and to York TS.

3.7. Remaining Life of Substation Transformers

The planning and financial lifespan of a substation transformer is commonly quoted as 40 years, and many units have had service lives of up to 60+ years. Long service life requires construction to an accepted standard, routine maintenance throughout the life of the asset, and avoiding the life shortening effects of loading beyond the rating.

The NOTL DS transformers meet the first two criteria but it is known that the station was operated at or above capacity prior to York TS being constructed. When the station was operated by Hydro One they used a 10 day LTR criteria for loading, which assumes an acceptable loss of service life to the transformer from overloading. There is no quantitative data on how much service life was impacted.

The NOTL transformers were constructed in 1983, making them 29 years old in 2012. It is a suitable time to assess the remaining age of the transformers, and to consider remedial work as required to maintain the asset.

The York transformer was constructed in 2003 and the transformer is less than 10 years old.

4. System Load

4.1. Historic Load

Load data dating from 1971 has been supplied by the utility and is shown in graphical form in Figure 1. Peak load reached 50.7 MVA in 2011.

4.2. Load Growth

Peak load for the utility is expected to grow slowly over time, with residential and development both occurring on a smaller scale. The addition of FIT and micro-FIT generation has the effect of offsetting load, and future economic growth in the area is anticipated to be slow.

No load growth study was done for this report. Instead, the recommended approach is to phase in station capacity expansion as load growth occurs and transformer assets reach end of life.

Figure 2 shows the supply station capacity plotted with the peak load. For illustrative purposes, a load growth of 1% has been shown beyond 2011.

4.3. Renewable Generation

A considerable number of renewable generators have been added to the NOTL distribution system in the past several years. From larger projects such as Weir 3 GS at 2.2 MW down to FIT and MicroFit projects, the total amount is currently 3.3MW. This generation supplies utility load and offsets the station loading.

Weir 3 GS is hydro-electric and production is intermittent depending on Welland Canal water levels and flows. The remainder is predominantly solar photovoltaic, the majority of which can be expected to be producing on a sunny summer day when peak load occurs. Peak load typically occurs between 4 and 6pm, while solar production peaks at midday when the sun is highest.

While renewable generation improves supply capacity, it is non-dispatchable, intermittent and provides a small component (6.5%) of peak utility load. For planning purposes renewable generation cannot be relied upon for full capacity during peak load periods.

5. Existing Supply Capability

With both stations in service, the peak load can be easily supplied. However, with one station out of service, the utility will be unable to meet peak load. Rotational load shedding will be required to protect the remaining transformer(s) from damage due to overloading.

The risk of operating in this manner depends on the risk of a foreseeable event causing the loss of an entire station. This could occur for various foreseeable events including:

- Loss of 115kV supply from Hydro One
- Transformer failure at York TS
- Failure of the 4.5km wood pole line supplying NOTL DS

As load growth occurs, the impact of such an event increases.

6. Planning Requirements

The study identified the following planning requirements to be considered.

- Increase station capacity at York TS and NOTL DS to permit each station to supply peak utility load. This will avoid rotational load shedding in the event of a station loss during peak load periods (summer).
- Assess the remaining life of the NOTL DS transformers.
- Ensure that available station capacity can be utilized.

7. Options to Increase Station Capacity

There are several options available to the utility to increase supply capacity. These are discussed in this section.

7.1. Option 1 - Upgrade to DESN

For urban supply areas, a more common station configuration is a DESN station, or Dual Element Spot Network. Such a station is supplied by two incoming high voltage lines, has two identical transformers normally operated in parallel supplying two low voltage buses. Any of these components can fail without seriously affecting supply reliability, as the companion equipment is capable of carrying the total station load.

A DESN station provides better reliability but requires redundant equipment and more facilities than the existing NOTL stations. Converting one or both of the NOTL stations would require:

- A second 115kV line tap from Hydro One,
- A second 115kV circuit switcher,
- A second transformer, same size and characteristics as the existing,
- A second low voltage bus, and a bus tie breaker,
- Additional protections including bus differential, breaker failure and high voltage line protections including telecommunications equipment to interface with Hydro One for transfer tripping.
- A DESN station would have higher short circuit levels than the existing station, requiring the existing feeder reclosers to be replaced with circuit breakers.

While this would provide the highest reliability solution, the level of cost involved makes it prohibitive.

7.2. Option 2 - Replace Transformers

The existing station transformers can be replaced with larger units.

This is a feasible option for NOTL DS. The existing transformers are 29 years old and could be either refurbished and sold, or sold as is to help offset the cost of two new larger transformers. However, the transformers have significant life left in them and the utility should utilize these assets if possible. This option is better suited to a very large utility that can use the transformers at another substation location.

This option is not suitable for York TS since the existing transformer is less than 10 years old.

7.3. Option 3 - Construct a New Supply Station

Due to the low level of anticipated load growth and the cost involved, this alternative was not considered. The two existing sites provide redundancy and can be expanded to supply future load growth.

7.4. Option 4 - Add Static Capacitors to Existing Stations

A small increase in substation capacity can be gained by the addition of static capacitors. The capacitor bank corrects the power factor of the transformer loading, freeing up capacity currently used by the reactive power component.

The power factor at the existing stations is quite good. NOTL DS average power factor is above 96% and York is 94%. Adding capacitors would provide a minimal gain in capacity. It would defer a capacity increase but not eliminate it.

7.5. Option 4 - Add a Fourth Substation Transformer

This option involves replacing the existing 15/20/25 MVA NOTL T1 with a new 25/33/41.7 MVA transformer similar to York T1. This would bring the NOTL DS capability up to 66.7 MVA which would allow it to supply the utility peak load.

The existing NOTL T1 would be relocated to the York site and installed as York T2, also bringing the station capacity up to 66.7 MVA. Both stations would be similarly equipped with one 25 MVA newer transformer and one 15 MVA older transformer.

Based on the 2% load growth assumption, this would permit either station to supply peak utility load until beyond 2023 when the 15 MVA units would be 40 years old. Based on their condition and the load at that time, a decision would be made to either extend their service life beyond 40 years or replace them.

The ultimate development stage would be to have companion 25 MVA transformers at both sites, giving both stations a capacity of 83.4 MVA.

7.6. Option 6 - Do Nothing

Under this alternative, the utility would continue to be exposed to the risk of rotating blackouts in the event of a total station outage during peak load periods.

This option is not considered viable.

8. Recommendation

The most economical option to provide station capacity to meet utility peak load under contingency conditions is Option 4 – Add a Fourth Substation Transformer.

This option provides:

- two stations of similar configuration and capacity,
- each supplied from separate 115kV sources,
- each capable of supplying utility peak load for the foreseeable future,
- makes good use of existing assets,
- minimizes expenditure on new assets,
- provides for planned or forced outages, allowing elements to be taken out of service one at a time, similar to the benefits of a DESN station.

As a good balance between reliability of supply and cost, this is the recommended option.

9. Implementation

9.1. Upgrade NOTL T1

The following major items need to be considered to increase NOTL T1 to 25 MVA.

9.1.1. Transformer Foundation

The existing concrete transformer pad at NOTL DS is rated for a maximum transformer weight of 59,000 kg.

For reference, the York T1 transformer has a total weight of 69,925 kg.

Transformer foundation reinforcement or replacement will be required to upgrade NOTL T1.

9.1.2. Oil Containment

The oil containment at NOTL DS has a volume of 21.0m3 within the concrete curbs and above the stone. The existing transformers contain 20473 litres of oil in the transformer and plus an additional __ litres in the tapchanger.

For reference, the York T1 transformer has an oil capacity of 30582 litres, including the tapchanger.

Oil containment expansion will be required to upgrade NOTL T1.

9.1.3. Ground Grid

A review of the station ground grid resistance is recommended before increasing transformer size. Good records of the existing grid exist.

9.1.4. HV Capacity

The 115kV supply line is owned by Hydro One. The ability of this line to supply additional transformation will be determined during their assessment of the expansion.

The 115kV bus in the station is rated at ___.

The 115kV circuit switchers are rated at 1200 amps.

The existing peak 115kV load of the station (50 MVA) is 251 amps. This will increase to 335 amps with the upgrade of T1 to 25 MVA and to 419 amps with the future upgrade of T2 to 25 MVA.

The HV bus and circuit switchers can supply the increased transformer size. A review of the drop leads and connections is required to confirm sufficient rating.

9.1.5. LV Capacity

The 27.6kV bus and switches are all rated at 1200 amps.

Full load of a 25/33/41.7 MVA transformer is 872 amps.

The LV bus and switches can supply the increased transformer size.

9.1.6. Short Circuit Levels

Increasing the transformer size can result in an increase in short circuit levels. The impedance of the transformer will influence the actual short circuit levels.

Existing 3ph bus short circuit level at NOTL DS is 3058 Amps (146 MVA).

Preliminary calculations show an increase to 4299 Amps (206 MVA) if T1 was replaced with a transformer similar to York T1. A detailed short circuit study would be required with actual transformer parameters.

The interrupting rating of the feeder reclosers is 12.0 kA.

The short circuit withstand of the LV bus would need to be verified.

The feeder relay settings would need to be checked against the new short circuit levels.

9.1.7. Protection and Control

New main and backup transformer protections were installed in 2009, along with HV circuit switchers. The protections are suitable for a larger transformer and will require a change in relay settings. Re-use or replacement of existing CT and control cables will be determined at the design stage.

The existing SCADA RTU has some spare capacity and the ability for expansion if required. Most of the SCADA points from the existing T1 would be re-used.

9.1.8. Metering

The station is currently metered at the LV level near the secondary of the transformers. A review of the metering current transformers is required to determine if they have capacity to meter the larger transformer.

9.1.9. Feeder Egress

NOTL T1 supplied two feeder positions. Assuming balanced load between feeders, the new transformer would provide feeder capacity of 436 amps per feeder. This is within the equipment ratings and below 80% of the relay pickup settings. The existing F1 and F2 can handle the increased transformer size.

NOTL T2 can supply more load than the existing feeder can take out of the station. The limiting factor is the 80% relay pickup criteria, limiting feeder loading to 448 amps or 21.4 MVA. This can be addressed by effectively shortening the feeder by adding a line recloser, permitting an increase in the feeder relay settings.

Another option to utilize the full capacity of T2 would be to add a fourth feeder position. The station was constructed with provision for four feeders. There is a position available for a fourth feeder breaker, including bus space, bus support foundation, control duct and primary ducts exiting the station. There is sufficient capability for egress from the station for a fourth feeder on Conc. 5.

The ultimate configuration for NOTL DS would be two 25/33/41.7 MVA transformers, at which point the fourth feeder position would be required.

9.1.10. Parallel Operation of Transformers

There may be times when the transformers will be paralleled, for example when transferring load without causing a customer outage. Due to the difference in impedances, the existing NOTL DS transformers and York TS transformer would share load in approximate relation to their ratings assuming equal voltages.

If the new NOTL T1 has a similar impedance to York T1 (9.95%) then parallel operation during switching will not present a problem.

The normal operation will continue to be split bus, with each transformer supplying load independently.

9.2. NOTL Transformer Assessment

This plan option assumes that the existing NOTL transformers are suitable for continued use in the long term. Routine gas-in-oil and oil analysis and electrical tests do not show any significant problems with the transformers. Their condition should be verified by undertaking a thorough condition assessment.

An initial assessment can be done in situ prior to replacement and will require taking the transformers out of service one at a time.

The results of the assessment will determine if remediation is required and a plan for such will be determined at that time. The transformers may require transport to a repair facility or may only require work on site. Once a new larger NOTL T1 is in service, sufficient capacity will be available to remove the smaller transformers for repair and relocation.

There are a number of large transformer service providers available to undertake the assessment and/or repair.

9.3. York T2

The preferred option includes upgrading the capacity of York TS by relocating the old NOTL T1 to the York site as T2.

At present, York has no facility at all for a second transformer, so a station expansion will be required. The station expansion should consider the ultimate stage of two 25/33/41.7 MVA transformers and include provision for the eventual replacement of York T2 with a larger unit.

The expansion of York TS will include:

- Detailed design,
- Hydro One and IESO approvals,
- Land acquisition to the west,
- Site grading, draining, grounding and fencing,
- Transformer, switch and bus foundations,
- Procurement and construction,
- Relaying and SCADA upgrades,
- At least one new feeder position, preferably two and provision for three.
- New feeder exits and egress.

York TS currently has no spare breakers. There is a spare set of ducts exiting the station, but one of them was recently used to bring an alternate station service supply in from York Rd. Any additional feeders will require bus extension and new foundations.

9.4. Budget

This section to be developed.

9.5. Timeline

The following timeline is intended to be illustrative. At present there are no specific schedule constraints.

- Q1 2012 Supply Plan Report presented to the Board
- Q2 2012 NOTL T1/T2 transformer assessment
- Q3 2012 Design work for NOTL T1 replacement (budget?)
- Q4 2012 Submit proposal to Hydro One / IESO
- Q1 2013 Hydro One / IESO Approval
- Q1 2013 Order New NOTL T1
- Q2 2013 Expand York TS
- Q1 2014 Replace NOTL T1
- Q2 2014 Refurbish old NOTL T1
- Q3 2014 Install York T2
- Q4 2014 Refurbish NOTL T2

10. Attachments

Figure 1	NOTL Hydro Peak Load
Figure 2	NOTL Hydro Peak Load vs. Station Capacity
Figure 3	NOTL Hydro Peak Load vs. Proposed Station Capacity
Drawing E1	Supply Stations Existing
Drawing E2	Supply Stations Expansion – Phase 1 – NOTL T1 Upgrade
Drawing E3	Supply Stations Expansion – Phase 2 – York T2

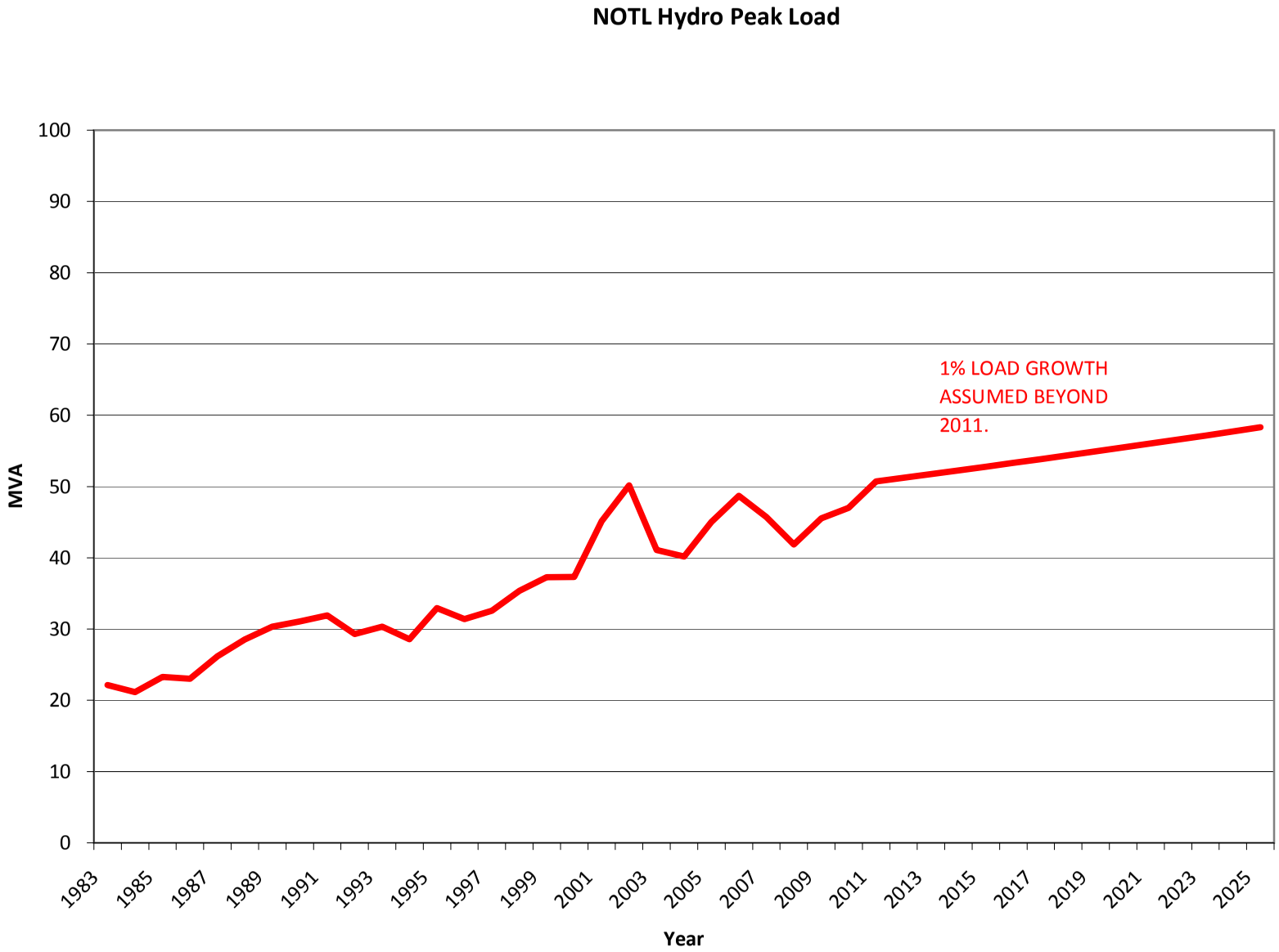
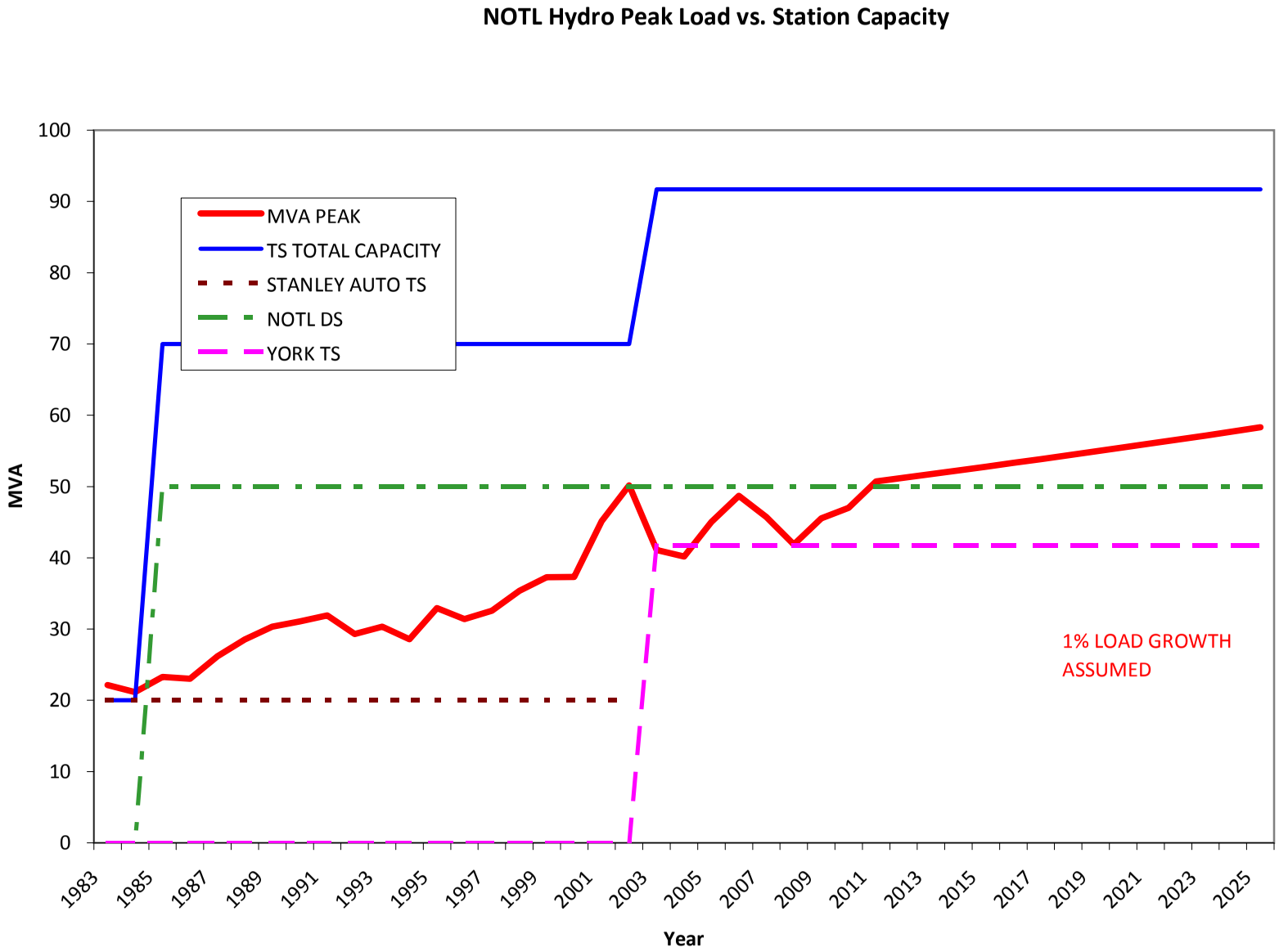

NOTL Hydro Peak Load
MVA
Year
1% LOAD GROWTH
ASSUMED BEYOND
2011.
0
10
20
30
40
50
60
70
80
90
100
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025

Figure 1


NOTL Hydro Peak Load vs. Station Capacity
MVA PEAK
TS TOTAL CAPACITY
STANLEY AUTO TS
NOTL DS
YORK TS
1% LOAD GROWTH ASSUMED
MVA
Year
0
10
20
30
40
50
60
70
80
90
100
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
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2015
2017
2019
2021
2023
2025

Figure 2

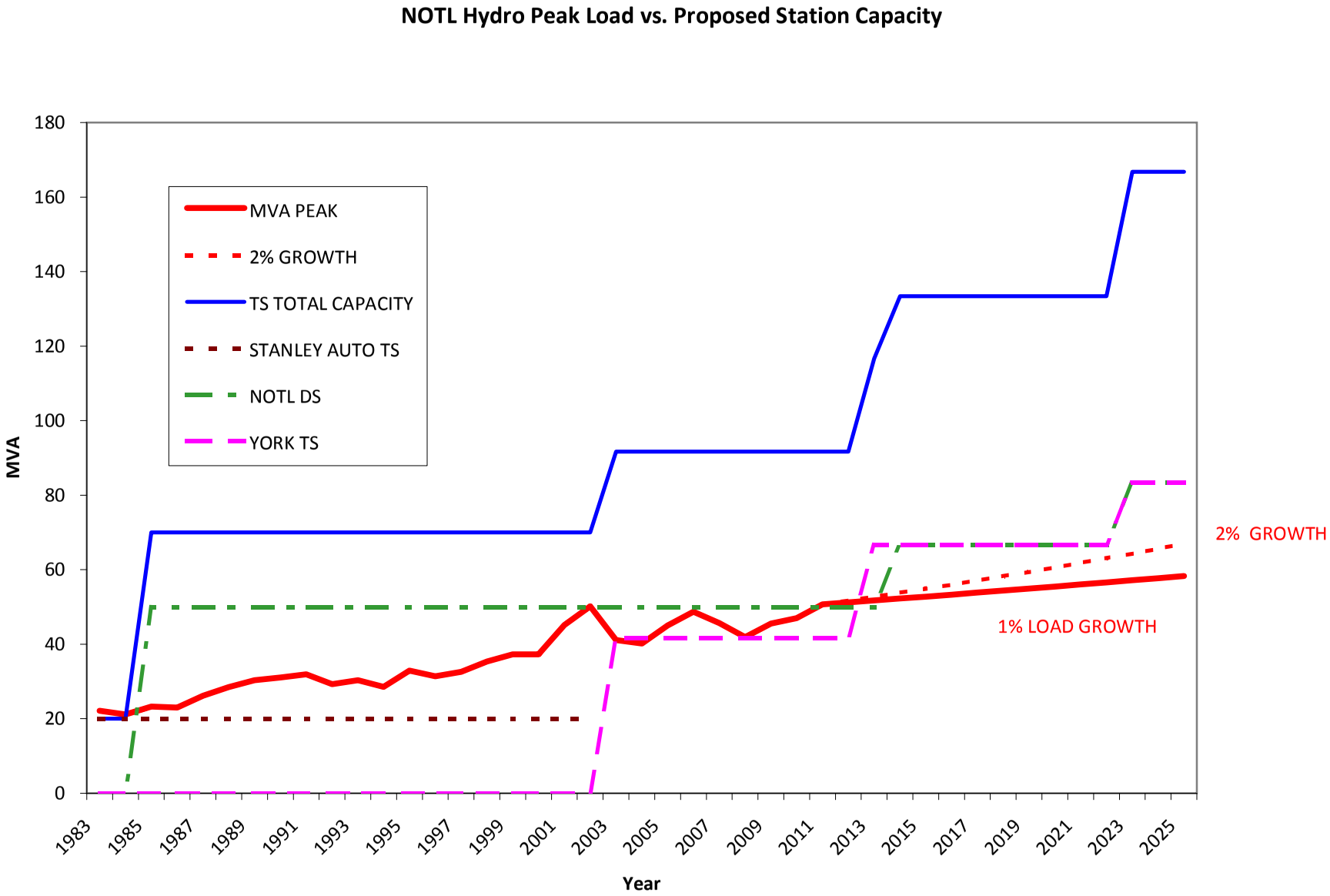
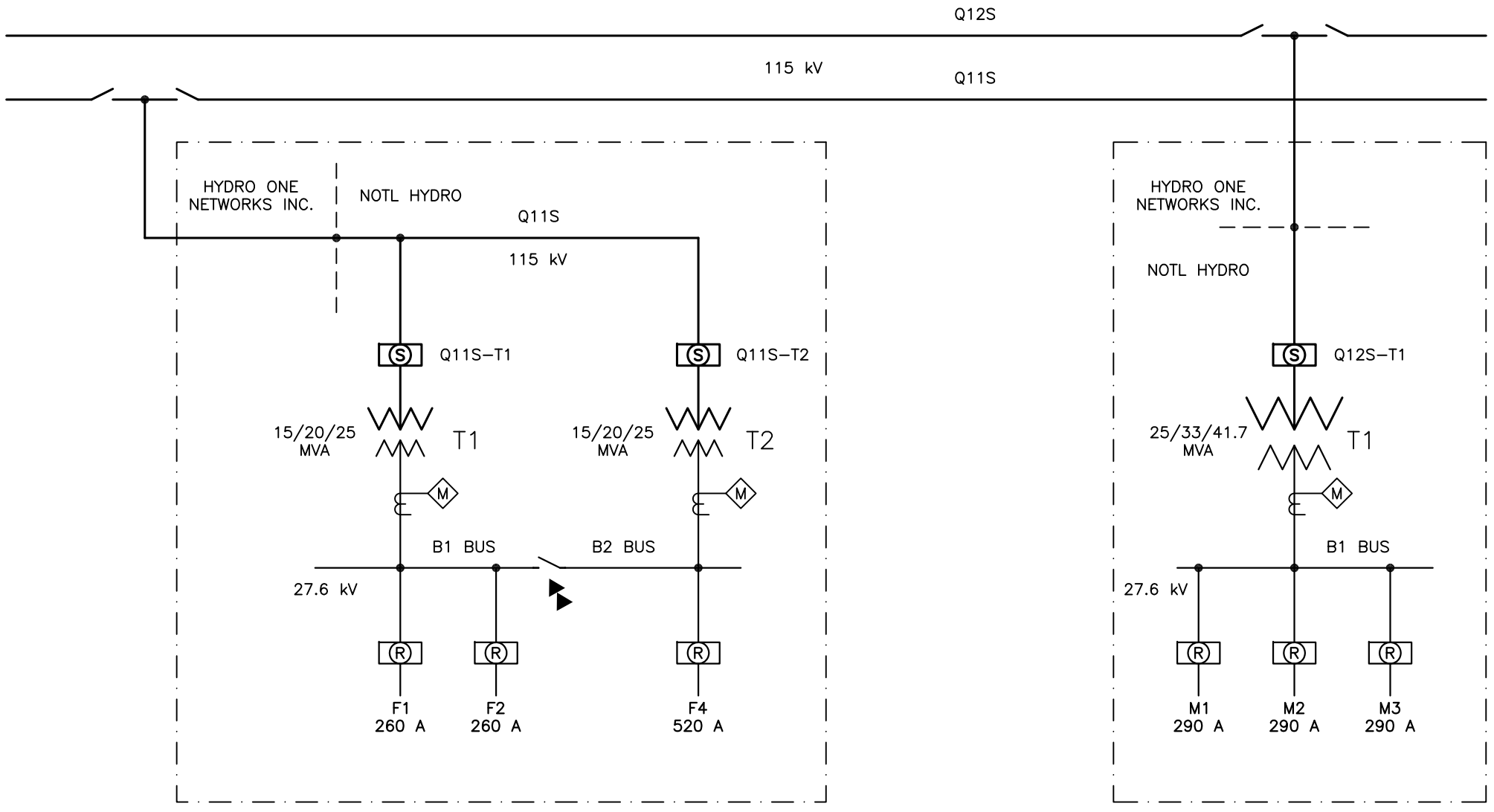

NOTL Hydro Peak Load vs. Proposed Station Capacity
MVA
Year
MVA PEAK
2% GROWTH
TS TOTAL CAPACITY
STANLEY AUTO TS
NOTL DS
YORK TS
2% GROWTH
1% LOAD GROWTH
0
20
40
60
80
100
120
140
160
180
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025

Figure 3

NOTES

1. THIS SCHEMATIC IS FOR ILLUSTRATIVE PURPOSED ONLY.
   NOT ALL FACILITIES ARE SHOWN.



NOTL DS

50.0 MVA CAPACITY

27 ? MVA PEAK LOAD

YORK TS

41.7 MVA CAPACITY

13 ? MVA PEAK

RAVEN
Engineering Inc.
Niagara Falls, ON.
(905) 353-9252

LEGEND

- GANG OPERATED LOADBREAK SWITCH
- DISCONNECT SWITCH
- CIRCUIT BREAKER
- CIRCUIT SWITCHER
- RECLOSER
- FUSE
- REVENUE METERING

E1

#	REVISIONS	DATE
A	FOR REVIEW	1/27/2012

NIAGARA–ON–THE–LAKE HYDRO

SUPPLY STATIONS

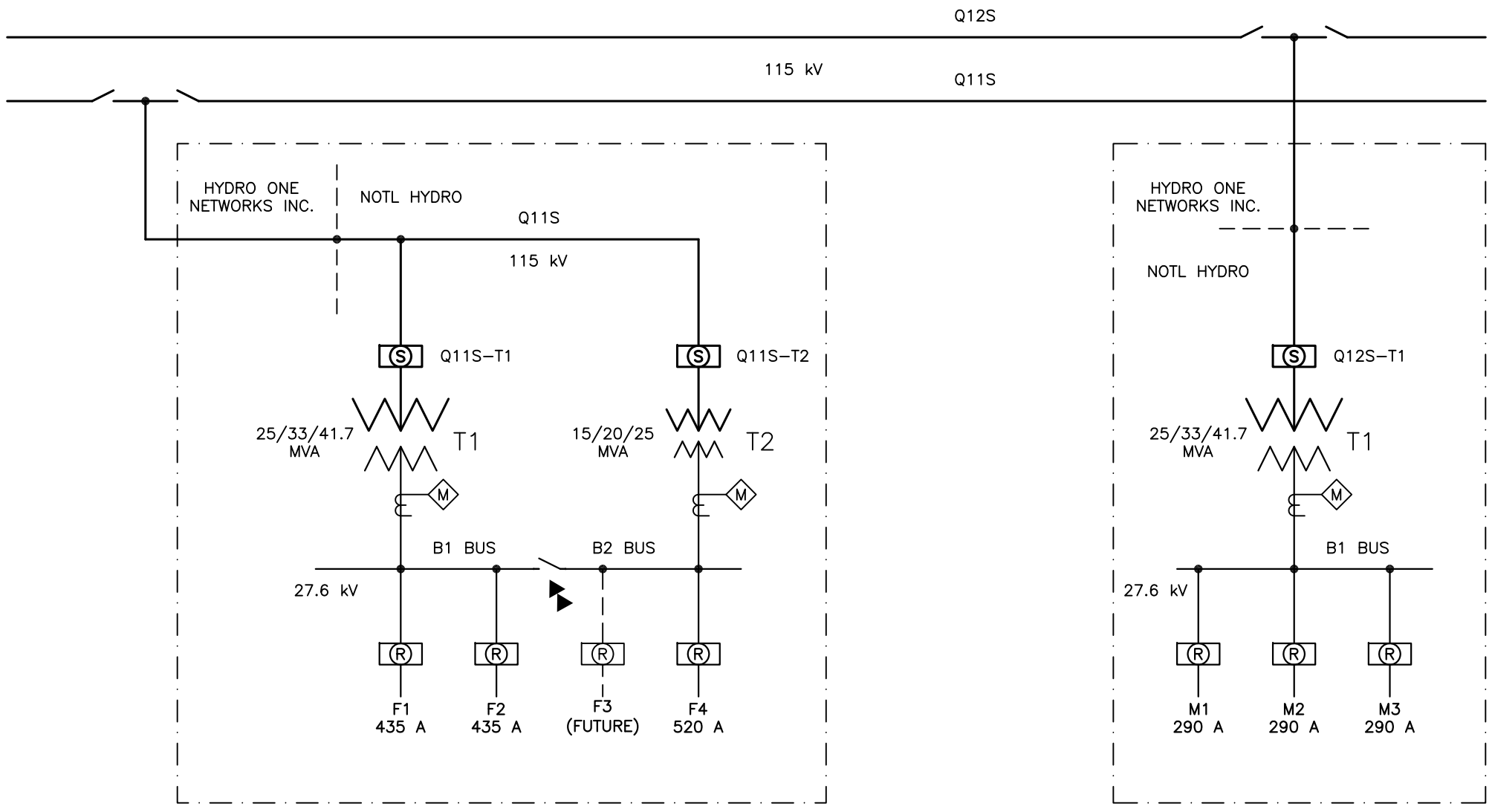
EXISTING

dwn LH	designed by	cad use	
chkd AD			
date month/day/yr	design approved		plot scale
1/6/2012	———		dist. code
scale Not To Scale	authorized		electronic filename 110229–E1 RA.DWG
w.o.			

dwg no 110229–E1 rev A

PHASE 1

1. REPLACE NOTL T1 WITH 25/33/41.7 MVA TRANSFORMER SIMILAR TO YORK T1.
2. RE–USE EXISTING CIRCUIT SWITCHER Q11S–T1 AND EXISTING T1 PROTECTIONS.
3. REQUIRES REVIEW OF SHORT CIRCUIT LEVELS, GROUND GRID, GPR AND FEEDER PROTECTION SETTINGS.



NOTL DS

66.7 MVA CAPACITY

YORK TS

41.7 MVA

RAVEN
Engineering Inc.
Niagara Falls, ON.
(905) 353-9252

LEGEND

- GANG OPERATED LOADBREAK SWITCH
- DISCONNECT SWITCH
- CIRCUIT BREAKER
- CIRCUIT SWITCHER
- RECLOSER
- FUSE
- REVENUE METERING

E2

#	REVISIONS	DATE
A	FOR REVIEW	1/27/2012

NIAGARA–ON–THE–LAKE HYDRO

SUPPLY STATIONS EXPANSION – PHASE 1 NOTL DS T1 UPGRADE TO 25/33/41.7 MVA

dwn LH	designed by	cod date	
chkd AD			
date month/day/yr 1/6/2012	design approved ———	plot scale	
		dist. code	
scale Not To Scale	authorized	electronic filename 110229–E2 RA.DWG	
w.o.			

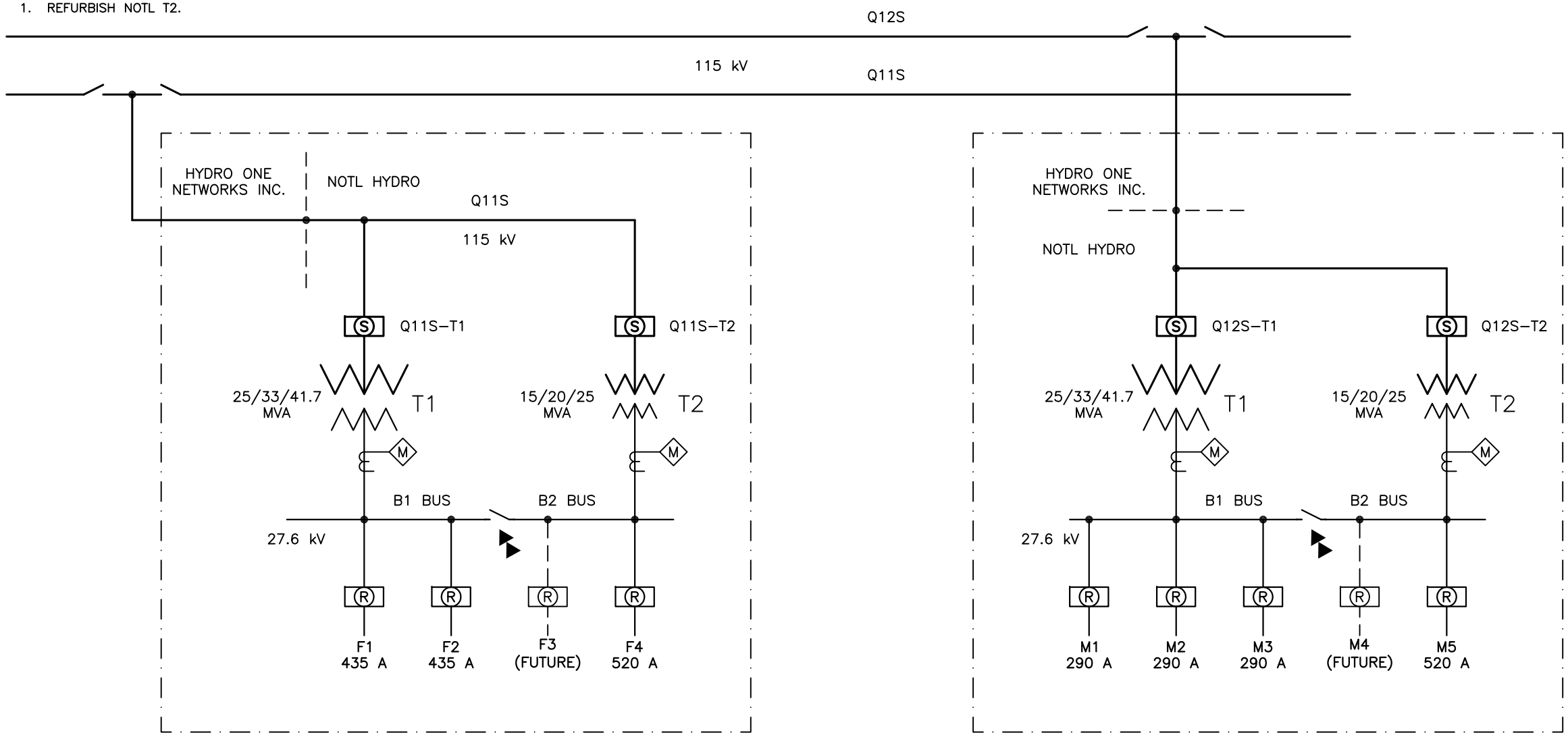
dwg no 110229–E2 rev A

PHASE 2

1. REFURBISH OLD NOTL T1 AND INSTALL AS YORK T2.
2. NEW CIRCUIT SWITCHER Q12S–T2 AND T2 PROTECTION.
3. NEW T2 FOUNDATION, GROUND GRID EXPANSION, STATION FENCE EXPANSION, MODIFIED 115KV BUSWORK.
4. REQUIRES REVIEW OF SHORT CIRCUIT LEVELS, GROUND GRID, GPR AND FEEDER PROTECTION SETTINGS.

PHASE 3

1. REFURBISH NOTL T2.



NOTL DS

66.7 MVA CAPACITY

YORK TS

66.7 MVA CAPACITY

RAVEN
Engineering Inc.
Niagara Falls, ON.
(905) 353-9252

LEGEND

- GANG OPERATED LOADBREAK SWITCH
- DISCONNECT SWITCH
- CIRCUIT BREAKER
- CIRCUIT SWITCHER
- RECLOSER
- FUSE
- REVENUE METERING

E3

#	REVISIONS	DATE
A	FOR REVIEW	1/27/2012

NIAGARA–ON–THE–LAKE HYDRO

SUPPLY STATIONS EXPANSION – PHASE 2 NEW YORK T2 REFURBISHED 15/20/25 MVA

dwn LH	designed by	cad use	
chkd AD			plot scale
date month/day/yr 1/6/2012	design approved ——		dist. code
scale Not To Scale	authorized		electronic filename 110229–E3 RA.DWG
w.o.			

dwg no 110229–E3 rev A

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX C

Condition Report

Date: June 25, 2012

To: Niagara on the Lake Hydro
PO Box 460
8 Henegan Road
Virgil, Ontario
L0S 1T0

Attention: Hassan Syed

Re: NOTL DS T1 and T2 Condition

Dear Hassan,

Thank you for providing us with the opportunity to assess the condition of your transformers at NOTL DS.

Introduction:

We have performed a review of our archived oil samples and test reports for T1 and T2 at Niagara on the Lake DS. We have also reviewed previous insulation resistance and power factor tests.

A frequency response analysis (FRA) was performed on May 9, 2012. Frequency response analysis is a useful tool to evaluate shifts in transformer windings over time due to through faults and/or deterioration. Since no baseline FRA test data was available, the FRA test results of the two virtually identical units at NOTL DS have been compared to each other.

Although only incomplete loading data was available, available information was reviewed as part of this assessment. Available loading data included periodic meter readings by Ascent and averaged monthly demand. Averaged monthly demand data was provided by NOTL Hydro.

Summary of Findings:

Oils:

Both units appear to be fit for continued service, although it is evident from the test data that the replacement of both transformers should be considered and budgeted for within the next five years, as both transformers are approaching end of life age, regardless of their current condition. Seasonal overloading is a concern – dissolved gas analysis (DGA) indicates that degradation of the cellulose insulation of both transformer cores has occurred in the past and will continue to occur under current operating conditions, although the rate of degradation has remained static.

The oil analysis of NOTL DS-T1 shows elevated levels of ethylene, which can be formed when metal parts of the transformer overheat under oil. Interfacial tension of the insulating oil of NOTL DS-T1 is barely within acceptable limits. For a detailed analysis of oil conditions for both transformers, please refer to Oil Analysis Report 24643LSP dated June 25, 2012. Furan analysis indicates that the mechanical strength of the solid insulation of the core of NOTL DS-T1 is close to that which would be found in a new transformer.

The oil analysis of NOTL DS-T2 shows levels of hydrogen just below IEEE condition 1 limits. This is potentially an indication of corona discharge occurring under oil. Furan analysis indicates that the mechanical strength of the solid insulation of the core of NOTL DS-T2 is close to that which would be found in a new transformer.

FRA Analysis:

The provided plots should be placed side by side to compare the frequency responses of NOTL DS-T1 to NOTL DS-T2

It is not possible to reach a definitive conclusion regarding the condition of either transformer from the FRA plots alone. The magnitude and phase response for the same test configurations for the two transformers are remarkably similar. Variations were observed in magnitude and phase response for the primary side (115kV) windings in the 1 kHz-10 kHz range for NOTL DS-T1. Test instrument probes were attached between phases B and A with the ground attached to phase A. This could be indicative of a primary winding shift due to a through fault, or shifting of the windings due to age and insulation degradation.

NOTL DS-T2 shows a variation of magnitude and phase response when the test instrument probes are attached between phases B (115kV) and b1 (27.6kV) with the ground attached to the neutral point of the secondary winding (27.6kV) of the transformer. It is difficult to guess what the cause of this variation might be, especially given the relatively better health of NOTL DS-T2 when compared to NOTL DS-T1. Winding shift or an anomaly in the solid insulation or core ground may be the cause. This result should not be cause for concern without baseline FRA data for this transformer.

Load:

Load information provided to Ascent by NOTL Hydro reveals that the transformers may loaded beyond their respective 30MVA capacities during the summer months. Overloading may be partly to blame for elevated carbon dioxide levels in the insulating oil.

Other Tests:

Insulation resistance tests showed that the insulation resistance of both units is within NETA limits. Insulation power factor is below 0.5%, which is within the recommended limits for new equipment. Winding ratio tests showed no indication of shorted windings. Winding resistance is within acceptable limits.

Further Recommendations:

Both NOTL DS-T1 and NOTL DS-T2 are fit for continued service – although there are indications of overloading. Since the transformers will continue to be overloaded, and are approaching the end of their design life, the following measures should be taken to ensure continued trouble free service.

Perform a Detailed Load Study for NOTL DS:

A detailed load study will show the duration and magnitude of transformer overloading, and will help determine whether or not elevated dissolved gas levels are due to overloading or hot spot activity. A detailed load study will also be helpful from a system planning perspective. Such a study would consist of collected and graphed amperage and/or kVA readings at intervals of several minutes over a period of several days each month. This information may be available from existing monitoring systems.

Oil Sampling Frequency:

Quarterly oil sampling is recommended for both transformers, to ensure that rapid deterioration of insulation is not occurring. This is recommended in the most recent Weidmann oil sample test report for NOTL DS-T2 (please refer to Oil Analysis Report 24743LSP dated June 25, 2012).

We hope that our comments will be helpful to NOTL Hydro. We look forward to being of continued service. Please contact me if you have any questions regarding this letter.

Yours sincerely,

Ben White
Ascent Solutions Inc.

Email: bwhite@ascent.ca
Phone: (519) 842-6458 x256
Cell: (519) 521-1170

June 7, 2012

Niagara on the Lake Hydro
8 Henegan Road
Virgil, ON
L0S 1T0

Attention: Hassan Syed

Re: Maintenance Inspection Report - Our Ref: 24743LSP
Site: NOTL DS – 801 Concession 5, Virgil

Dear Hassan,

Please find the attached report for the maintenance work and inspections completed May 8, 2012 at the NOTL DS substation.

Ascent Solutions inspected and tested T1 and T2 as required. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

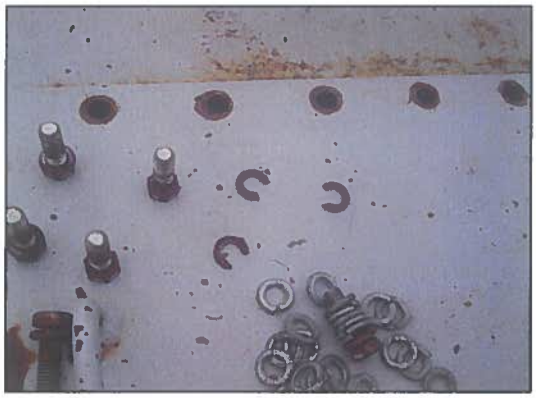
T1

Findings/Repairs:

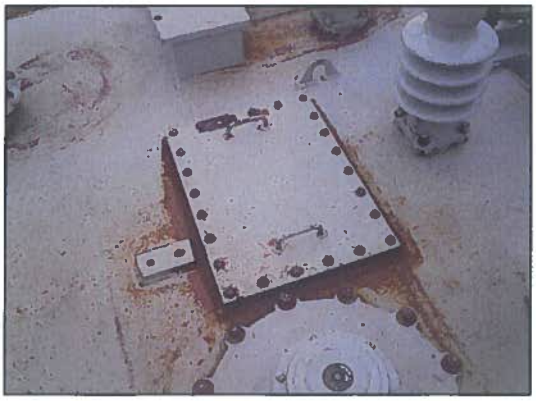
- All test results found satisfactory

- Oil found to be very clear in tank, non-visible in transformer on internal inspection

- Replaced lock washers as three were found broken



- Transformer showing signs of rust



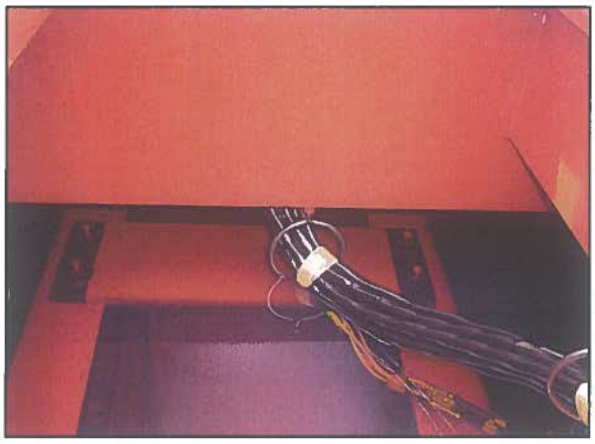
Recommendations:

- Continue with regular maintenance inspections to keep equipment clean and in good working condition
- Repaint transformer to prevent further rusting

T2

Findings/Repairs:

- All test results found satisfactory
- Oil found very clear in tank with none visible on the transformer



- Transformer showing signs of rust

Recommendations:

- Continue with regular maintenance inspections to keep equipment clean and in good working condition
- Repaint transformer to prevent further rusting

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all of the recommended repairs listed in this report.

If you have any questions/concerns please do not hesitate to contact us. We look forward to being of continued service to Niagara on the Lake Hydro.

Sincerely,
ASCENT

Doug Charron
E.E. Technician, Master Electrician
Maintenance & Technical Services
Phone: (519) 842-6458
Fax: (519) 842-2496
Cell: (519) 521-2600

May 8, 2012

Niagara on the Lake Hydro
8 Henegan Road
P.O. Box 460
Virgil, ON
L0S 1T0

Attention: ***Mr. Craig McLean***

Re: Oil Analysis Report – Our Ref: 24570LSP
Transformer: Westinghouse, Serial No. A3S5671

Dear Craig,

Attached are the results of the oil analysis of samples recently taken from the 3 Transformers and 3 LTC's located at your substations by Niagra-on-the-Lake.

➢ **Transformer – T1, Westinghouse, Serial No. A3S5671**

- ***Dissolved Gas Analysis (DGA) (Resample)***

The gas in oil analysis indicates that the oil appears to be reasonably satisfactory. With the exception of Ethylene (C2H4) and Carbon Dioxide (CO2), all of the other gases remained within the IEEE recommended limits. **Ethylene increased to *57 ppm* compared with results almost a year ago (*50 ppm*) (exceeding the IEEE limit of *50 ppm*), while Carbon Dioxide jumped to *5749 ppm* compared with *4864 ppm* (exceeding IEEE limit of *4000 ppm*).** Trending shows there may be **a small hot spot slowly developing inside the transformer, possibly due to a bad connection inside.** Ethylene is usually accompanied by Ethane, together they sometimes called the "hot metal gases", however since levels of Ethane are not currently elevated, **no action is recommended at this time, but levels of Ethylene should be closely monitored.**

Carbon Dioxide is a byproduct associated with the decomposition of the cellulose insulation, heat being a major factor of its rate produced, usually attributed to overloading. A transformer will also produce this gas along with Carbon Monoxide as it ages, and depending on the manufacturer type/model, varies in amounts produced, with Westinghouse models prone to having higher levels. **Concentrations in the key gases however have not made significant increases to warrant cause for any concern at this time, so no action is required. We do however recommend continued annual sampling to more accurately assess trends such as these.**

- ***Chemical Analysis (ASTM/Water)***

The chemistry (ASTM) tests show that the oil is in satisfactory condition, remaining clear with trace amounts of sediments, and a slight amount of water content (*6 ppm*). All measured parameters remained within the IEEE recommended limits for acceptable in-service operation, however the **Interfacial Tension at *32.62 dynes/cm* was only slightly above the IEEE acceptable minimum limit of *30 dynes/cm*.**

➢ **Transformer – T2, Westinghouse, Serial No. A3S5672**

- ***Dissolved Gas Analysis (DGA) (Resample)***

The gas in oil analysis indicates that the oil appears to be satisfactory, and with the exception of Carbon Monoxide (CO) and Carbon Dioxide (CO2), all other gases remained within the IEEE recommended limits. **Carbon Monoxide increased to *881 ppm* from *773 ppm* almost a year ago (exceeding the IEEE limit of *570 ppm*), while Carbon Dioxide jumped to *5615 ppm* compared with *4509 ppm* (exceeding IEEE limit of *4000 ppm*).** Carbon Monoxide and Carbon Dioxide are produced through the decomposition to the paper insulation through overheating. A transformer will normally produce these gases over its lifespan with Westinghouse models typically producing excess levels of these gases. Through trending analysis we can also see that levels have been building up over time, thus no action is required at this time.

- ***Chemical Analysis (ASTM/Water)***

The chemistry (ASTM) tests show that the oil is in satisfactory condition, it remains clear and with no sediments and no appreciable amount of water content. All measured parameters remained within the IEEE recommended limits for acceptable in-service operation.

➢ **Transformer – York DS, Ferranti Packard, Serial No. 5016910101**

- ***Dissolved Gas Analysis (DGA) (Resample)***

The gas in oil analysis indicates that the oil appears to be satisfactory, with levels for all of the key gases within the currently recommended IEEE limits, thus no action is required at this time.

- ***Chemical Analysis (ASTM/Water)***

The chemistry (ASTM) tests show that the oil is in satisfactory condition, remaining clear and with no sediments and having a slight amount of water content (*7 ppm*). All measured parameters remained within the IEEE recommended limits for acceptable in-service operation.

➢ **Load Tap Changer – LTC T1, ABB, Serial No. 8380980**

- ***Dissolved Gas Analysis (DGA) (Resample)***

The gas in oil analysis indicates that the oil appears to be satisfactory, with levels for all of the key gases within the currently recommended IEEE limits, thus no action is required at this time.

- ***Chemical Analysis (ASTM/Water)***

The chemistry (ASTM) tests show that the oil is in satisfactory condition, remaining clear and with no sediments, having a moderate amount of water content (*19 ppm*). All measured parameters remained within the IEEE recommended limits for acceptable in-service operation.

➢ **Load Tap Changer – LTC T2, ASEA, Serial No. 2285139**

- ***Dissolved Gas Analysis (DGA) (Resample)***

The gas in oil analysis indicates that the oil appears to be satisfactory, with levels for all of the key gases within the currently recommended IEEE limits, thus no action is required at this time.

- ***Chemical Analysis (ASTM/Water)***

The chemistry (ASTM) tests show that the oil is in satisfactory condition, remaining clear and with no sediments, having a moderate amount of water content (*15 ppm*). All measured parameters remained within the IEEE recommended limits for acceptable in-service operation.

➢ **Load Tap Changer – York TS LTC, Reinhausen, Serial No.C014959**

- ***Dissolved Gas Analysis (DGA) (Resample)***

The gas in oil analysis indicates that the oil appears to be satisfactory, with levels for all of the key gases within the currently recommended IEEE limits, thus no action is required at this time.

- ***Chemical Analysis (ASTM/Water)***

The chemistry (ASTM) tests show that the oil is in satisfactory condition, remaining clear and with no sediments, having a moderate amount of water content (*17 ppm*). All measured parameters remained within the IEEE recommended limits for acceptable in-service operation.

Please call us if you have any questions regarding this analysis. We look forward to being of continued service to Niagara on the Lake Hydro in the future.

Sincerely,
ASCENT

Doug Charron
Electrical Technician/Master Electrician
Maintenance & Technical Services
Phone: (519) 842-6458
Fax: (519) 842-2496
Mobile: (519) 521-2600

WEIDMANN

WEIDMANN DIAGNOSTIC SOLUTIONS
919 FRASER DR. UNIT 13 + BURLINGTON, ON + L7L 4X8
905-632-8697 + 905-632-8698
WWW.WEIDMANN-DIAGNOSTICS.COM

TEST REPORT
01-6406014-388493-00

CENT SOLUTIONS INC.	**Serial#:** A3S5671	**Mfr:** WESTINGHOUSE	**Control#:** 6406014
14719 BAYHAM DR, RR#3	**Location:** NOTL DS-T1	**kV:** 115.5	**Order#:** 388493
	Equipment: TRANSFORMER	**kVA:** 25000	**Account:** 6312
TILSONBURG, ON N4G 4G8 CA	**Compartment:** MAIN(BOTTOM)	**Year Mf'd:** 1983	**Received:** 04/11/2012
ATTN: WARNER ARDELT	**Breathing:** SEAL	**Syringe ID:** 8000107	**Reported:** 04/23/2012
PO#: AS1-128502	**Bank:** NA **Phase:** 3	**Bottle ID:**	
Project ID: 24570LSP	**Fluid:** MINUSGal: 20473	**Sampled By:** DB	
Customer ID: T1			

		Lab Control Number:	6406014	6381969	6271839	6138757	6003571
		Date Sampled:	04/02/2012	01/18/2012	03/24/2011	04/06/2010	02/10/2009
		Order Number:	388493	383108	359663	332091	300050
		Oil Temp:	20		15	40	20
Dissolved Gas Analysis (DGA)		**Hydrogen (H2) (ppm):**	12		12	7	2.7
ASTM		**Methane (CH4) (ppm):**	5		4	4	4.0
D-3612		**Ethane (C2H6) (ppm):**	7		6	6	5.0
		Ethylene (C2H4) (ppm):	**57**		**50**	**64**	**58**
		Acetylene (C2H2) (ppm):	<1		<1	<1	<1
		Carbon Monoxide (CO) (ppm):	202		170	129	135
		Carbon Dioxide (CO2) (ppm):	**5749**		**4864**	**4910**	**5070**
		Nitrogen (N2) (ppm):	66401		64472	67003	71788
		Oxygen (O2) (ppm):	28579		26057	34132	23586
		Total Dissolved Gas (TDG) (ppm):	101012		95635	106255	10.3
		Total Dissolved Combustible Gas (TDCG) (ppm):	283		242	210	205
		Equivalent TCG (%):	0.2087		0.1874	0.1286	

DGA Diagnostics (most recent sample)	**DGA Keys Gas / Interpretive Method:** **PER IEEE C57.104-2008**	Hydrogen within condition 1 limits (100 ppm). Methane within condition 1 limits (120 ppm). Ethane within condition 1 limits (65 ppm). Ethylene: Condition 2 Indications of overheated (>350°C) oil (50 ppm). Acetylene within condition 1 limits (1 ppm). Carbon Monoxide within condition 1 limits (350 ppm). Carbon Dioxide: Condition 3 Significant Indications of overheated cellulose insulation (4000 ppm). TDCG within condition 1 limits (720 ppm).
	DGA TDCG Rate Interpretive Method: **PER IEEE C57.104-2008** (two most recent sample)	Retest Annually. 1-Continue normal operation.
	DGA Cellulose (Paper) Insulation:	CO2/CO Ratio not applicable - neither gas exceeds its limit.
	WDS DGA Condition Code: **WDS Recommended Action:**	CAUTION Resample within 6 months for testing.

Comment:

General Oil Quality (GOQ)						
D-1533	**Moisture in Oil**	**(ppm):**	6	4	4	3.5
D-971	**Interfacial Tension**	**(dynes/cm):**	32.62	34.8	34.0	36.1
D-974	**Acid Number**	**(mg KOH/g):**	0.043	0.032	0.031	0.02
D-1500	**Color Number**	**(Relative):**	L2.0	L2.0	L2.0	2.0
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK	CLR&SPRK	Clear
D-1524	**Sediment Exam.**	**(Relative):**	TRACE	ND	ND	
D-877	**Dielectric Breakdown**	**(kV):**	41	43	44	58
D-1298	**Specific Gravity**	**(Relative):**	0.8649	0.868	0.867	0.863

GOQ Diagnostics **PER IEEE C57.106-2006** (most recent sample)	**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).
	Interfacial Tension:	Acceptable for in-service oil (30 dynes/cm min).
	Acid Number:	Acceptable for in-service oil (0.15 mg KOH/g max).

...ations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

,CENT SOLUTIONS INC.	**Serial#:** A3S5671	**Mfr:** WESTINGHOUSE	**Control#:** 6406014
14719 BAYHAM DR, RR#3	**Location:** NOTL DS-T1	**kV:** 115.5	**Order#:** 388493
	Equipment: TRANSFORMER	**kVA:** 25000	**Account:** 6312
TILSONBURG, ON N4G 4G8 CA	**Compartment:** MAIN(BOTTOM)	**Year Mf'd:** 1983	**Received:** 04/11/2012
ATTN: WARNER ARDELT	**Breathing:** SEAL	**Syringe ID:** 8000107	**Reported:** 04/23/2012
PO#: AS1-128502	**Bank:** NA **Phase:** 3	**Bottle ID:**	
Project ID: 24570LSP	**Fluid:** MINUSGal **:** 20473	**Sampled By:** DB	

Customer ID: T1

Lab Control Number:	6406014	6381969	6271839	6138757	6003571
Date Sampled:	04/02/2012	01/18/2012	03/24/2011	04/06/2010	02/10/2009
Order Number:	388493	383108	359663	332091	300050
Oil Temp:	20		15	40	20
Color Number and Visual:	Diagnostic not applicable. Diagnostic not applicable.				
Dielectric Breakdown D-877:	Diagnostic not applicable.				
Comment:					
PCB **Concentration (ppm):**	< 1.0 PPM				
ASTM Method D-4059 **PCB Type (Arocolor):**	ND				
Reporting Limit:	1.0				
Comment:					

End of Test Report

Authorized By: _____

,ations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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TEST REPORT
01-6406012-388493-00

SCENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128502
Project ID: 24570LSP
Customer ID: T2

Serial#: A3S5672
Location: NOTL DS-T2
Equipment: TRANSFORMER
Compartment: MAIN(BOTTOM)
Breathing: SEAL
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 20473

Mfr: WESTINGHOUSE
kV: 115.5
kVA: 25000
Year Mf'd: 1983
Syringe ID: 8003857
Bottle ID:
Sampled By: DB

Control#: 6406012
Order#: 388493
Account: 6312
Received: 04/11/2012
Reported: 04/23/2012

	Lab Control Number:	6406012	6381970	6271835	6138752	6003570
	Date Sampled:	04/02/2012	01/11/2012	03/24/2011	04/06/2010	02/10/2009
	Order Number:	388493	383108	359663	332091	300050
	Oil Temp:	20		15	20	20
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**	83		96	118	93
ASTM	**Methane (CH4) (ppm):**	18		17	18	18
D-3612	**Ethane (C2H6) (ppm):**	15		13	15	14
	Ethylene (C2H4) (ppm):	26		20	31	28
	Acetylene (C2H2) (ppm):	<1		<1	<1	<1
	Carbon Monoxide (CO) (ppm):	**881**		**733**	**858**	**813**
	Carbon Dioxide (CO2) (ppm):	**5615**		**4509**	**4984**	**4994**
	Nitrogen (N2) (ppm):	76615		71174	83529	71482
	Oxygen (O2) (ppm):	3226		2549	5534	<500
	Total Dissolved Gas (TDG) (ppm):	86479		79111	95087	7.9
	Total Dissolved Combustible Gas (TDCG) (ppm):	**1023**		**879**	**1040**	**967**
	Equivalent TCG (%):	0.993		0.9574	0.9512	

DGA Diagnostics	**DGA Keys Gas / Interpretive Method:** (most recent sample)	Hydrogen within condition 1 limits (100 ppm). Methane within condition 1 limits (120 ppm). Ethane within condition 1 limits (65 ppm). Ethylene within condition 1 limits (50 ppm). Acetylene within condition 1 limits (1 ppm). Carbon Monoxide: Condition 3 Indications of significantly overheated cellulose insulation (570 ppm). Carbon Dioxide: Condition 3 Significant Indications of overheated cellulose insulation (4000 ppm). TDCG: Condition 2 Levels exceed normal concentrations. Fault may be present (720 ppm).
	DGA TDCG Rate Interpretive Method: **PER IEEE C57.104-2008** (two most recent sample)	Retest Quarterly. Exercise caution. Analyze for individual gases. Determine load dependence.
	DGA Cellulose (Paper) Insulation:	Normal decomposition of cellulose insulation.
	WDS DGA Condition Code:	NORMAL
	WDS Recommended Action:	Continue normal operation. Resample for testing within one year.

Comment:

General Oil Quality (GOQ)						
D-1533	**Moisture in Oil**	**(ppm):**	5	4	4	2.7
D-971	**Interfacial Tension**	**(dynes/cm):**	38.98	41.3	39.7	42.8
D-974	**Acid Number**	**(mg KOH/g):**	0.026	0.015	0.012	
D-1500	**Color Number**	**(Relative):**	1.0	L1.5	L1.5	1.5
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK	CLR&SPRK	Clear
D-1524	**Sediment Exam.**	**(Relative):**	ND	ND	ND	
D-877	**Dielectric Breakdown**	**(kV):**	45	42	50	58
D-1298	**Specific Gravity**	**(Relative):**	0.8636	0.867	0.867	0.861

GOQ Diagnostics PER IEEE C57.106-2006	**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).
	Interfacial Tension:	Acceptable for in-service oil (30 dynes/cm min).

...tions: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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TEST REPORT
01-6406012-388493-00

SCENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128502
Project ID: 24570LSP
Customer ID: T2

Serial#: A3S5672
Location: NOTL DS-T2
Equipment: TRANSFORMER
Compartment: MAIN(BOTTOM)
Breathing: SEAL
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 20473

Mfr: WESTINGHOUSE
kV: 115.5
kVA: 25000
Year Mf'd: 1983
Syringe ID: 8003857
Bottle ID:
Sampled By: DB

Control#: 6406012
Order#: 388493
Account: 6312
Received: 04/11/2012
Reported: 04/23/2012

	Lab Control Number:	6406012	6381970	6271835	6138752	6003570
	Date Sampled:	04/02/2012	01/11/2012	03/24/2011	04/06/2010	02/10/2009
	Order Number:	388493	383108	359663	332091	300050
	Oil Temp:	20		15	20	20
(most recent sample)	**Acid Number:**	Acceptable for in-service oil (0.15 mg KOH/g max).				
	Color Number and Visual:	Diagnostic not applicable. Diagnostic not applicable.				
	Dielectric Breakdown D-877:	Diagnostic not applicable.				
Comment:						
PCB	**Concentration (ppm):**	< 1.0 PPM				
ASTM Method D-4059	**PCB Type (Arocolor):**	ND				
	Reporting Limit:	1.0				
Comment:						

End of Test Report

Authorized By: _____

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TEST REPORT
01-6406015-388493-00

SCENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128502
Project ID: 24570LSP
Customer ID:

Serial#: 5016910101
Location: NOTL YORK DS
Equipment: TRANSFORMER
Compartment: MAIN(BOTTOM)
Breathing: FB
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 28172

Mfr: FERRANTI PACKARD
kV: 115.5
kVA: 41700
Year Mf'd: 2003
Syringe ID: 8000160
Bottle ID:
Sampled By: DB

Control#: 6406015
Order#: 388493
Account: 6312
Received: 04/11/2012
Reported: 04/23/2012

	Lab Control Number:	6406015	6271842	6138760	5659838	6003572
	Date Sampled:	04/02/2012	03/24/2011	04/06/2010	04/07/2009	02/10/2009
	Order Number:	388493	359663	332091	225747	300050
	Oil Temp:	20	12	40		16
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**	5	12	6	<2	6.1
ASTM	**Methane (CH4) (ppm):**	2	2	2	2	2.2
D-3612	**Ethane (C2H6) (ppm):**	<1	<1	<1	<1	1.1
	Ethylene (C2H4) (ppm):	<1	<1	<1	1	1
	Acetylene (C2H2) (ppm):	<1	<1	<1	<1	<1
	Carbon Monoxide (CO) (ppm):	81	96	104	2	126
	Carbon Dioxide (CO2) (ppm):	739	677	608	589	811
	Nitrogen (N2) (ppm):	61899	56758	62290	60817	61860
	Oxygen (O2) (ppm):	30766	25334	34509	34320	28492
	Total Dissolved Gas (TDG) (ppm):	93492	82879	97519	95731	9.2
	Total Dissolved Combustible Gas (TDCG) (ppm):	88	110	112	5	134
	Equivalent TCG (%):	0.0865	0.129	0.1066	0.0025	

DGA Diagnostics	**DGA Keys Gas / Interpretive Method:** (most recent sample)	Hydrogen within condition 1 limits (100 ppm). **PER IEEE C57.104-2008** Methane within condition 1 limits (120 ppm). Ethane within condition 1 limits (65 ppm). Ethylene within condition 1 limits (50 ppm). Acetylene within condition 1 limits (1 ppm). Carbon Monoxide within condition 1 limits (350 ppm). Carbon Dioxide within condition 1 limits (2500 ppm). TDCG within condition 1 limits (720 ppm).
	DGA TDCG Rate Interpretive Method: **PER IEEE C57.104-2008** (two most recent sample)	Retest Annually. 1-Continue normal operation.
	DGA Cellulose (Paper) Insulation:	CO2/CO Ratio not applicable - neither gas exceeds its limit.
	WDS DGA Condition Code:	NORMAL
	WDS Recommended Action:	Continue normal operation. Resample for testing within one year.

Comment:

General Oil Quality (GOQ)							
D-1533	**Moisture in Oil**	**(ppm):**	7	5	3	5	<2
D-971	**Interfacial Tension**	**(dynes/cm):**	39.59	41.5	39.9	29.7	43.5
D-974	**Acid Number**	**(mg KOH/g):**	0.018	0.009	0.005	0.005	
D-1500	**Color Number**	**(Relative):**	L1.	L1.0	1.0	L1.0	1.0
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK	CLR&SPRK	CLR&SPRK	Clear
D-1524	**Sediment Exam.**	**(Relative):**	ND	ND	ND	ND	
D-877	**Dielectric Breakdown**	**(kV):**	43	47	47	42	60
D-1298	**Specific Gravity**	**(Relative):**	0.8907	0.893	0.894	0.893	0.877

GOQ Diagnostics	**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).
PER IEEE C57.106-2006	**Interfacial Tension:**	Acceptable for in-service oil (30 dynes/cm min).
(most recent sample)	**Acid Number:**	Acceptable for in-service oil (0.15 mg KOH/g max).

tions: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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TEST REPORT
01-6406015-388493-00

SCENT SOLUTIONS INC.	**Serial#:**	5016910101	**Mfr:**	FERRANTI PACKARD	**Control#:** 6406015
14719 BAYHAM DR, RR#3	**Location:**	NOTL YORK DS	**kV:**	115.5	**Order#:** 388493
	Equipment:	TRANSFORMER	**kVA:**	41700	**Account:** 6312
TILSONBURG, ON N4G 4G8 CA	**Compartment:**	MAIN(BOTTOM)	**Year Mf'd:**	2003	**Received:** 04/11/2012
ATTN: WARNER ARDELT	**Breathing:**	FB	**Syringe ID:**	8000160	**Reported:** 04/23/2012
PO#: AS1-128502	**Bank:** NA	**Phase:** 3	**Bottle ID:**		
Project ID: 24570LSP	**Fluid:** MIN	**USGal:** 28172	**Sampled By:**	DB	
Customer ID:					

Lab Control Number:	6406015	6271842	6138760	5659838	6003572
Date Sampled:	04/02/2012	03/24/2011	04/06/2010	04/07/2009	02/10/2009
Order Number:	388493	359663	332091	225747	300050
Oil Temp:	20	12	40		16
Color Number and Visual:	Diagnostic not applicable.				
Dielectric Breakdown D-877:	Diagnostic not applicable.				
Comment:					

End of Test Report

Authorized By: _____

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TEST REPORT
01-6406018-388493-00

3CENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128502
Project ID: 24570LSP
Customer ID:

Serial#: 8380980
Location: NOTL-T1 LTC
Equipment: LTC
Compartment: SELECTOR
Breathing: FB
Bank: NA **Phase:** 3
Fluid: MIN
Model: UZERN

Mfr: ABB
kV: 115
kVA:
Year Mf'd: 1998
Syringe ID: 8003818
Bottle ID:
Sampled By:

Control#: 6406018
Order#: 388493
Account: 6312
Received: 04/11/2012
Reported: 04/23/2012

	Lab Control Number:	6406018	6381969	6354003	6331511	6271854
	Date Sampled:	04/02/2012	01/18/2012	10/28/2011	08/17/2011	03/24/2011
	Order Number:	388493	383108	376959	371979	359663
	Oil Temp:	20				
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**	22	<2	63	156	35
ASTM	**Methane (CH4) (ppm):**	7	1	23	31	18
D-3612	**Ethane (C2H6) (ppm):**	<1	<1	3	<1	4
	Ethylene (C2H4) (ppm):	9	**<1**	77	61	63
	Acetylene (C2H2) (ppm):	85	<1	694	672	616
	Carbon Monoxide (CO) (ppm):	5	2	20	28	11
	Carbon Dioxide (CO2) (ppm):	428	**220**	483	708	657
	Nitrogen (N2) (ppm):	60991	62328	62833	55106	59164
	Oxygen (O2) (ppm):	31327	28738	31679	25669	29115
	Total Dissolved Gas (TDG) (ppm):	92874	91289	95875	82431	89683
	Total Dissolved Combustible Gas (TDCG) (ppm):	128	3	880	948	747
	Equivalent TCG (%):	0.0649	0.0022	0.2348	0.5109	0.1666
DGA Diagnostics	**Ratio Analysis:**	Acetylene exceeds normal limits. Further analysis is recommended.				
)mment:						

General Oil Quality (GOQ)							
D-1533	**Moisture in Oil**	**(ppm):**	19	16	43	22	25
D-971	**Interfacial Tension**	**(dynes/cm):**	47.52	47.8	45.44	46.9	46.7
D-974	**Acid Number**	**(mg KOH/g):**		0.006	0.013		
D-1500	**Color Number**	**(Relative):**	L0.5	L0.5	L0.5	L0.5	L0.5
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK	CLR&SPRK	CLR&SPRK	CLR&SPRK
D-1524	**Sediment Exam.**	**(Relative):**	ND	ND	ND	ND	ND
D-877	**Dielectric Breakdown**	**(kV):**		48	34		
D1816	**Dielectric Breakdown 1 mm**	**(kV mm-C):**	34 (1-23C)			18 (1-24C)	25 (1-23C)
D-1298	**Specific Gravity**	**(Relative):**		0.8715	0.883		

GOQ Diagnostics	**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).
PER IEEE C57.106-2006	**Interfacial Tension:**	Diagnostic not applicable.
(most recent sample)	**Color Number and Visual:**	Diagnostic not applicable. Diagnostic not applicable.
	Dielectric Breakdown D-1816:	Acceptable for in-service oil (28 kV min @ 1mm).

Comment:

End of Test Report

Authorized By: _____

ations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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TEST REPORT
01-6406020-388493-00

ɔCENT SOLUTIONS INC.	**Serial#:** 2285139	**Mfr:** ASEA	**Control#:** 6406020
14719 BAYHAM DR, RR#3	**Location:** NOTL-T2 LTC	**kV:** 115	**Order#:** 388493
	Equipment: LTC	**kVA:**	**Account:** 6312
TILSONBURG, ON N4G 4G8 CA	**Compartment:** COMMON	**Year Mf'd:**	**Received:** 04/11/2012
ATTN: WARNER ARDELT	**Breathing:** SEALED	**Syringe ID:** 8002246	**Reported:** 04/23/2012
PO#: AS1-128502	**Bank:** NAPhase: 3	**Bottle ID:**	
Project ID: 24570LSP	**Fluid:** MIN	**Sampled By:** DB	
Customer ID:	**Model:** UZERN		

		Lab Control Number:	6406020	6381969	6354004	6331512	6271856
		Date Sampled:	04/02/2012	01/18/2012	10/28/2011	08/17/2011	03/24/2011
		Order Number:	388493	383108	376959	371979	359663
		Oil Temp:	20				
Dissolved Gas Analysis (DGA)		**Hydrogen (H2) (ppm):**	37	<2	170	208	47
ASTM		**Methane (CH4) (ppm):**	6	1	39	44	31
D-3612		**Ethane (C2H6) (ppm):**	<1	<1	2	<1	4
		Ethylene (C2H4) (ppm):	6	<1	107	88	84
		Acetylene (C2H2) (ppm):	60	<1	1065	984	880
		Carbon Monoxide (CO) (ppm):	6	2	30	47	16
		Carbon Dioxide (CO2) (ppm):	422	220	622	941	784
		Nitrogen (N2) (ppm):	61465	62328	64109	56408	60289
		Oxygen (O2) (ppm):	30311	28738	32514	27164	29913
		Total Dissolved Gas (TDG) (ppm):	92313	91289	98658	85884	92048
		Total Dissolved Combustible Gas (TDCG) (ppm):	115	3	1413	1371	1062
		Equivalent TCG (%):	0.0962	0.0022	0.5061	0.6806	0.2275
DGA Diagnostics		**Ratio Analysis:**	Heating to arcing gas ratios within normal limits.				
ɔmment:							
General Oil Quality (GOQ)							
D-1533	**Moisture in Oil**	**(ppm):**	15	16		30	18
D-971	**Interfacial Tension**	**(dynes/cm):**	46.98	47.8		45.98	47.1
D-974	**Acid Number**	**(mg KOH/g):**		0.006		0.013	
D-1500	**Color Number**	**(Relative):**	L0.5	L0.5		L0.5	L0.5
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK		CLR&SPRK	CLR&SPRK
D-1524	**Sediment Exam.**	**(Relative):**	ND	ND		TRACE	ND
D-877	**Dielectric Breakdown**	**(kV):**		48		33	
D1816	**Dielectric Breakdown 1 mm**	**(kV mm-C):**	34 (1-23C)				11 (1-24C)
D-1298	**Specific Gravity**	**(Relative):**		0.8715		0.883	
GOQ Diagnostics		**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).				
PER IEEE C57.106-2006		**Interfacial Tension:**	Diagnostic not applicable.				
(most recent sample)		**Color Number and Visual:**	Diagnostic not applicable. Diagnostic not applicable.				
		Dielectric Breakdown D-1816:	Acceptable for in-service oil (28 kV min @ 1mm).				
Comment:							

End of Test Report

Authorized By: _____

ations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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TEST REPORT
01-6406024-388493-00

CENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128502
Project ID: 24570LSP
Customer ID:

Serial#: C014959
Location: NOTL (YORK TS)
Equipment: LTC
Compartment: SELECTOR
Breathing: VACUUM
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 268
Model: RMV-II

Mfr: REINHAUSEN
kV:
kVA:
Year Mf'd: 2003
Syringe ID: 8001091
Bottle ID:
Sampled By: DB

Control#: 6406024
Order#: 388493
Account: 6312
Received: 04/11/2012
Reported: 04/23/2012

		Lab Control Number:	6406024	6331513
		Date Sampled:	04/02/2012	08/16/2011
		Order Number:	388493	371979
		Oil Temp:	20	
Dissolved Gas Analysis (DGA)		Hydrogen (H2) (ppm):	4	10
ASTM		Methane (CH4) (ppm):	1	2
D-3612		Ethane (C2H6) (ppm):	<1	<1
		Ethylene (C2H4) (ppm):	<1	<1
		Acetylene (C2H2) (ppm):	<1	<1
		Carbon Monoxide (CO) (ppm):	3	10
		Carbon Dioxide (CO2) (ppm):	590	543
		Nitrogen (N2) (ppm):	59545	53721
		Oxygen (O2) (ppm):	30891	25052
		Total Dissolved Gas (TDG) (ppm):	91034	79338
		Total Dissolved Combustible Gas (TDCG) (ppm):	8	22
		Equivalent TCG (%):	0.0122	0.0372
DGA Diagnostics		Ratio Analysis:	Acetylene within normal limits.	
Comment:				
General Oil Quality (GOQ)				
D-1533	Moisture in Oil	(ppm):	17	21
D-971	Interfacial Tension	(dynes/cm):	30.42	30.72
D-974	Acid Number	(mg KOH/g):		0.016
D-1500	Color Number	(Relative):	1.0	L1.0
D-1524	Visual Exam.	(Relative):	CLR&SPRK	CLR&SPRK
D-1524	Sediment Exam.	(Relative):	ND	ND
D-877	Dielectric Breakdown	(kV):		31
D1816	Dielectric Breakdown 1 mm	(kV mm-C):	38 (1-23C)	
D-1298	Specific Gravity	(Relative):		0.893
GOQ Diagnostics		Moisture in Oil:	Acceptable for equipment > 69 kV for in-service oil - kV not provided (25 ppm max).	
PER IEEE C57.106-2006		Interfacial Tension:	Diagnostic not applicable.	
(most recent sample)		Color Number and Visual:	Diagnostic not applicable. Diagnostic not applicable.	
		Dielectric Breakdown D-1816:	Acceptable for equipment > 69 kV for in-service oil - kV not provided (28 kV min @ 1mm).	
Comment:				

End of Test Report

Authorized By: K Douglas

olations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

June 26, 2012

Niagara On The Lake Hydro
8 Henegan Road
P.O. Box 460
Virgil, ON
L0S 1T0

Attention: ***Hassan Syed***

Re: Oil Analysis Report - Our Ref: 24743LSP
Site: NOTL DS – 801 Concession 5 Road, Virgil, ON

Dear Hassan,

Attached are the oil analysis results of the samples recently taken from the transformers located at the NOTL DS in Virgil.

➢ **Transformer 1 – Westinghouse, Serial no. A3S5671**

- ***Dissolved Gas Analysis (DGA)***

  The history of the oil analysis indicates that there may be a "hot spot" developing inside the transformer, showing a level of Ethylene (C2H4) at ***72 ppm***. As well, Carbon Dioxide (CO2) was found at ***4083 ppm***. This level exceeds *Condition 2* of the IEEE recommended limit of ***2500 ppm***. Condition 2 indicates overheating and deterioration of the transformer windings paper insulation. With higher levels of Ethylene, close attention should be taken to monitor these gases through trending in subsequent samplings. It is recommended to continue sampling in short intervals, such as 6 month period or less, to monitor the transformer's health, particularly those gases which have exceeded IEEE recommended limits.

- ***Chemical Analysis (ASTM/Water)***

  The chemistry (ASTM) tests show that the oil itself is in satisfactory condition, remains clear and has no appreciable water content or sediments.

- ***Furanic Analysis***

  The results of the Furanic sampling indicate that the transformer has some appreciable 'wear' on its winding insulation. The value of *2-Furaldehyde* is *19 ppb* indicating some decomposition of the cellulose insulation has occurred via overheating. The *Degree of Polymerization (DP)* was evaluated to be *921* estimating the operating age at around 2 years. This is very good for a transformer which is 29 years old, the result however may be misleading, if the oil had previously been replaced.

➢ **Transformer 2 – Westinghouse, Serial no. A3S5672**

- ***Dissolved Gas Analysis (DGA)***

  There is a finding of elevated Hydrogen dissolved in the oil now at ***97 ppm***. This is slightly lower than the IEEE recommended level of ***100 ppm***. Elevated hydrogen is an indication of partial discharge (corona) having occurred, as well there was a finding of elevated levels of Carbon Monoxide (CO) and Carbon Dioxide (CO2). The IEEE recommended levels for these are ***570 ppm*** and ***4000 ppm*** respectively. These gases are accompanied by medium concentrations of Methane (CH4), Ethane (C2H6), and Ethylene (C2H4).

- ***Chemical Analysis (ASTM/Water)***

  The chemistry (ASTM) tests show that the oil itself is in satisfactory condition, remains clear and has no appreciable water content or sediments

- ***Furanic Analysis***

  The results of the Furanic sampling indicate that the transformer has some appreciable 'wear' on its winding insulation. The value of *2-Furaldehyde* is *11 ppb* indicating that slight decomposition of the cellulose insulation has occurred thru overheating. The *Degree of Polymerization (DP)* was evaluated to be *995* estimating the operating age at almost 1 year. This is very good considering the vintage of this transformer (1983). This result however could be misleading, if the oil had previously been replaced.

Please call us if you have any questions regarding this analysis. We look forward to being of continued service to Niagara On The Lake Hydro in the future.

Sincerely,
ASCENT

Doug Charron
Electrical Technician/Master Electrician
Maintenance & Technical Services
Phone: (519) 842-6458
Fax: (519) 842-2496
Mobile: (519) 521-2600

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TEST REPORT
01-6418698-391375-00

ASCENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128692
Project ID: 24743LSP
Customer ID: T1

Serial#: A3S5671
Location: NOTL DS-T1
Equipment: TRANSFORMER
Compartment: MAIN(BOTTOM)
Breathing: SEAL
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 20473

Mfr: WESTINGHOUSE
kV: 115.5
kVA: 25000
Year Mf'd: 1983
Syringe ID: 8000694
Bottle ID: A3S5671
Sampled By: DB

Control#: 6418698
Order#: 391375
Account: 6312
Received: 05/15/2012
Reported: 05/24/2012

	Lab Control Number:	6418698	6406014	6381969	6271839	6138757
	Date Sampled:	05/09/2012	04/02/2012	01/18/2012	03/24/2011	04/06/2010
	Order Number:	391375	388493	383108	359663	332091
	Oil Temp:	35	20		15	40
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**	8	12	<2	12	7
ASTM	**Methane (CH4) (ppm):**	4	5	1	4	4
D-3612	**Ethane (C2H6) (ppm):**	7	7	<1	6	6
	Ethylene (C2H4) (ppm):	**72**	**57**	**<1**	**50**	**64**
	Acetylene (C2H2) (ppm):	<1	<1	<1	<1	<1
	Carbon Monoxide (CO) (ppm):	191	202	2	170	129
	Carbon Dioxide (CO2) (ppm):	**4083**	**5749**	**220**	**4864**	**4910**
	Nitrogen (N2) (ppm):	62279	66401	62328	64472	67003
	Oxygen (O2) (ppm):	27024	28579	28738	26057	34132
	Total Dissolved Gas (TDG) (ppm):	93668	101012	91289	95635	106255
	Total Dissolved Combustible Gas (TDCG) (ppm):	282	283	3	242	210
	Equivalent TCG (%):	0.204	0.2087	0.0022	0.1874	0.1286

DGA Diagnostics (most recent sample)	**DGA Keys Gas / Interpretive Method: PER IEEE C57.104-2008**	Hydrogen within condition 1 limits (100 ppm). Methane within condition 1 limits (120 ppm). Ethane within condition 1 limits (65 ppm). Ethylene: Condition 2 Indications of overheated (>350°C) oil (50 ppm). Acetylene within condition 1 limits (1 ppm). Carbon Monoxide within condition 1 limits (350 ppm). Carbon Dioxide: Condition 3 Significant Indications of overheated cellulose insulation (4000 ppm). TDCG within condition 1 limits (720 ppm).
	DGA TDCG Rate Interpretive Method: PER IEEE C57.104-2008 (two most recent sample)	Retest Annually. 1-Continue normal operation.
	DGA Cellulose (Paper) Insulation:	CO2/CO Ratio not applicable - neither gas exceeds its limit.
	WDS DGA Condition Code:	CAUTION
	WDS Recommended Action:	Resample within 6 months for testing.

Comment:

General Oil Quality (GOQ)							
D-1533	**Moisture in Oil**	**(ppm):**	4	6	16	4	4
D-971	**Interfacial Tension**	**(dynes/cm):**	33.78	32.62	47.8	34.8	34.0
D-974	**Acid Number**	**(mg KOH/g):**	0.045	0.043	0.006	0.032	0.031
D-1500	**Color Number**	**(Relative):**	L2.0	L2.0	L0.5	L2.0	L2.0
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK	CLR&SPRK	CLR&SPRK	CLR&SPRK
D-1524	**Sediment Exam.**	**(Relative):**	ND	TRACE	ND	ND	ND
D-877	**Dielectric Breakdown**	**(kV):**	50	41	48	43	44
D-1298	**Specific Gravity**	**(Relative):**	0.8642	0.8649	0.8715	0.868	0.867

GOQ Diagnostics PER IEEE C57.106-2006 (most recent sample)	**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).
	Interfacial Tension:	Acceptable for in-service oil (30 dynes/cm min).
	Acid Number:	Acceptable for in-service oil (0.15 mg KOH/g max).

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

ASCENT SOLUTIONS INC.	**Serial#:**	A3S5671	**Mfr:**	WESTINGHOUSE	**Control#:** 6418698
14719 BAYHAM DR, RR#3	**Location:**	NOTL DS-T1	**kV:**	115.5	**Order#:** 391375
	Equipment:	TRANSFORMER	**kVA:**	25000	**Account:** 6312
TILSONBURG, ON N4G 4G8 CA	**Compartment:**	MAIN(BOTTOM)	**Year Mf'd:**	1983	**Received:** 05/15/2012
ATTN: WARNER ARDELT	**Breathing:**	SEAL	**Syringe ID:**	8000694	**Reported:** 05/24/2012
PO#: AS1-128692	**Bank:** NA	**Phase:** 3	**Bottle ID:**	A3S5671	
Project ID: 24743LSP	**Fluid:** MIN	**USGal:** 20473	**Sampled By:**	DB	

Customer ID: T1

	Lab Control Number:	6418698	6406014	6381969	6271839	6138757
	Date Sampled:	05/09/2012	04/02/2012	01/18/2012	03/24/2011	04/06/2010
	Order Number:	391375	388493	383108	359663	332091
	Oil Temp:	35	20		15	40
	Color Number and Visual:	Diagnostic not applicable. Diagnostic not applicable.				
	Dielectric Breakdown D-877:	Diagnostic not applicable.				
Comment:						
Furanic Compound	**2-Furaldehyde (ppb):**	19				
D-5837	**5-Hydroxy-methyl-furaldehyde (ppb):**	< 10				
	2-Acetylfuran (ppb):	< 10				
	5-Methyl-2-furaldehyde (ppb):	< 10				
	2-Furyl alcohol (ppb):	< 10				

Furanic Compound Diagnostics (most recent sample):

New insulation with a high degree of mechanical strength will typically have a Degree of Polymerization (DP) of 1000-1300. "Middle Aged" paper is approximately 500 and paper with less than 250 is in its "Old Age." Severely degraded insulation with a DP of 150 or less will have very little mechanical strength and may result in a transformer failure. The above estimations are based on a study by Chendong of GSU transformers filled with mineral oil.

Estimated Average Degree of Polymerization (DP): 921

Estimated Operating Age of the Equipment: 2

Notations:

Comment:

PCB	**Concentration (ppm):**	< 1.0 PPM
ASTM Method D-4059	**PCB Type (Arocolor):**	ND
	Reporting Limit:	1.0

Comment:

End of Test Report

Authorized By: _____

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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WWW.WEIDMANN-DIAGNOSTICS.COM

TEST REPORT
01-6418695-391375-00

\SCENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128692
Project ID: 24743LSP
Customer ID: T2

Serial#: A3S5672
Location: NOTL DS-T2
Equipment: TRANSFORMER
Compartment: MAIN(BOTTOM)
Breathing: SEAL
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 20473

Mfr: WESTINGHOUSE
kV: 115.5
kVA: 25000
Year Mf'd: 1983
Syringe ID: 8003031
Bottle ID: A3S5672
Sampled By: DB

Control#: 6418695
Order#: 391375
Account: 6312
Received: 05/15/2012
Reported: 05/24/2012

	Lab Control Number:	6418695	6406012	6381970	6271835	6138752
	Date Sampled:	05/09/2012	04/02/2012	01/11/2012	03/24/2011	04/06/2010
	Order Number:	391375	388493	383108	359663	332091
	Oil Temp:	30	20		15	20
Dissolved Gas Analysis (DGA)	**Hydrogen (H2) (ppm):**	97	83		96	118
ASTM	**Methane (CH4) (ppm):**	18	18		17	18
D-3612	**Ethane (C2H6) (ppm):**	15	15		13	15
	Ethylene (C2H4) (ppm):	39	26		20	31
	Acetylene (C2H2) (ppm):	<1	<1		<1	<1
	Carbon Monoxide (CO) (ppm):	**831**	**881**		**733**	**858**
	Carbon Dioxide (CO2) (ppm):	**4114**	**5615**		**4509**	**4984**
	Nitrogen (N2) (ppm):	74831	76615		71174	83529
	Oxygen (O2) (ppm):	3670	3226		2549	5534
	Total Dissolved Gas (TDG) (ppm):	83615	86479		79111	95087
	Total Dissolved Combustible Gas (TDCG) (ppm):	**1000**	**1023**		**879**	**1040**
	Equivalent TCG (%):	0.9999	0.993		0.9574	0.9512

DGA Diagnostics	**DGA Keys Gas / Interpretive Method:** **PER IEEE C57.104-2008** (most recent sample)	Hydrogen within condition 1 limits (100 ppm). Methane within condition 1 limits (120 ppm). Ethane within condition 1 limits (65 ppm). Ethylene within condition 1 limits (50 ppm). Acetylene within condition 1 limits (1 ppm). Carbon Monoxide: Condition 3 Indications of significantly overheated cellulose insulation (570 ppm). Carbon Dioxide: Condition 3 Significant Indications of overheated cellulose insulation (4000 ppm). TDCG: Condition 2 Levels exceed normal concentrations. Fault may be present (720 ppm).
	DGA TDCG Rate Interpretive Method: **PER IEEE C57.104-2008** (two most recent sample)	Retest Quarterly. Exercise caution. Analyze for individual gases. Determine load dependence.
	DGA Cellulose (Paper) Insulation:	CO2/CO Ratio not applicable - neither gas exceeds its limit.
	WDS DGA Condition Code:	NORMAL
	WDS Recommended Action:	Continue normal operation. Resample for testing within one year.
Comment:		

General Oil Quality (GOQ)						
D-1533	**Moisture in Oil**	**(ppm):**	3	5	4	4
D-971	**Interfacial Tension**	**(dynes/cm):**	40.66	38.98	41.3	39.7
D-974	**Acid Number**	**(mg KOH/g):**	0.021	0.026	0.015	0.012
D-1500	**Color Number**	**(Relative):**	L1.5	1.0	L1.5	L1.5
D-1524	**Visual Exam.**	**(Relative):**	CLR&SPRK	CLR&SPRK	CLR&SPRK	CLR&SPRK
D-1524	**Sediment Exam.**	**(Relative):**	ND	ND	ND	ND
D-877	**Dielectric Breakdown**	**(kV):**	45	45	42	50
D-1298	**Specific Gravity**	**(Relative):**	0.8628	0.8636	0.867	0.867

GOQ Diagnostics PER IEEE C57.106-2006	**Moisture in Oil:**	Acceptable for in-service oil (25 ppm max).
	Interfacial Tension:	Acceptable for in-service oil (30 dynes/cm min).

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

ASCENT SOLUTIONS INC.
14719 BAYHAM DR, RR#3

TILSONBURG, ON N4G 4G8 CA
ATTN: WARNER ARDELT
PO#: AS1-128692
Project ID: 24743LSP
Customer ID: T2

Serial#: A3S5672
Location: NOTL DS-T2
Equipment: TRANSFORMER
Compartment: MAIN(BOTTOM)
Breathing: SEAL
Bank: NA **Phase:** 3
Fluid: MIN **USGal:** 20473

Mfr: WESTINGHOUSE
kV: 115.5
kVA: 25000
Year Mf'd: 1983
Syringe ID: 8003031
Bottle ID: A3S5672
Sampled By: DB

Control#: 6418695
Order#: 391375
Account: 6312
Received: 05/15/2012
Reported: 05/24/2012

	Lab Control Number:	6418695	6406012	6381970	6271835	6138752
	Date Sampled:	05/09/2012	04/02/2012	01/11/2012	03/24/2011	04/06/2010
	Order Number:	391375	388493	383108	359663	332091
	Oil Temp:	30	20		15	20
(most recent sample)	**Acid Number:**	Acceptable for in-service oil (0.15 mg KOH/g max).				
	Color Number and Visual:	Diagnostic not applicable. Diagnostic not applicable.				
	Dielectric Breakdown D-877:	Diagnostic not applicable.				
Comment:						
Furanic Compound	**2-Furaldehyde (ppb):**	11				
D-5837	**5-Hydroxy-methyl-furaldehyde (ppb):**	< 10				
	2-Acetylfuran (ppb):	< 10				
	5-Methyl-2-furaldehyde (ppb):	< 10				
	2-Furyl alcohol (ppb):	< 10				

Furanic Compound Diagnostics (most recent sample):

New insulation with a high degree of mechanical strength will typically have a Degree of Polymerization (DP) of 1000-1300. "Middle Aged" paper is approximately 500 and paper with less than 250 is in its "Old Age." Severely degraded insulation with a DP of 150 or less will have very little mechanical strength and may result in a transformer failure. The above estimations are based on a study by Chendong of GSU transformers filled with mineral oil.

Estimated Average Degree of Polymerization (DP): 995

Estimated Operating Age of the Equipment: <1.0

Notations:

Comment:

PCB	**Concentration (ppm):**	< 1.0 PPM
ASTM Method D-4059	**PCB Type (Arocolor):**	ND
	Reporting Limit:	1.0

Comment:

End of Test Report

Authorized By: 

Notations: 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

TRANSFORMER DATA SHEET (Pg. 1 of 4)

System ID: NOTL DS | Device ID: T1

Customer	NIAGARA ON THE LAKE HYDRO	Date	May 8, 2012
Customer Address	8 HENEGAN ROAD, VIRGIL	Job #	24743LSP
Site	NOTL DS		
Site Address	801 CONCESSION 5, VIRGIL		

Nameplate Data

Transformer Class	Unit Padmount		Padmount		Station	X			Other	
Transformer Cooling	ONAN	X	ONAF	X	LNAN		DRY		Other	
Bushing Configuration	Dead Front		Top - Top	X	Top - Side		Side - Side		Other	

Manufacturer	WESTINGHOUSE		Core & Windings	27215	kg X	lb	
Date of Manufacture	1983		Tanks & Fittings	12643	kg X	lb	
Serial #	A355671		Coolant Volume	20473	L X	Gal	
KVA / Prov. KVA Rating	15, 20, 25	MVA	Coolant Weight	17772	kg X	lb	
Primary Voltage	115500	V	Total Weight	57630	kg X	lb	
Primary Ampacity	125	A	Temperature Rise	55	°C X	°F	
Secondary Voltage	29500	V	HV BIL Rating	550	kV		
Secondary Ampacity	489	A	LV BIL Rating	150	kV		
HV Winding Material	NA		Percent Impedance	8.6 / 8.9 %	ONAN		ONAF X
LV Winding Material	NA		Tamper Resistant		YES		NO X
CSA Specification(s)	NA		Transformer Colour	GREY			
Comments							

Visual Inspection

Nameplate Condition	Satisfactory	√	Not Satisfactory		N/A		Comments		
Fan / Pump Operation	Satisfactory	√	Not Satisfactory		N/A		Comments		
Ground Connections	Satisfactory	√	Not Satisfactory		N/A		Comments		
Liquid Levels In Tanks	Satisfactory	√	Not Satisfactory		N/A		Comments		
Interlock Operation	Satisfactory		Not Satisfactory		N/A	√	Comments		
Temp. Gauge Operation	Satisfactory	√	Not Satisfactory		N/A		Comments		

Coolant Temperature	20	°C X	°F	Max. Coolant Temperature	35	°C X	°F
Comments							

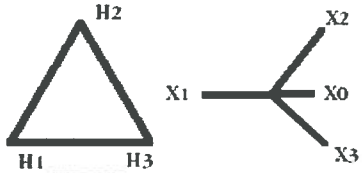
Oil Conservator

Oil Conservator	Yes		No	X		Conservator Volume		L	Gal
Silica Gel Breather	Yes		No			Breather Volume		L	Gal
Silica Gel Colour	Good		Bad		Replaced	N/A	X		
Comments									

Tap Changer Data

Position / Designation		Tap Voltages (V)	As Found	As Left
1 / A	105.00%	26550		
2 / B	102.50%	26918		
3 / C	100.00%	27288		
4 / D	97.50%	27656	4	4
5 / E	95.00%	28025		

Vector Diagram



Primary Vector: X | Secondary Vector: X

Comments: ADDITIONAL TRANSFORMER SECONDARY SIDE TAP CHANGER POSITIONS:
6/F = 28395 V, 7/G = 28763 V, 8/H = 29131 V, 9/I = 29500 V, 10/J = 29869 V, 11/K = 30238 V

Tested By: DAVE BENJAMIN

TRANSFORMER DATA SHEET (Pg. 2 of 4)

System ID: NOTL DS Device ID: T1

Neutral Grounding Resistor (NGR)

NGR Present: Yes [ ] No [X]
Manufacturer: _____ NGR Serial #: _____
NGR Voltage: _____ V Maximum Current: _____ A
NGR Resistance: _____ Ω NGR Location: _____
Comments: _____

Transformer Lightning Arrestors

Class: Distribution [ ] Intermediate [X] Station [ ]
Composition: Ceramic [ ] Polymer [X]
Manufacturer: GE TRANQUELL Max. / MCOV Rating: 21.0 / 17.0 kV
Catalog #: 9L12PPA021S
Comments: LV SIDE OF TRANSFORMER

Interlock

Key Interlock: Yes [ ] No [X]
Interlock Type: Elec. [ ] Mech. [ ] Utility Lock [ ]
Devices Interlocked: H.V. Switch [ ] Breaker [ ] Trans. Encl. [ ] Other [ ] _____
Manufacturer: _____ Key Interlock #: _____
Comments: _____

Fans

of Fans: 10 Fan Voltage: _____
Fan Size: 24"-28" Frame Size: _____
Horsepower: 25 HP
Comments: _____

Transformer Load Side Conductor Data

Conductor Type: Cable [ ] Bus Bar [ ] Conductor Size / Dim.: _____
Conductor Material: Aluminum [ ] Copper [ ] Conductors per Phase: _____ / Phase
Tape Shield: Aluminum [ ] Copper [ ] Bond Size / Dim.: _____
Concentric Neutral: Aluminum [ ] Copper [ ] # of Bond Conductors: _____
Insulation Voltage: _____ # of Neutral Conductors: _____
Insulation Type: _____ Neutral Size / Dim.: _____
Comments: NA

Tested By: DAVE BENJAMIN

Ascent™

TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID: NOTL DS Device ID: T1

Electrical Tests

Turn Ratio Test

Tap Position / Designation		Tap Voltage (V)	Calculated Ratio	H 1 To H 2 / X 0 To X 2	H 2 To H 3 / X 0 To X 3	H 3 To H 1 / X 0 To X 1
1 / A	105.00%	26550				
2 / B	102.50%	26918				
3 / C	100.00%	27288				
4 / D	97.50%	27656	7.233	7.253	7.255	7.250
5 / E	95.00%	28025				

		Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
Tap Position As Found	4	0.10 mA	%	0.70 mA	%	0.11 mA	%
Tap Position As Left		mA	%	mA	%	mA	%

Primary Winding Resistance

Resistance in ohms at 1 A after 1 minute

H0 - H1	NA Ω	H1 - H2	2.663 Ω
H0 - H2	NA Ω	H2 - H3	2.658 Ω
H0 - H3	NA Ω	H3 - H1	2.659 Ω

Stabilization Time > 1 Minute

Secondary Winding Resistance

Resistance in milli-ohms at 10 A after 1 minute

X0 - X1	75.81 mΩ	X1 - X2	150.70 mΩ
X0 - X2	75.83 mΩ	X2 - X3	150.90 mΩ
X0 - X3	75.80 mΩ	X3 - X1	150.80 mΩ

Stabilization Time > 1 Minute

Capacitance Test

	Low - Ground	Low - Guard	UST (High - Low)	High - Guard	High - Ground
Capacitance in pico-farads	6427 pF	2044 pF	4388 pF	9568 pF	13948 pF
Uncorrected D.F. (%)	0.222 %	0.327 %	0.173 %	0.423 %	0.375 %
Corrected to 20 °C (%)	0.222 %	0.327 %	0.173 %	0.423 %	0.375 %

Temp. Correction Factor 1

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @ 10000 V DC after 1 minute

Phase A to Ground	11700 MΩ
Phase B to Ground	11000 MΩ
Phase C to Ground	7590 MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @ NA V DC after 1 minute

Phase A to Ground	NA MΩ	Phase A to Phase B	NA MΩ
Phase B to Ground	NA MΩ	Phase B to Phase C	NA MΩ
Phase C to Ground	NA MΩ	Phase C to Phase A	NA MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger	
	Serial #	0311	0510	5374	1025	

Tested By: DAVE BENJAMIN

Ascent™

TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID: NOTL DS Device ID: T1

Dielectric Absorption Test (Insulation Resistance)

Time	High to Low & Gnd Uncorrected	High to Low & Gnd Corrected	Low to High & Gnd Uncorrected	Low to High & Gnd Corrected	High & Low to Gnd Uncorrected	High & Low to Gnd Corrected
15 sec	3550 MΩ	3550 MΩ	1950 MΩ	1950 MΩ	3900 MΩ	3900 MΩ
30 sec	3920 MΩ	3920 MΩ	2360 MΩ	2360 MΩ	4780 MΩ	4780 MΩ
45 sec	4260 MΩ	4260 MΩ	2530 MΩ	2530 MΩ	5160 MΩ	5160 MΩ
1 min	4610 MΩ	4610 MΩ	2770 MΩ	2770 MΩ	5740 MΩ	5740 MΩ
2 min	5600 MΩ	5600 MΩ	3520 MΩ	3520 MΩ	6740 MΩ	6740 MΩ
3 min	6350 MΩ	6350 MΩ	4100 MΩ	4100 MΩ	7290 MΩ	7290 MΩ
4 min	6850 MΩ	6850 MΩ	4620 MΩ	4620 MΩ	7650 MΩ	7650 MΩ
5 min	7310 MΩ	7310 MΩ	4930 MΩ	4930 MΩ	7980 MΩ	7980 MΩ
6 min	7630 MΩ	7630 MΩ	5290 MΩ	5290 MΩ	8150 MΩ	8150 MΩ
7 min	7920 MΩ	7920 MΩ	5550 MΩ	5550 MΩ	8300 MΩ	8300 MΩ
8 min	8190 MΩ	8190 MΩ	5790 MΩ	5790 MΩ	8460 MΩ	8460 MΩ
9 min	8350 MΩ	8350 MΩ	6000 MΩ	6000 MΩ	8600 MΩ	8600 MΩ
10 min	8530 MΩ	8530 MΩ	6220 MΩ	6220 MΩ	8720 MΩ	8720 MΩ
Test Voltage	10000 V		10000 V		10000 V	
Multiplier	1		1		1	
Polarization Index	1.85		2.25		1.52	
TCC 1.00	Insulation Resistance Readings Corrected to 20 °C					

Insulation Resistance

Resistance in meg-ohms after 1 minute.

High to Low & Ground	4610	MΩ @	10000	V
Low to High & Ground	2770	MΩ @	10000	V
High & Low to Ground	5740	MΩ @	10000	V

Core Ground Insulation Resistance

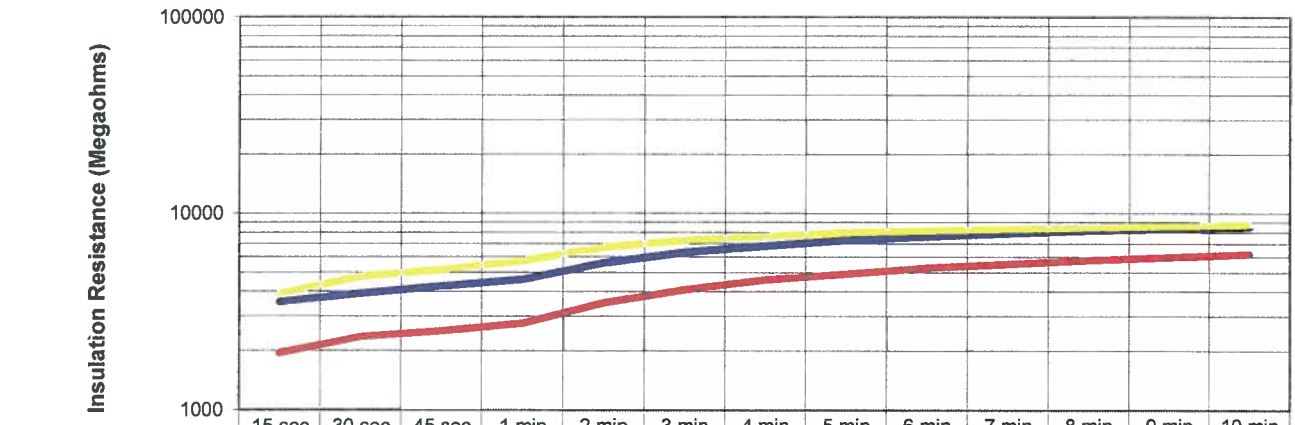
Resistance in meg-ohms after 1 minute.

Core Ground Accessible: Yes ☐ No ☐

Test Voltage: 500 V

Core Ground Resistance: _____ MΩ

Dielectric Absorption Test



	15 sec	30 sec	45 sec	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
High to Low & Gnd	3550	3920	4260	4610	5600	6350	6850	7310	7630	7920	8190	8350	8530
Low to High & Gnd	1950	2360	2530	2770	3520	4100	4620	4930	5290	5550	5790	6000	6220
High & Low to Gnd	3900	4780	5160	5740	6740	7290	7650	7980	8150	8300	8460	8600	8720

Test Instrument(s) — Manufacturer / Model: Megger; Serial #: 1025

Comments: _____

Tested By: DAVE BENJAMIN

TRANSFORMER DATA SHEET (Pg. 1 of 4)

System ID: NOTL DS | Device ID: T2

Customer	NIAGARA ON THE LAKE HYDRO	Date	May 9, 2012
Customer Address	8 HENEGAN ROAD, VIRGIL	Job #	24743LSP
Site	NOTL DS		
Site Address	801 CONCESSION 5, VIRGIL		

Nameplate Data

Transformer Class	Unit Padmount		Padmount		Station			Other
Transformer Cooling	ONAN		ONAF	X	LNAN		DRY	Other
Bushing Configuration	Dead Front		Top - Top		Top - Side		Side - Side	Other

Manufacturer	WESTINGHOUSE		Core & Windings	27215	kg	X	lb	
Date of Manufacture	1983		Tanks & Fittings	12643	kg	X	lb	
Serial #	A355672		Coolant Volume	20473	L	X	Gal	
KVA / Prov. KVA Rating	15, 20, 25	MVA	Coolant Weight	17772	kg	X	lb	
Primary Voltage	115500	V	Total Weight	57630	kg	X	lb	
Primary Ampacity	125	A	Temperature Rise	55	°C	X	°F	
Secondary Voltage	29500	V	HV BIL Rating	550	kV			
Secondary Ampacity	489	A	LV BIL Rating	150	kV			
HV Winding Material	NA		Percent Impedance	8.56 / 8.46 %	ONAN	X	ONAF	X
LV Winding Material	NA		Tamper Resistant		YES		NO	X
CSA Specification(s)	NA		Transformer Colour	GREY				
Comments								

Visual Inspection

Nameplate Condition	Satisfactory	√	Not Satisfactory		N/A		Comments	
Fan / Pump Operation	Satisfactory	√	Not Satisfactory		N/A		Comments	
Ground Connections	Satisfactory	√	Not Satisfactory		N/A		Comments	
Liquid Levels In Tanks	Satisfactory	√	Not Satisfactory		N/A		Comments	
Interlock Operation	Satisfactory		Not Satisfactory		N/A	√	Comments	
Temp. Gauge Operation	Satisfactory	√	Not Satisfactory		N/A		Comments	

Coolant Temperature	30	°C	X	°F		Max. Coolant Temperature	40	°C	X	°F	
Comments											

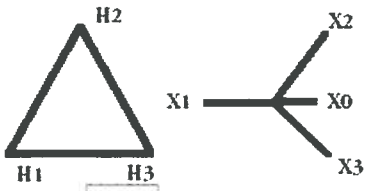
Oil Conservator

Oil Conservator	Yes		No	X			Conservator Volume		L		Gal
Silica Gel Breather	Yes		No				Breather Volume		L		Gal
Silica Gel Colour	Good		Bad		Replaced		N/A				
Comments											

Tap Changer Data

Position / Designation		Tap Voltages (V)	As Found	As Left
1 / A	105.00%	26550		
2 / B	102.50%	26918		
3 / C	100.00%	27288	3	3
4 / D	97.50%	27656		
5 / E	95.00%	28025		

Vector Diagram



Primary Vector: X | Secondary Vector: X

Comments: ADDITIONAL TRANSFORMER SECONDARY SIDE TAP CHANGER POSITIONS:
6/F = 28395 V, 7/G = 28763 V, 8/H = 29131 V, 9/I = 29500 V, 10/J = 29869 V, 11/K = 30238 V

Tested By: DAVE BENJAMIN

TRANSFORMER DATA SHEET (Pg. 2 of 4)

System ID: NOTL DS Device ID: T2

Neutral Grounding Resistor (NGR)

NGR Present: Yes [ ] No [X]
Manufacturer: _____ NGR Serial #: _____
NGR Voltage: _____ V Maximum Current: _____ A
NGR Resistance: _____ Ω NGR Location: _____
Comments: _____

Transformer Lightning Arrestors

Class: Distribution [ ] Intermediate [X] Station [ ]
Composition: Ceramic [ ] Polymer [X]
Manufacturer: GE TRANQUELL Max. / MCOV Rating: 21.0 / 17.0 kV
Catalog #: 9L12PPA021S
Comments: LV SIDE OF TRANSFORMER

Interlock

Key Interlock: Yes [ ] No [X]
Interlock Type: Elec. [ ] Mech. [ ] Utility Lock [ ]
Devices Interlocked: H.V. Switch [ ] Breaker [ ] Trans. Encl. [ ] Other [ ] _____
Manufacturer: _____ Key Interlock #: _____
Comments: _____

Fans

of Fans: _____ Fan Voltage: _____
Fan Size: _____ Frame Size: _____
Horsepower: _____
Comments: _____

Transformer Load Side Conductor Data

Conductor Type: Cable [ ] Bus Bar [ ] Conductor Size / Dim.: _____
Conductor Material: Aluminum [ ] Copper [ ] Conductors per Phase: _____ / Phase
Tape Shield: Aluminum [ ] Copper [ ] Bond Size / Dim.: _____
Concentric Neutral: Aluminum [ ] Copper [ ] # of Bond Conductors: _____
Insulation Voltage: _____ # of Neutral Conductors: _____
Insulation Type: _____ Neutral Size / Dim.: _____
Comments: _____

Tested By: DAVE BENJAMIN

Ascent™

TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID: NOTL DS Device ID: T2

Electrical Tests

Turn Ratio Test

Tap Position / Designation		Tap Voltage (V)	Calculated Ratio	H 1 To H 2 / X 0 To X 2	H 2 To H 3 / X 0 To X 3	H 3 To H 1 / X 0 To X 1
1 / A	105.00%	26550				
2 / B	102.50%	26918				
3 / C	100.00%	27288	7.331	7.349	7.350	7.350
4 / D	97.50%	27656				
5 / E	95.00%	28025				

		Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
Tap Position As Found	3	0.11 mA	NA %	0.07 mA	NA %	0.10 mA	NA %
Tap Position As Left		mA	%	mA	%	mA	%

Primary Winding Resistance

Resistance in ohms at 1 A after 1 minute

H0 - H1	NA Ω	H1 - H2	2.701 Ω
H0 - H2	NA Ω	H2 - H3	2.709 Ω
H0 - H3	NA Ω	H3 - H1	2.708 Ω

Stabilization Time > 1 Minute

Secondary Winding Resistance

Resistance in milli-ohms at 10 A after 1 minute

X0 - X1	77.580 mΩ	X1 - X2	153.200 mΩ
X0 - X2	77.560 mΩ	X2 - X3	154.400 mΩ
X0 - X3	77.230 mΩ	X3 - X1	152.500 mΩ

Stabilization Time > 1 Minute

Capacitance Test

	Low - Ground	Low - Guard	UST (High - Low)	High - Guard	High - Ground
Capacitance in pico-farads	3220 pF	1022 pF	2197 pF	4758 pF	6953 pF
Uncorrected D.F. (%)	0.213 %	0.324 %	0.160 %	0.412 %	0.358 %
Corrected to 20 °C (%)	0.134 %	0.204 %	0.101 %	0.260 %	0.226 %

Temp. Correction Factor: 0.63

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @ 10000 V DC after 1 minute

Phase A to Ground	7890 MΩ
Phase B to Ground	12800 MΩ
Phase C to Ground	29100 MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @ NA V DC after 1 minute

Phase A to Ground	NA MΩ	Phase A to Phase B	NA MΩ
Phase B to Ground	NA MΩ	Phase B to Phase C	NA MΩ
Phase C to Ground	NA MΩ	Phase C to Phase A	NA MΩ

Comments / Observations

RAINED PRIOR TO CAPACITANCE TESTING - 16°C, 72%

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger	
	Serial #	0311	0510	5374	1025	

Tested By: DAVE BENJAMIN

TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID NOTL DS **Device ID** T2

Dielectric Absorption Test (Insulation Resistance)

Time	High to Low & Gnd Uncorrected	High to Low & Gnd Corrected	Low to High & Gnd Uncorrected	Low to High & Gnd Corrected	High & Low to Gnd Uncorrected	High & Low to Gnd Corrected
15 sec	3550 MΩ	6390 MΩ	1950 MΩ	3510 MΩ	3900 MΩ	7020 MΩ
30 sec	3920 MΩ	7056 MΩ	2360 MΩ	4248 MΩ	4780 MΩ	8604 MΩ
45 sec	4260 MΩ	7668 MΩ	2530 MΩ	4554 MΩ	5160 MΩ	9288 MΩ
1 min	4610 MΩ	8298 MΩ	2770 MΩ	4986 MΩ	5740 MΩ	10332 MΩ
2 min	5600 MΩ	10080 MΩ	3520 MΩ	6336 MΩ	6740 MΩ	12132 MΩ
3 min	6350 MΩ	11430 MΩ	4100 MΩ	7380 MΩ	7290 MΩ	13122 MΩ
4 min	6850 MΩ	12330 MΩ	4620 MΩ	8316 MΩ	7650 MΩ	13770 MΩ
5 min	7310 MΩ	13158 MΩ	4930 MΩ	8874 MΩ	7980 MΩ	14364 MΩ
6 min	7630 MΩ	13734 MΩ	5290 MΩ	9522 MΩ	8150 MΩ	14670 MΩ
7 min	7920 MΩ	14256 MΩ	5550 MΩ	9990 MΩ	8300 MΩ	14940 MΩ
8 min	8190 MΩ	14742 MΩ	5790 MΩ	10422 MΩ	8460 MΩ	15228 MΩ
9 min	8350 MΩ	15030 MΩ	6000 MΩ	10800 MΩ	8600 MΩ	15480 MΩ
10 min	8530 MΩ	15354 MΩ	6220 MΩ	11196 MΩ	8720 MΩ	15696 MΩ
Test Voltage	10000 V		10000 V		10000 V	
Multiplier	1		1		1	
Polarization Index	1.85		2.25		1.52	
TCC 1.80	Insulation Resistance Readings Corrected to 20 °C					

Insulation Resistance

Resistance in meg-ohms after 1 minute.

High to Low & Ground	8298	MΩ @	10000	V
Low to High & Ground	4986	MΩ @	10000	V
High & Low to Ground	10332	MΩ @	10000	V

Core Ground Insulation Resistance

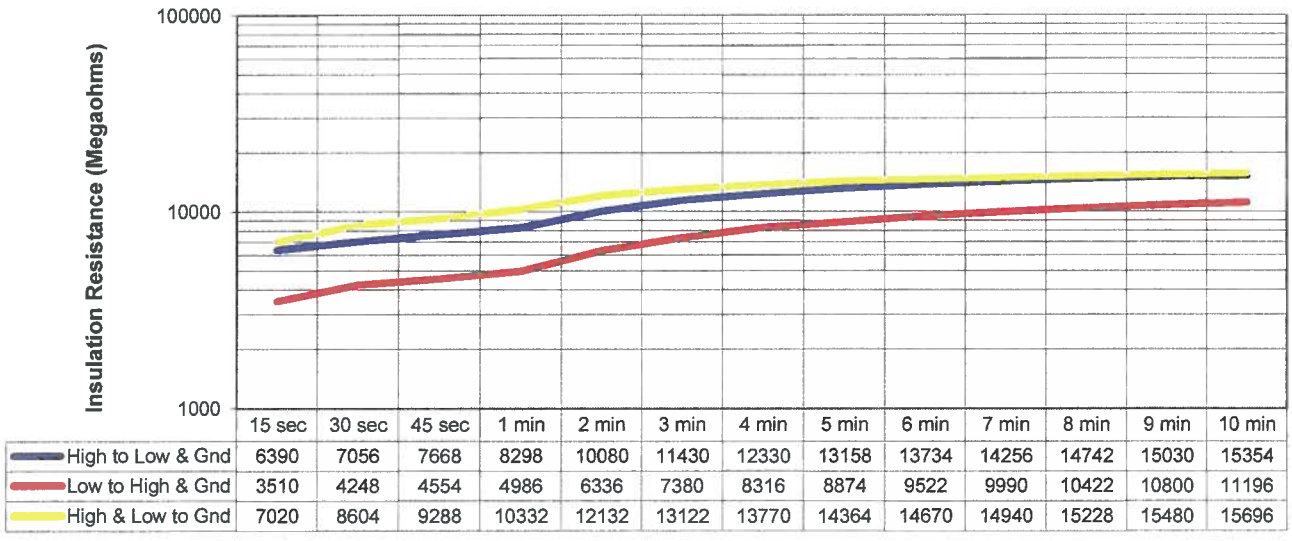
Resistance in meg-ohms after 1 minute.

Core Ground Accessible Yes ☐ No ☐

Test Voltage 500 V

Core Ground Resistance MΩ

Dielectric Absorption Test



Test Instrument(s)	Manufacturer / Model	Megger				
	Serial #	1025				

Comments: WEATHER: RAINY, WET, WINDY

Tested By: DAVE BENJAMIN

WINDING INSULATION POWER FACTOR TEST REPORT

System ID: NOTL DS Device ID: T1

Customer: NIAGARA ON THE LAKE HYDRO
Customer Address: 8 HENEGAN ROAD, VIRGIL
Site: NOTL DS
Site Address: 801 CONCESSION 5, VIRGIL

Date: May 8, 2012
Job #: 24743LSP

Transformer Data

Oil Temperature: 20 °C
Winding Temperature: 20 °C
Temp. Correction Factor: 1

Conditions

Temperature: 13 °C
Humidity: 77 %

Test Data

Test Mode/No.		Insulation Tested	Test Voltage (kV)	Equivalent 10kV Current (mA)	Equivalent 10kV Watts (W)	Measured %PF	Corrected %PF @ 20 deg C	Capacitance (pF)
GST GND	Low-Gnd	CHG+CHL	10K	24.490	0.5530	0.23	0.23	6495
GST	Low-Guard	CHG	10.20K	7.788	0.2328	0.30	0.30	2066
UST	High-Low	CHL	10.02K	16.700	0.3238	0.19	0.19	4429
		ACTUAL						4429
GST GND	High-Gnd	CLG+CHL	10K	53.090	1.7100	0.32	0.32	14087
GST	High-Guard	CLG	10K	36.430	1.3920	0.38	0.38	9662
UST	High-Low	CHL	10K	16.690	0.3255	0.20	0.20	4428
		ACTUAL						4425

Comments / Observations

Test Instrument(s) Manufacturer / Model: MEGGER
Serial #: DELTA 2000

Tested By: DAVE BENJAMIN, MIKE LEFEBVRE

WINDING INSULATION POWER FACTOR TEST REPORT

System ID: NOTL DS | Device ID: T2

Customer: NIAGARA ON THE LAKE HYDRO
Customer Address: 8 HENEGAN ROAD, VIRGIL
Site: NOTL DS
Site Address: 801 CONCESSION 5, VIRGIL

Date: May 8, 2012
Job #: 24743LSP

Transformer Data

Oil Temperature: 30 °C
Winding Temperature: 30 °C
Temp. Correction Factor: 0.63

Conditions

Temperature: 17 °C
Humidity: 59 %

Test Data

Test Mode/No.		Insulation Tested	Test Voltage (kV)	Equivalent 10kV Current (mA)	Equivalent 10kV Watts (W)	Measured %PF	Corrected %PF @ 20 deg C	Capacitance (pF)
GST GND	Low-Gnd	CHG+CHL	10.03K	24.490	0.5461	0.22	0.14	6497
GST	Low-Guard	CHG	10.05K	7.770	0.2323	0.30	0.19	2062
UST	High-Low	CHL	10.02K	16.720	0.3176	0.19	0.12	4435
		ACTUAL						4435
GST GND	High-Gnd	CLG+CHL	10.02K	52.930	1.6560	0.31	0.20	14044
GST	High-Guard	CLG	10.05K	36.240	1.3480	0.37	0.23	9613
UST	High-Low	CHL	10.02K	16.720	0.3176	0.19	0.12	4435
		ACTUAL						4431

Comments / Observations

Test Instrument(s) Manufacturer / Model: MEGGER
Serial #: DELTA 2000

Tested By: DAVE BENJAMIN, MIKE LEFEBVRE

SFRA Test Results

Report date: 2012-06-07

Date of Test: 5/8/2012	**Time of Test:** 11:40:55
Company Name: Ascent	**Location:** NOTL DS
Test Object: NOTL T1	**Manufacturer:** Westinghouse
Serial Number: A 3S-5671	**Built Year:** 1983
Phase Design: 3	**Winding Configuration:**
KV Rating: 150000	**KVA Rating:** 15-20-25
NLTC Position: 4	**LTC Position:** Position 4
Temperature: 15	**Reason For Test:** Assessment Analysis

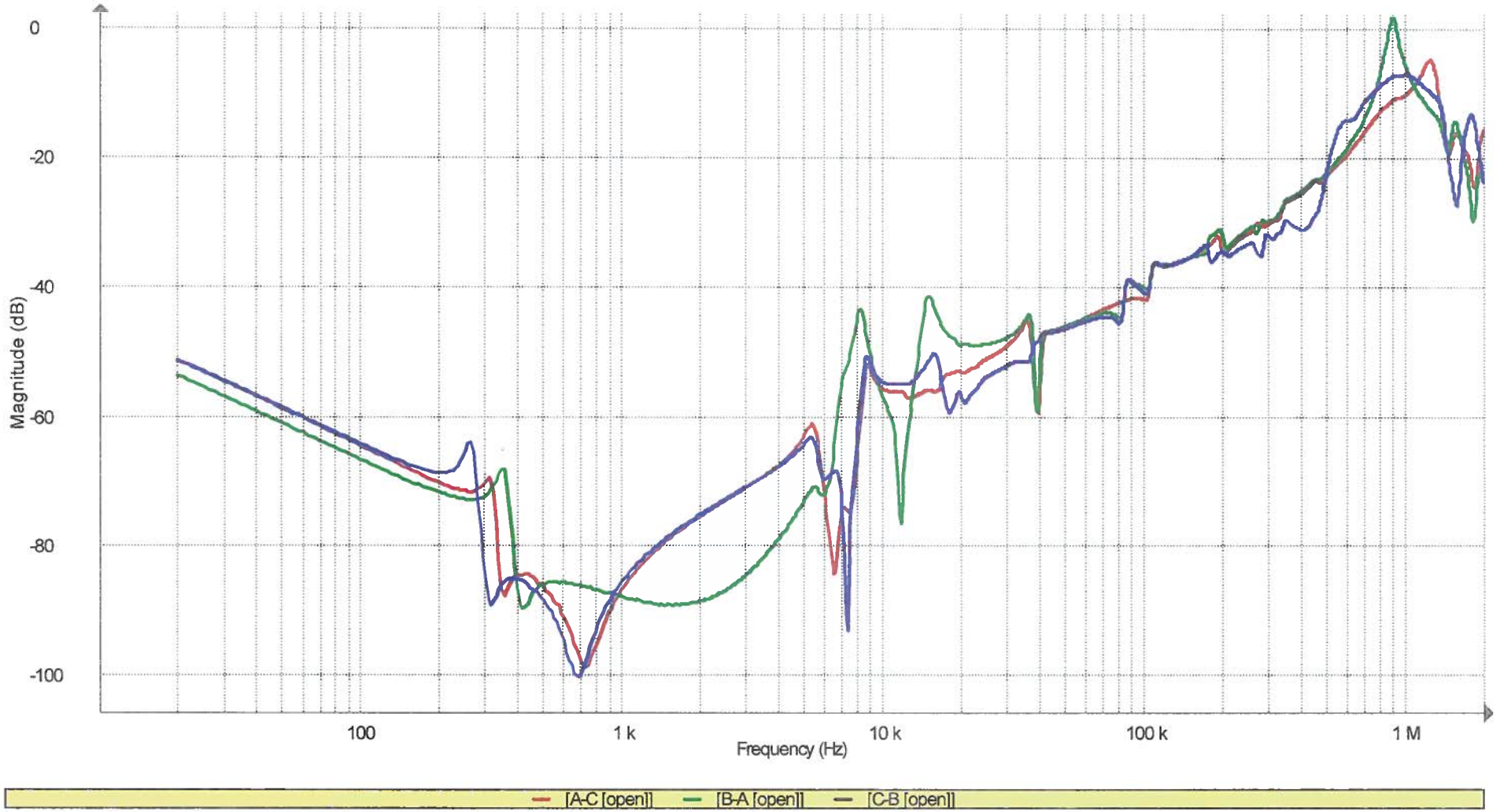
Tested By:
Dave Benjamin

Notes:

 Report generated by FRAX software

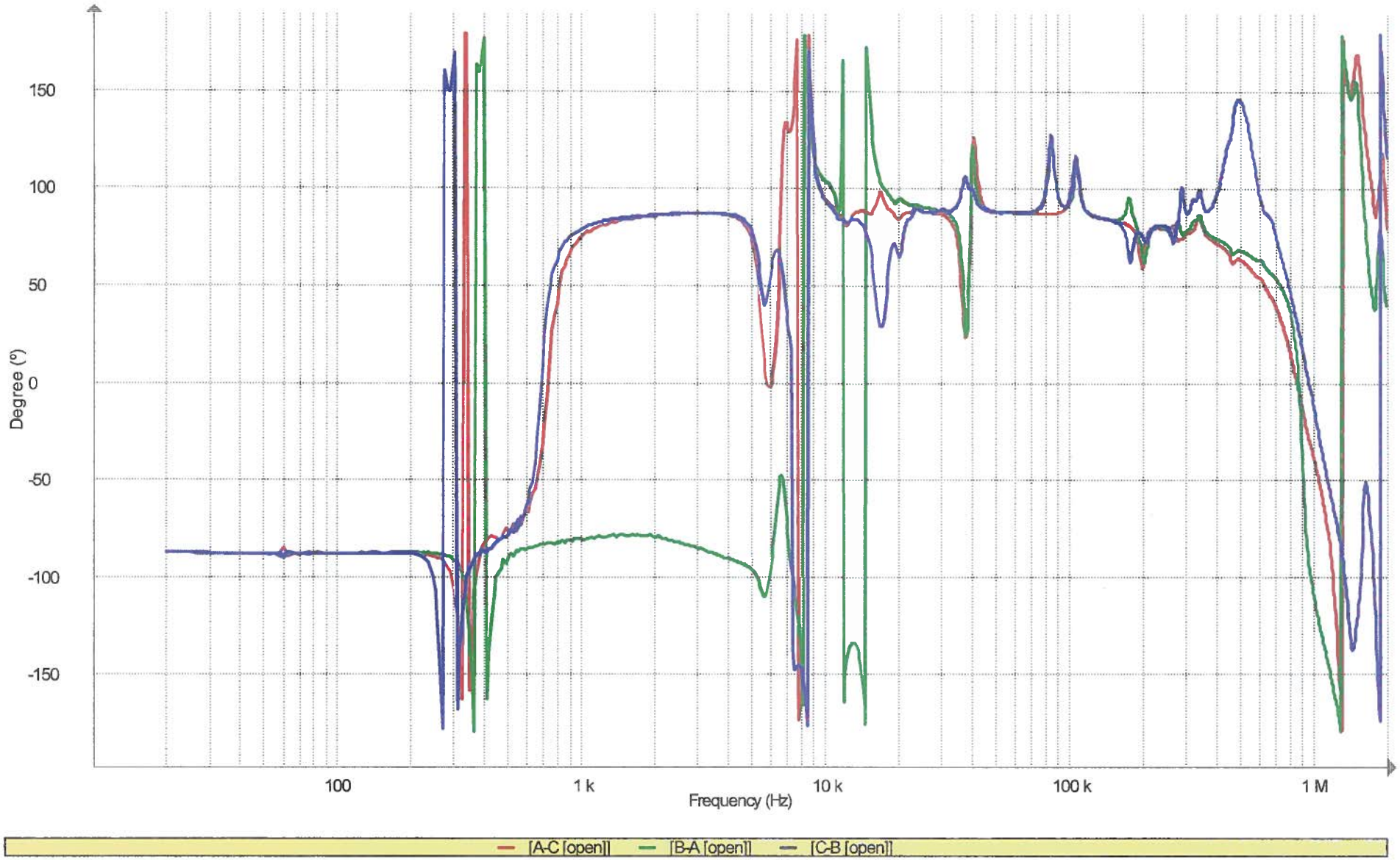
Transformer: "NOTL T1" **at** "NOTL DS"
Serial Number: A 3S-5671 **Manufacturer:** Westinghouse
Tested 5/8/2012 **at** 11:40:55 **Tested by:** Dave Benjamin

Magnitude:



 Report generated by FRAX software

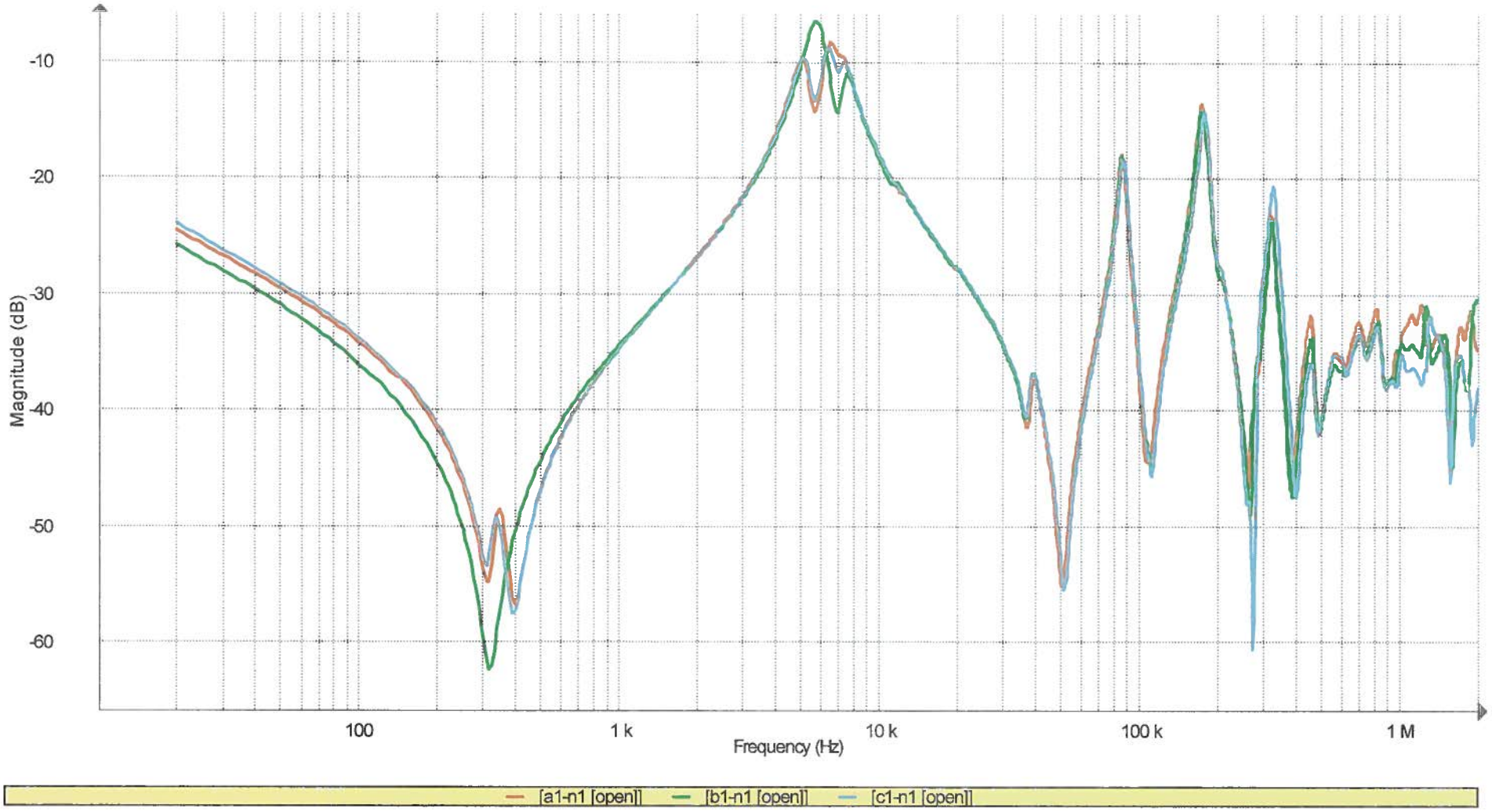
Phase:



 Report generated by FRAX software

Transformer: "NOTL T1" **at** "NOTL DS"
Serial Number: A 3S-5671 **Manufacturer:** Westinghouse
Tested 5/8/2012 **at** 11:40:55 **Tested by:** Dave Benjamin

Magnitude:



 Report generated by FRAX software

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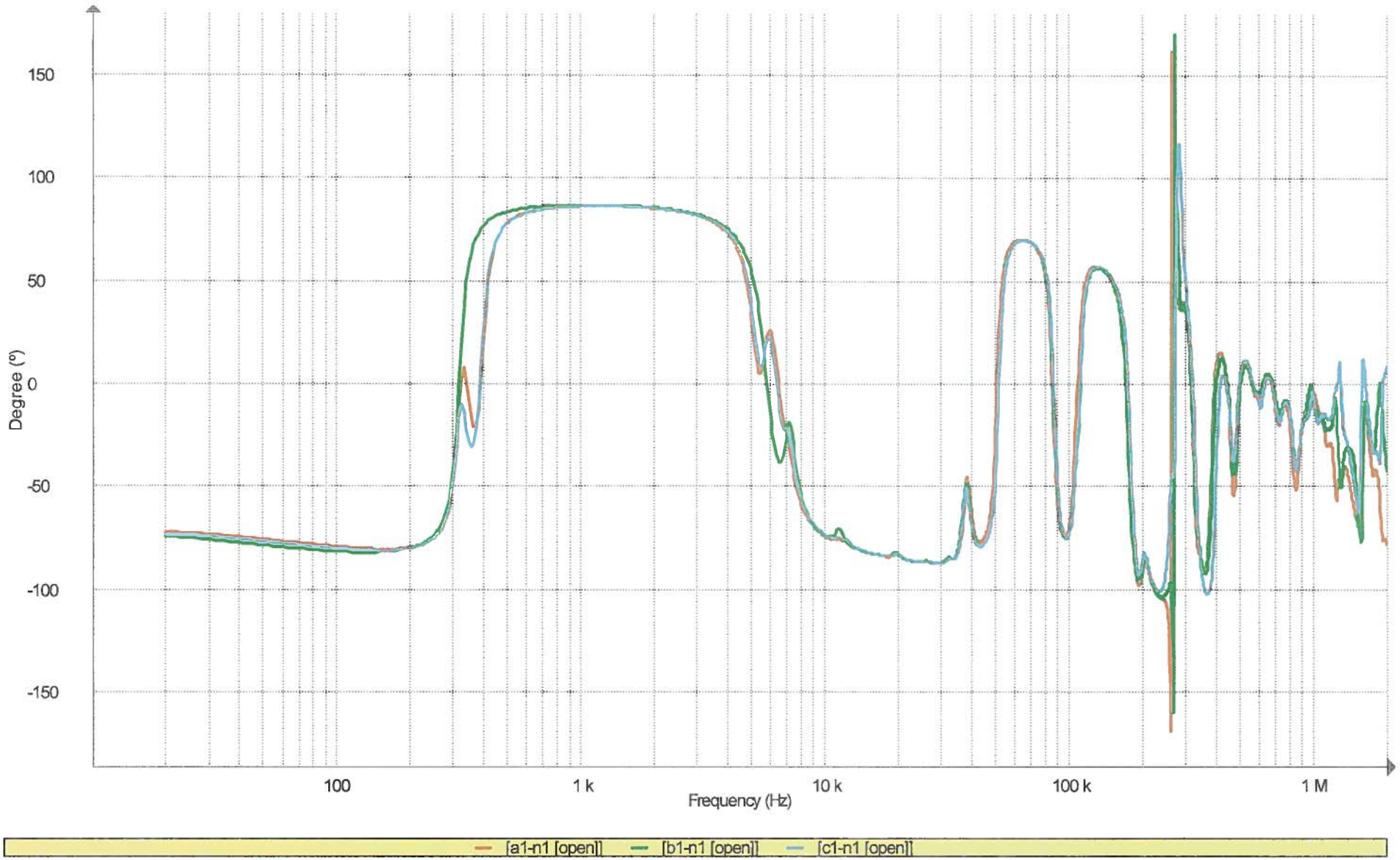
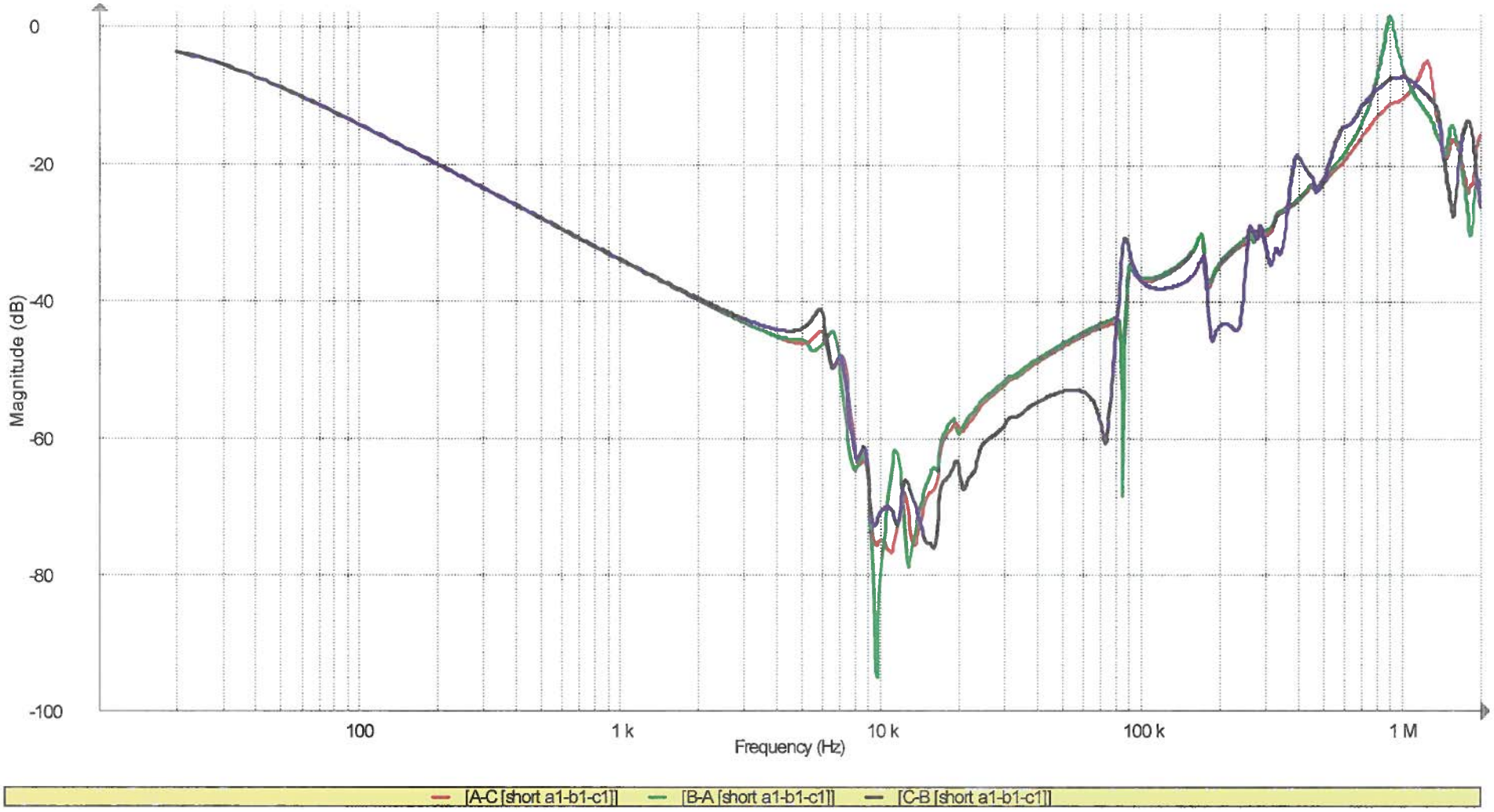


 Report generated by FRAX software

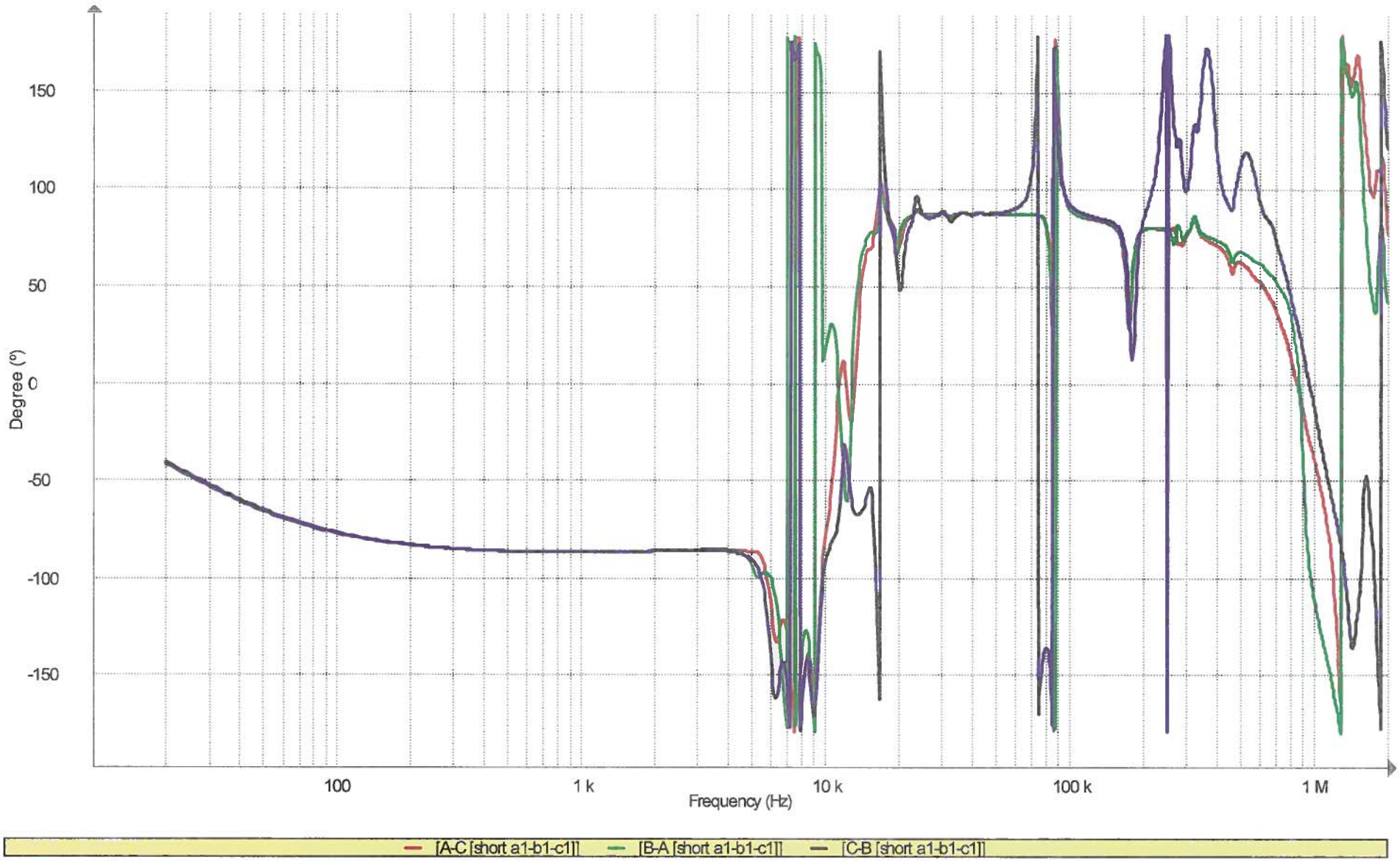
Transformer: "NOTL T1" **at** "NOTL DS"
Serial Number: A 3S-5671 **Manufacturer:** Westinghouse
Tested 5/8/2012 **at** 11:40:55 **Tested by:** Dave Benjamin

Magnitude:



 Report generated by FRAX software

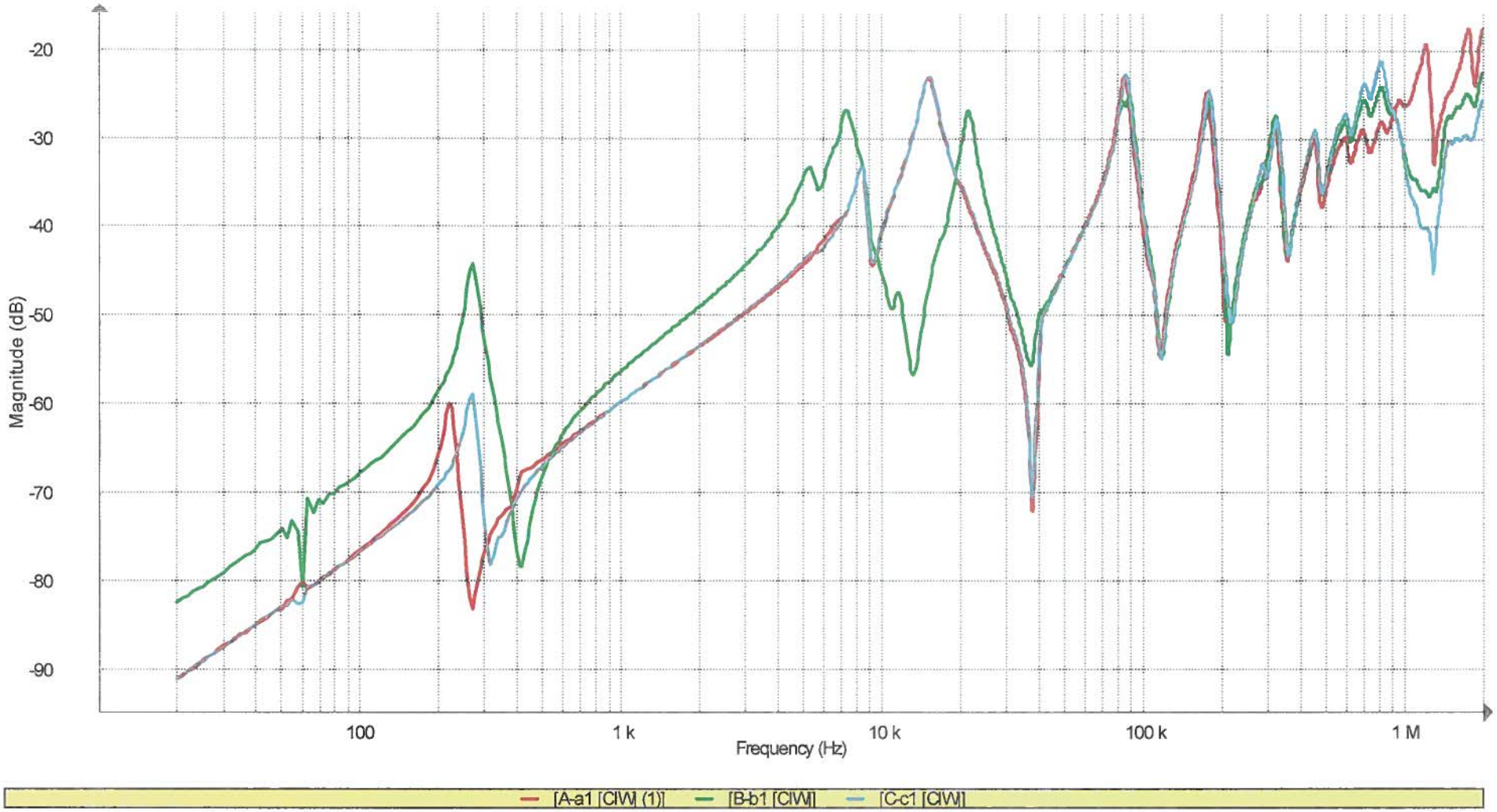
Phase:



 Report generated by FRAX software

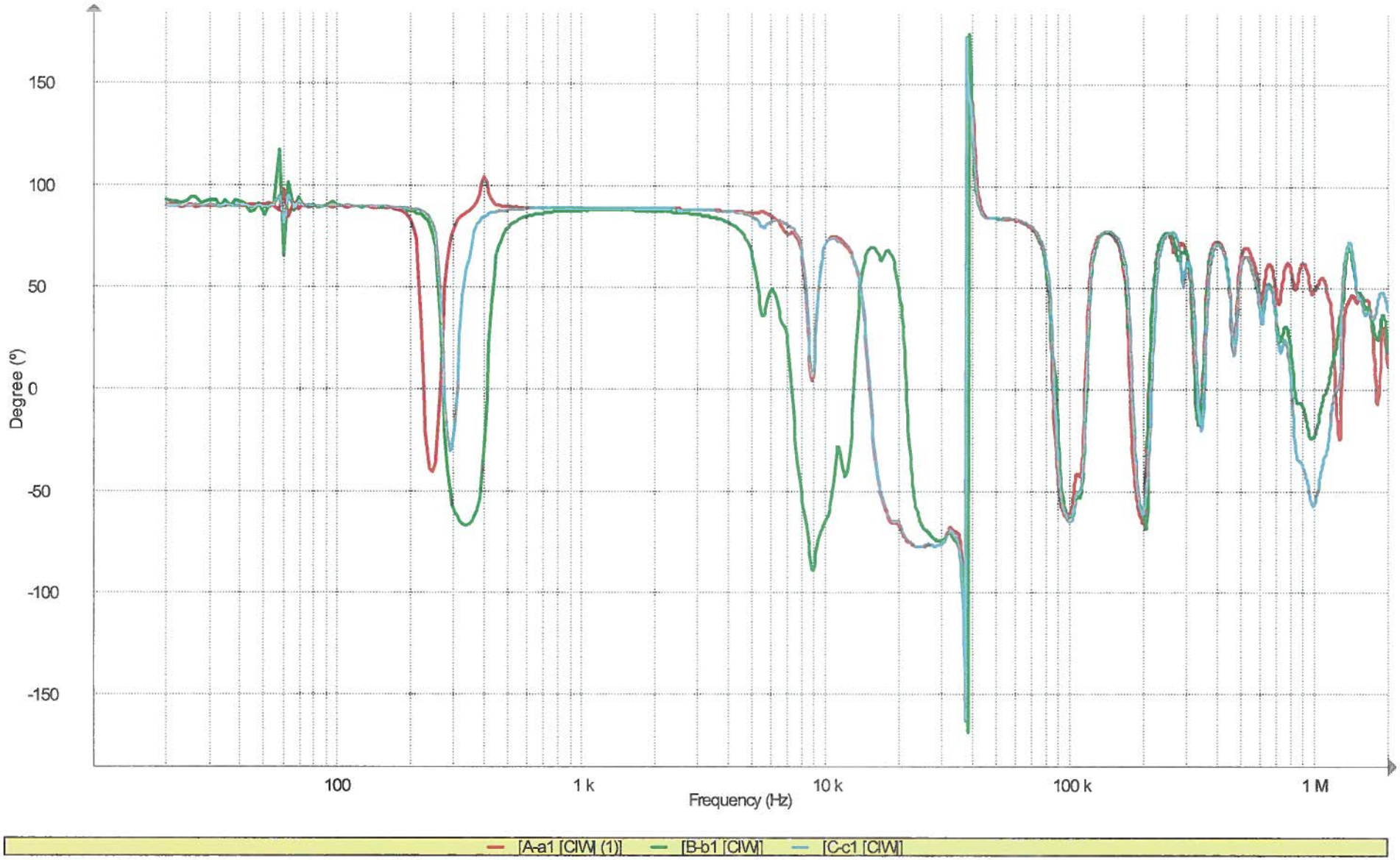
Transformer: "NOTL T1" **at** "NOTL DS"
Serial Number: A 3S-5671 **Manufacturer:** Westinghouse
Tested 5/8/2012 **at** 11:40:55 **Tested by:** Dave Benjamin

Magnitude:



 Report generated by FRAX software

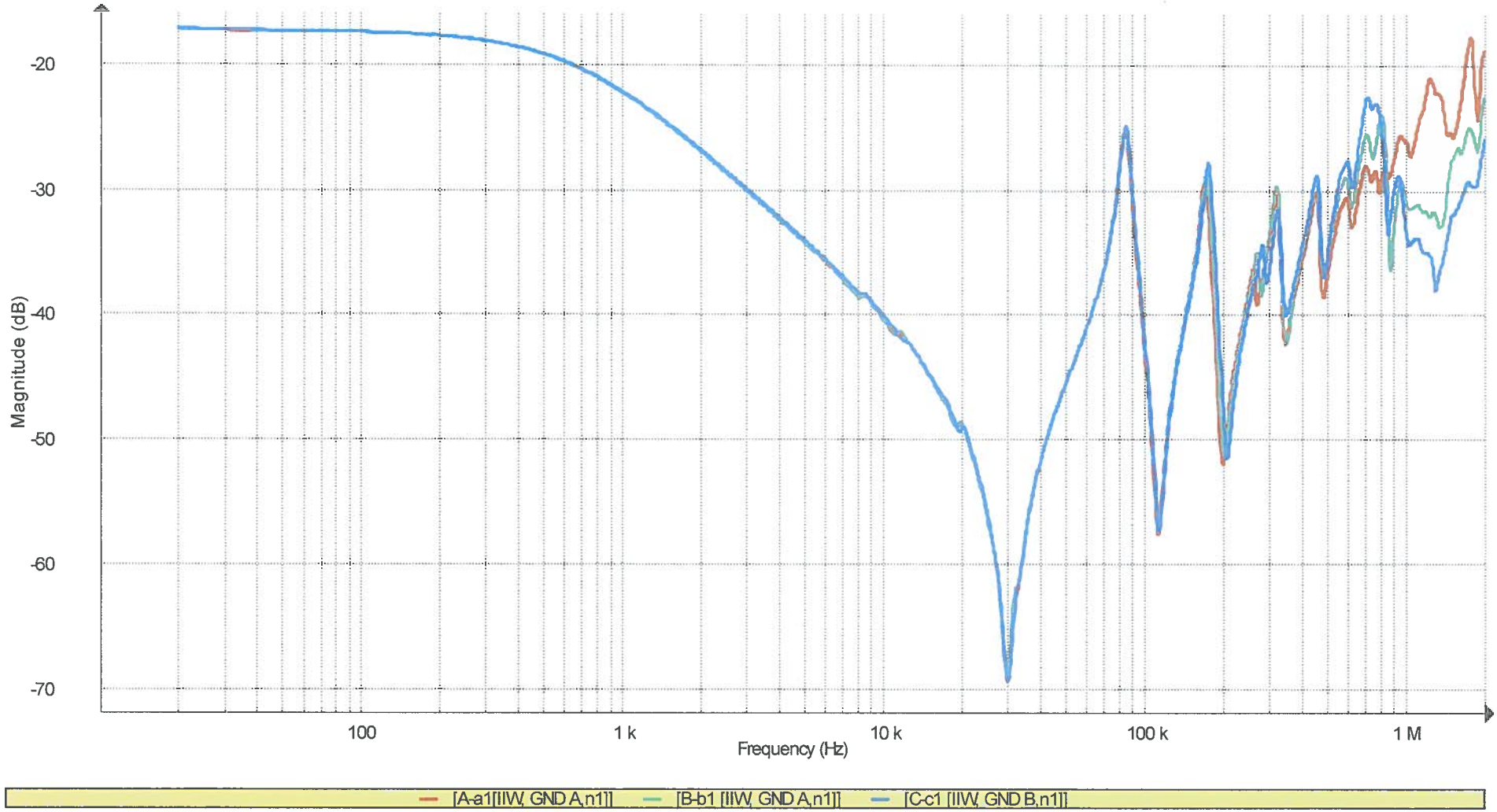
Phase:



 Report generated by FRAX software

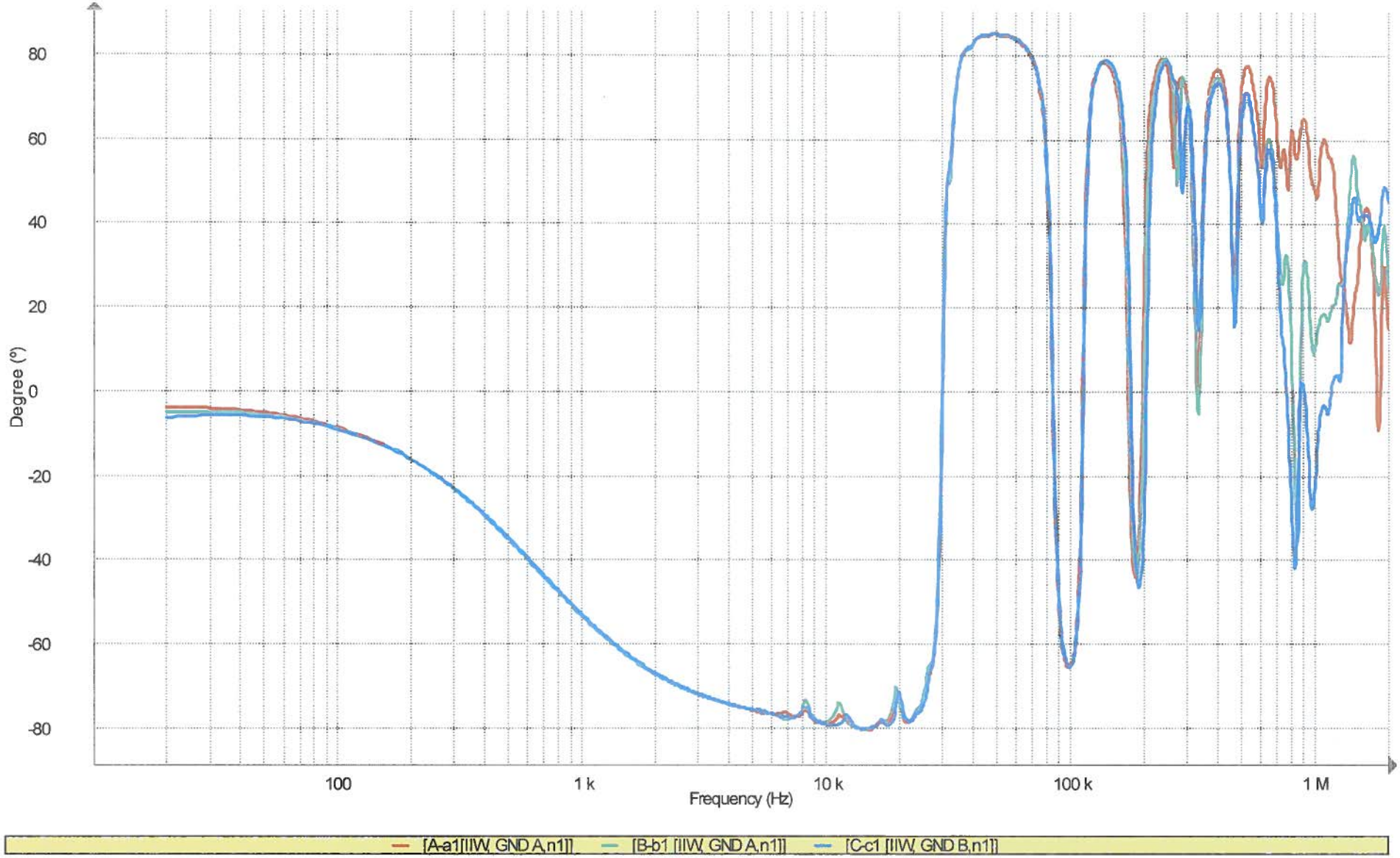
Transformer: "NOTL T1" **at** "NOTL DS"
Serial Number: A 3S-5671 **Manufacturer:** Westinghouse
Tested 5/8/2012 **at** 11:40:55 **Tested by:** Dave Benjamin

Magnitude:



 Report generated by FRAX software

Phase:



 Report generated by FRAX software

SFRA Test Results

Report date: 2012-06-07

Date of Test: 5/9/2012	**Time of Test:** 08:58:01
Company Name: Ascent	**Location:** NOTL DS
Test Object: NOTL T2	**Manufacturer:** Westinghouse
Serial Number: A 3S-5672	**Built Year:** 1983
Phase Design: 3	**Winding Configuration:**
KV Rating: 15500	**KVA Rating:** 15-20-25
NLTC Position: 3	**LTC Position:** Position 3
Temperature: 13	**Reason For Test:** Assessment Analysis

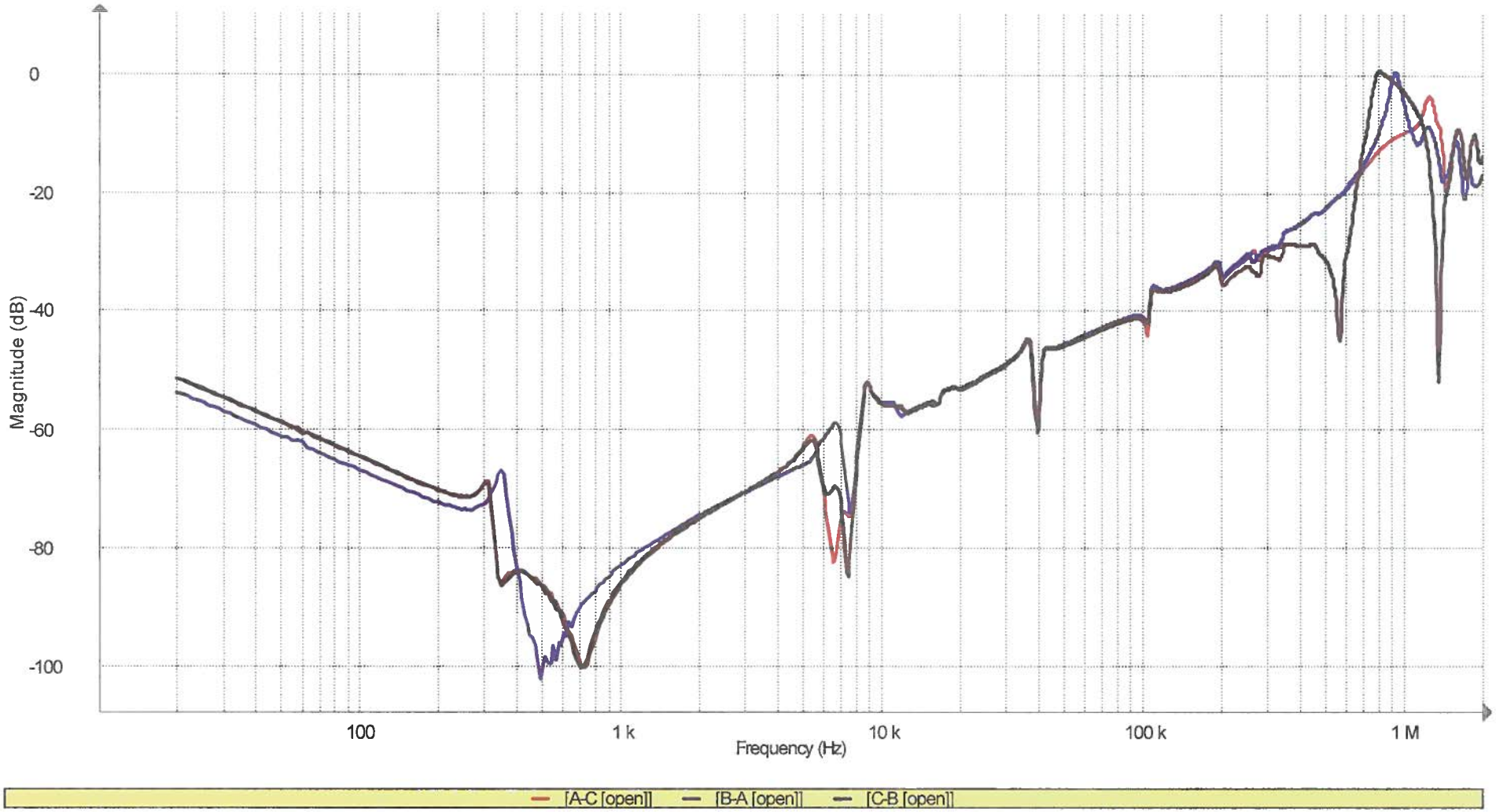
Tested By:
Dave Benjamin

Notes:

 Report generated by FRAX software

Transformer: "NOTL T2" **at** "NOTL DS"
Serial Number: A 3S-5672 **Manufacturer:** Westinghouse
Tested 5/9/2012 **at** 08:58:01 **Tested by:** Dave Benjamin

Magnitude:



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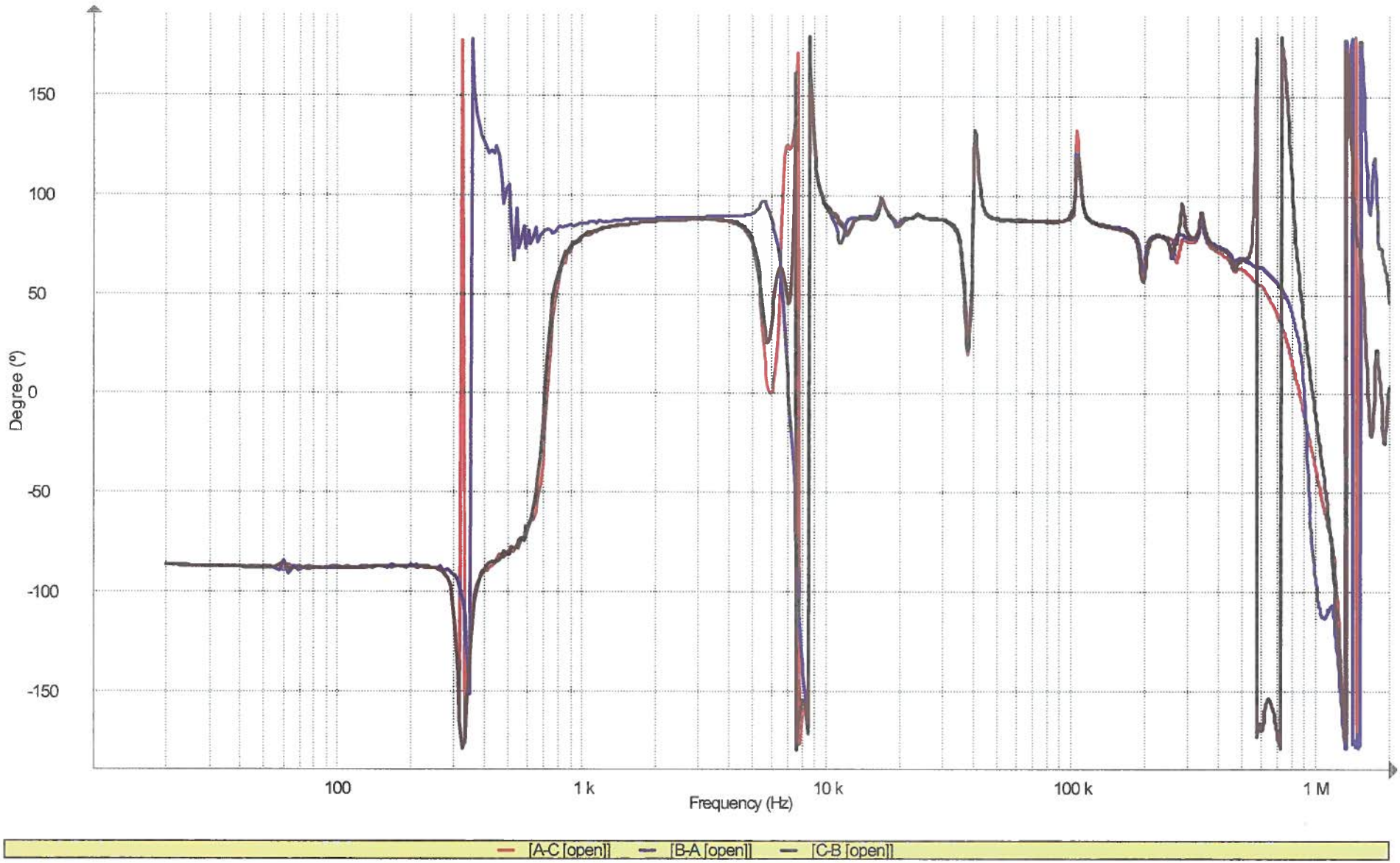
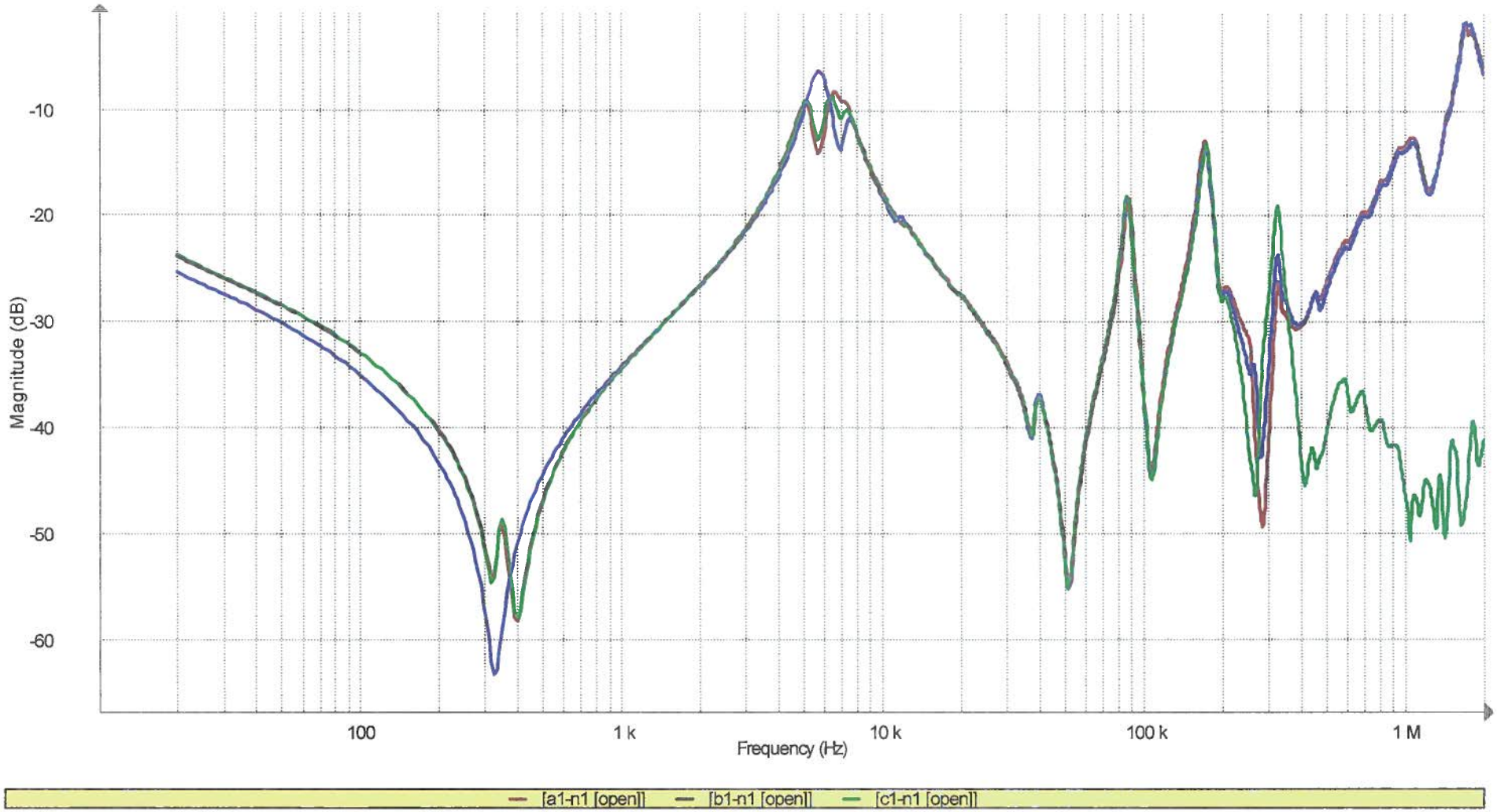


 Report generated by FRAX software

Transformer: "NOTL T2" **at** "NOTL DS"
Serial Number: A 3S-5672 **Manufacturer:** Westinghouse
Tested 5/9/2012 **at** 08:58:01 **Tested by:** Dave Benjamin

Magnitude:



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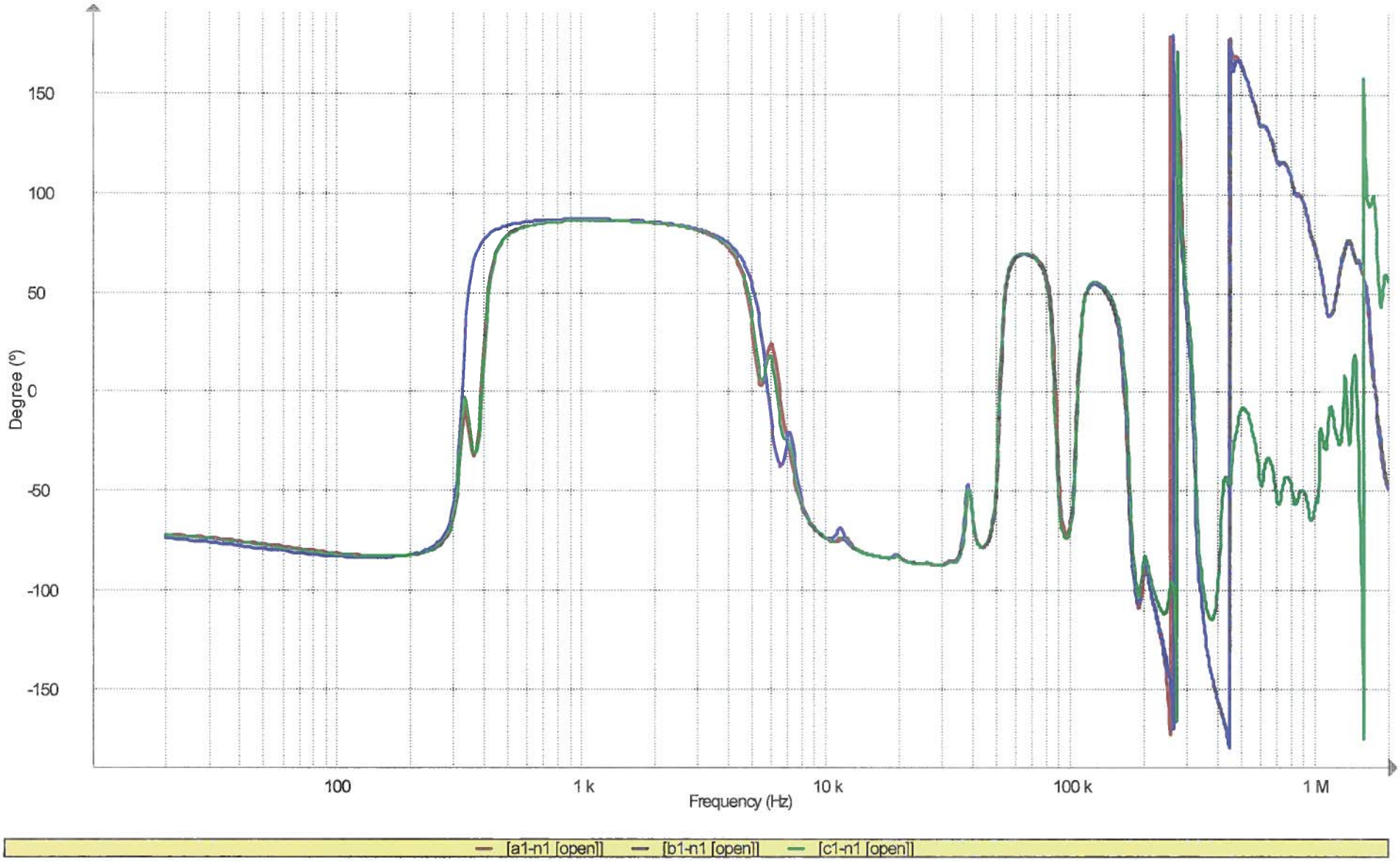

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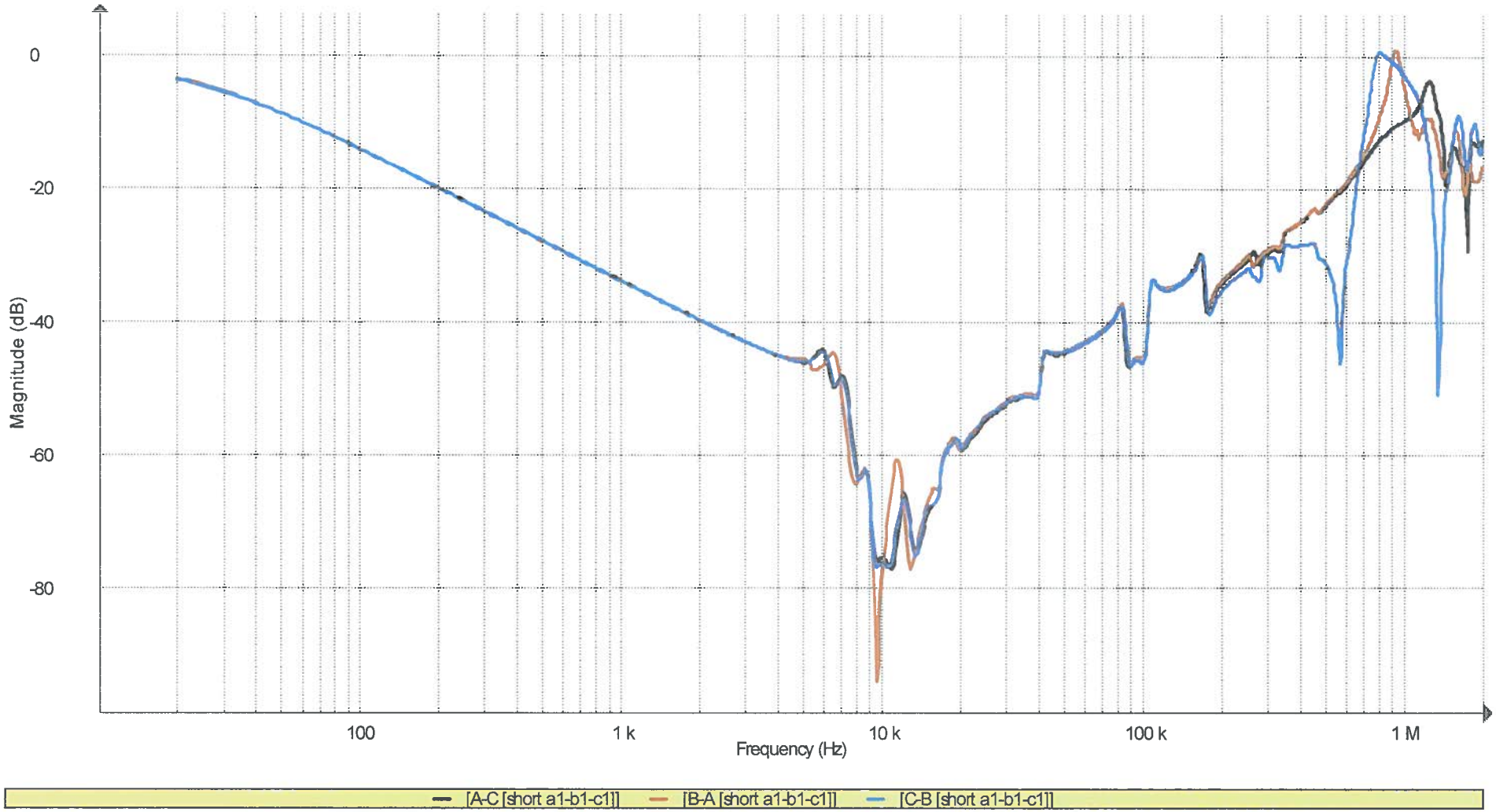

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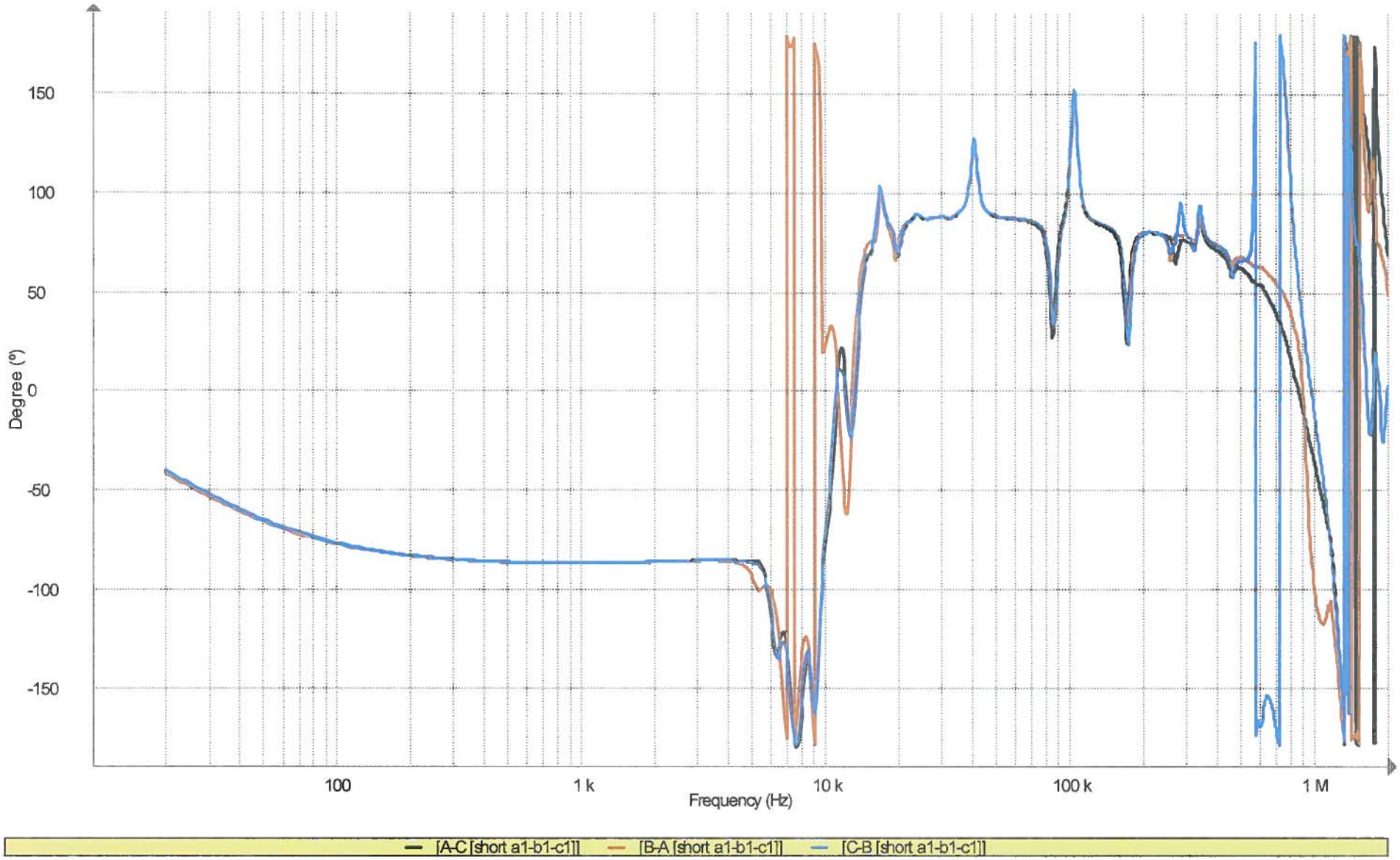

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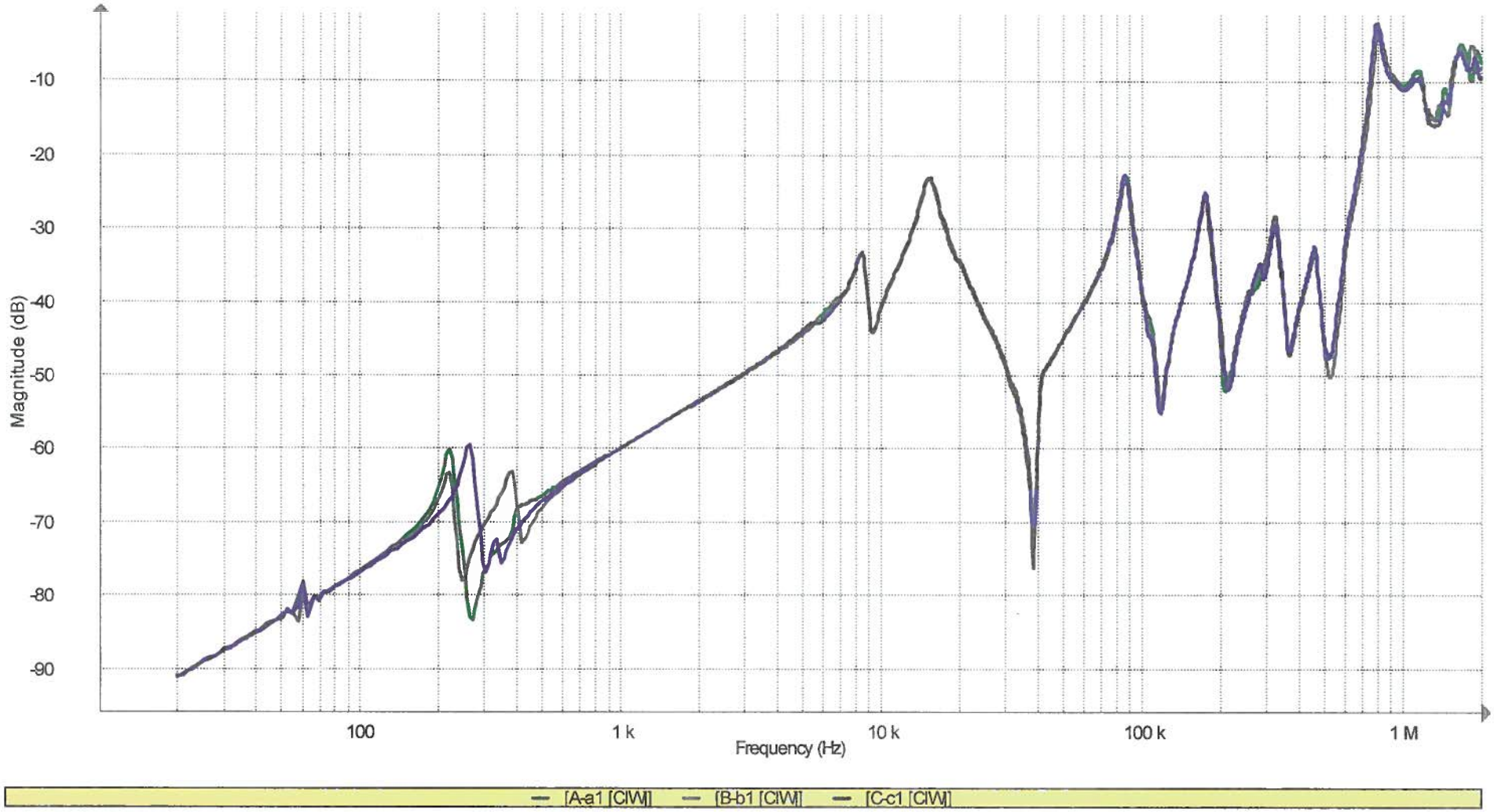

 Report generated by FRAX software

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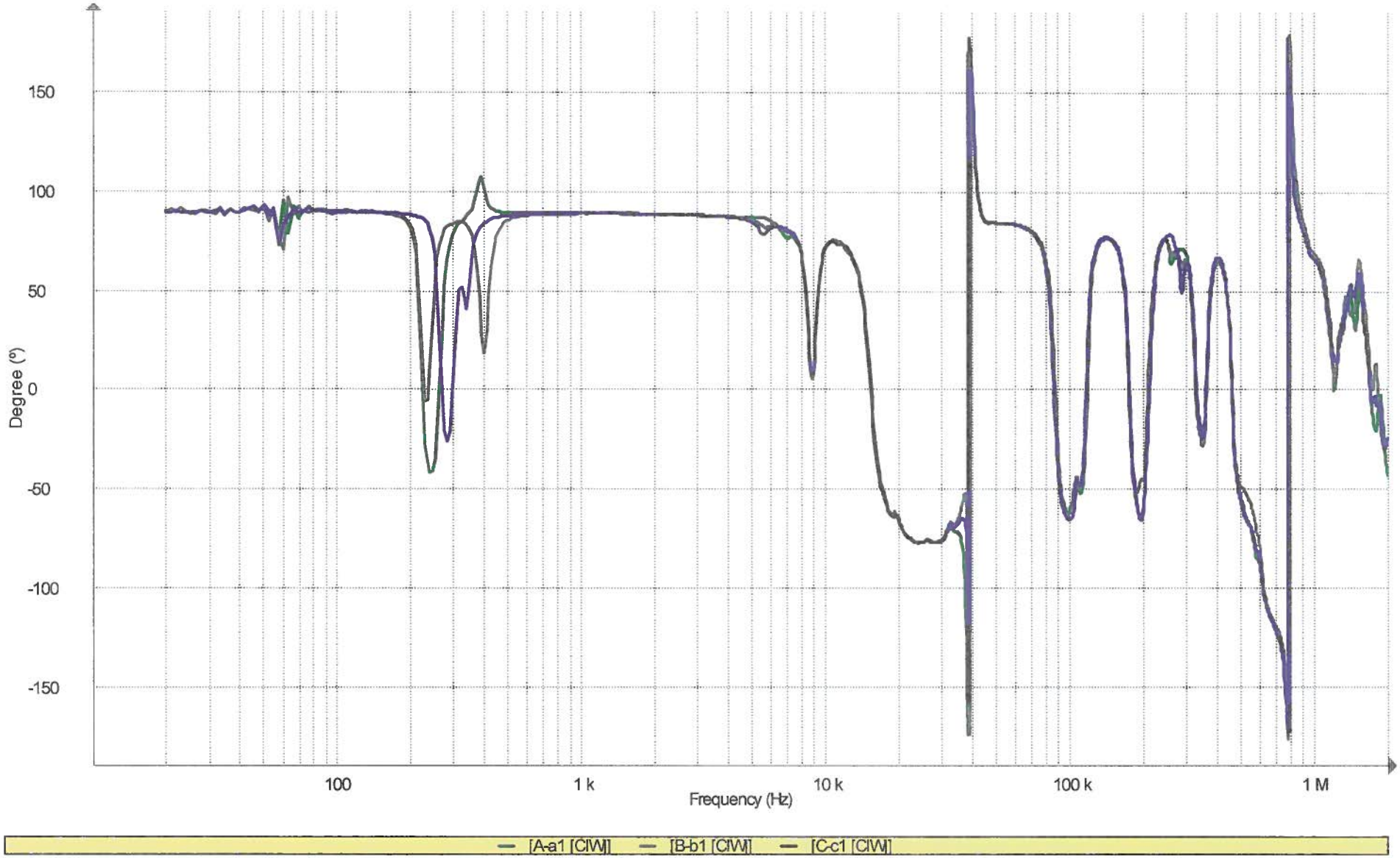

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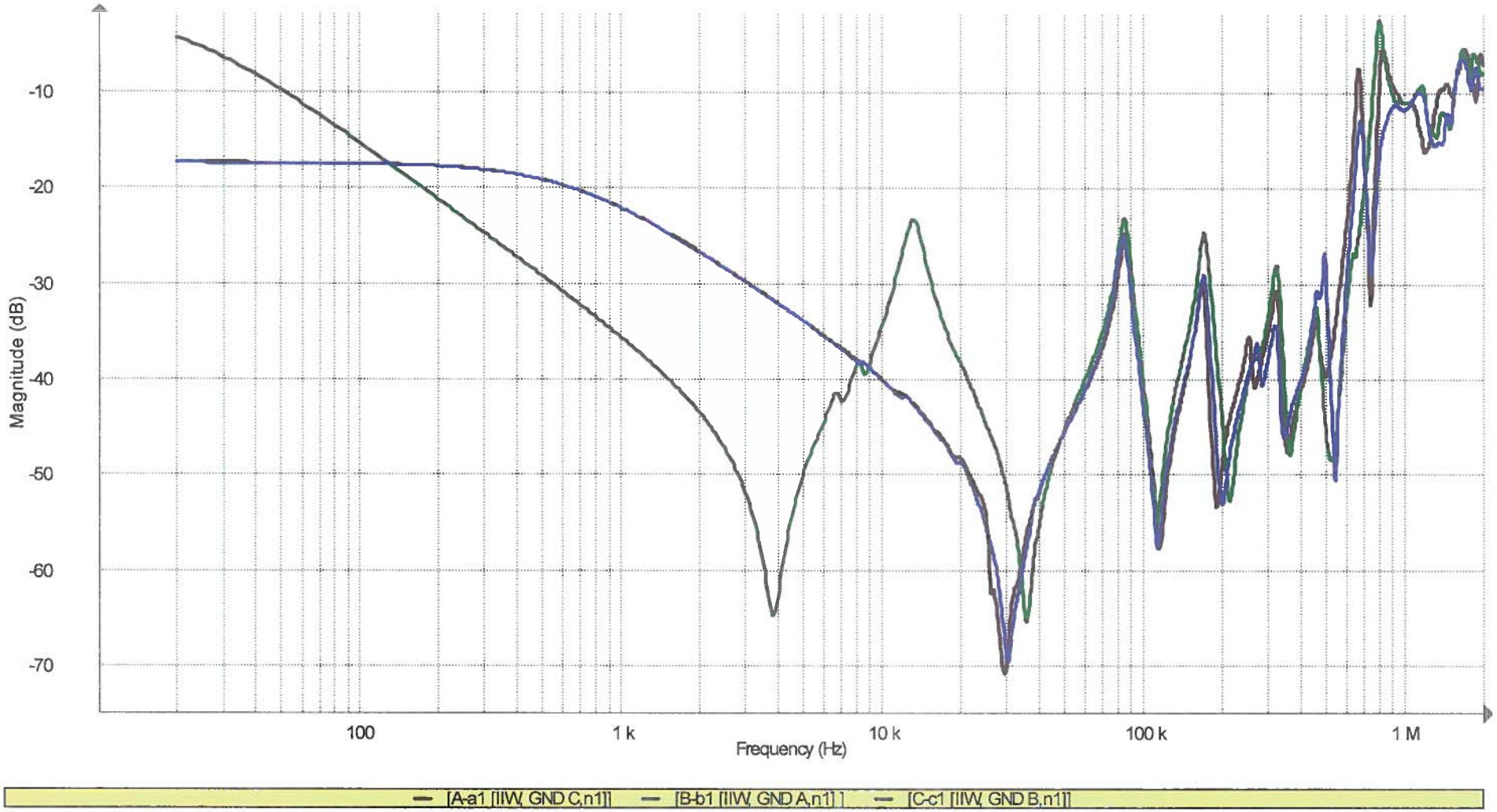

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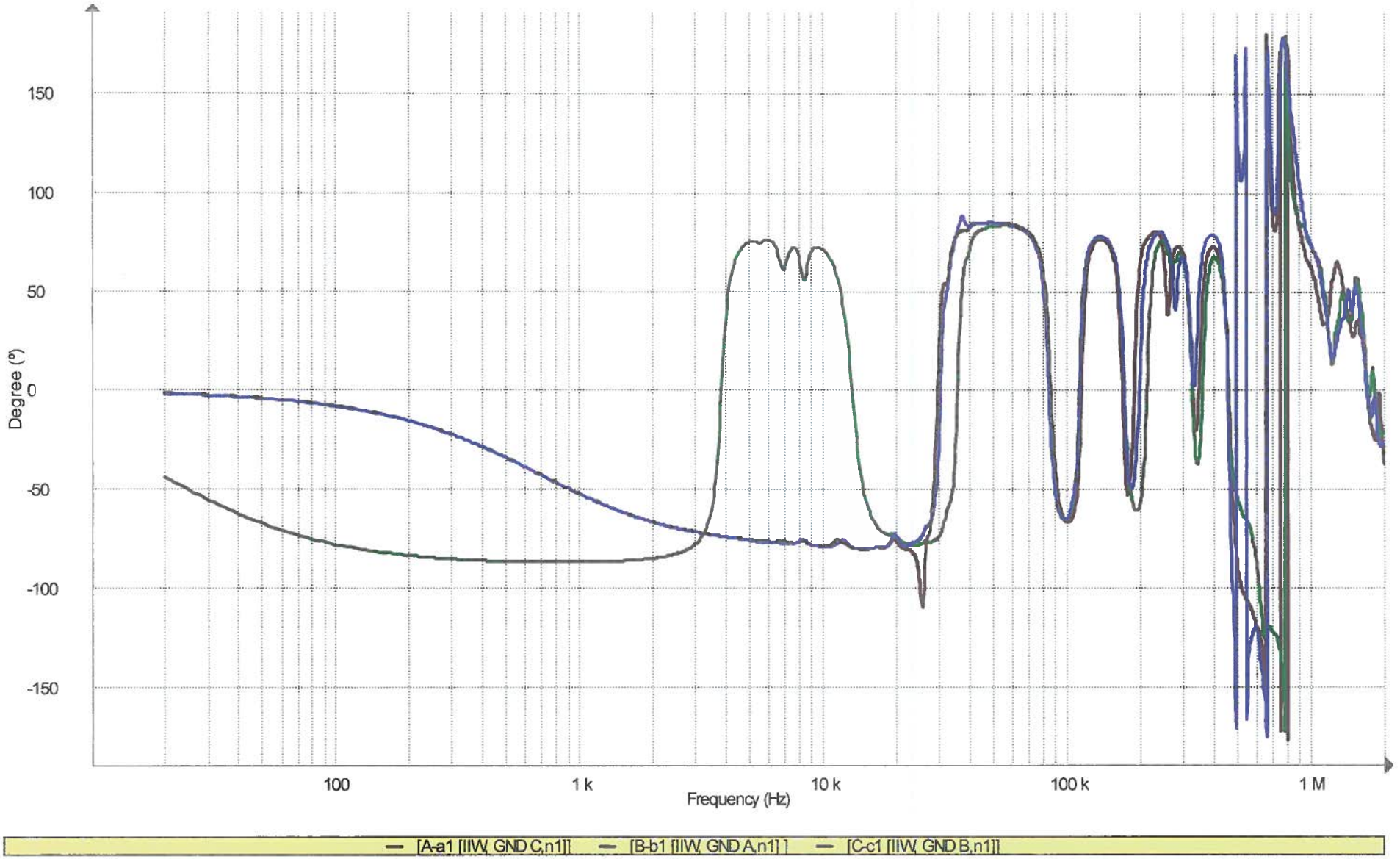

 Report generated by FRAX software

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX D

Transformer RFP

TENDER	2014-03-19
ISSUED FOR	**DATE**

IBI Group

30 International Boulevard
Rexdale ON
M9W 5P3
tel 416 679 1930
fax 416 675 4620

PROJECT MANUAL

End Of Section

/dd/

1 Drawings

The Drawings upon which Tender and Contract are to be based include that listed below. The "SK Rev" column reflects revisions to the Drawings which are issued in a reduced sheet:

Dwg. No.	SK Rev.	Rev. No.	Title	Date
ELSK01			POWER TRANSFORMERS TI ELECTRICAL SINGLE LINE DIAGRAM	MAR 18 2014
ELSK01			POWER TRANSFORMERS TI EMERGENCY LOAD PROFILE	MAR 18 2014

2 Reference Drawings

.1 The following Drawings are issued for Reference only. Be responsible for properly assessing the information contained in these Drawings which has effect on this Contract:

Dwg. No.	Title	Date
NQN2003-D1S-25000-0002	FOUNDATION LOCATION	-

End Of Section

/dd/

1 Invitation

1.1 **REQUEST FOR QUOTATION**

.1 Quotation for provision of all the Work will be received by

Niagara-on-the-Lake Hydro Inc.
c/o IBI Group (Canada) Inc.
30 International Boulevard
Rexdale, Ontario
M9W 5P3

before 3:00:00 PM LOCAL TIME, TUESDAY, APRIL 09, 2014, as designated by the receiving office timepiece.

.2 Quotation submitted after above time may be regarded as informal and subject to rejection.

.3 Amendments to a submitted quotation will be permitted if received in writing prior to quotation closing and also endorsed by same party or parties who signed sealed quotation.

1.2 **CONTRACT DOCUMENTS IDENTIFICATION**

.1 The quotation documents are identified as

Power Transformer
NOTL MTS No.2
Project No. 24RX140062
Niagara-on-the-Lake Hydro Inc. [**NOTL Hydro**]

8 Henegan Road
Virgil ON L0S 1T0 Canada

Issued for Quotation on March 19, 2014

as prepared by IBI Group (Canada) Inc., 30 International Blvd., Rexdale, Ontario, and listed in Section 00 01 10 - Table of Contents.

1.3 **EXAMINATION OF QUOTATION DOCUMENTS**

.1 Each Bidder shall be responsible for checking all items noted in the quotation documents to ensure that this set of quotation documents is complete. Immediately notify the Consultant of any omissions.

.2 All the quotation documents shall be read in conjunction with one another and it shall be assumed that they are in agreement. Each Bidder shall examine all the quotation documents as soon as possible after receipt thereof and should he discover any discrepancies, omissions, errors, ambiguities or conflicts in or among the quotation documents, or be in doubt as to their meaning or intent, must bring the matter to the attention of the Consultant at least seven (7) business days prior to the date set for receiving quotations.

1.4 **QUERIES - ADDENDA**

.1 Direct questions by email to Consultant:

IBI Group (Canada) Inc., Rexdale office
Attention: Mr. Piero Lucci, P.Eng.

Email: piero.lucci@ibigroup.com

.1 Questions, sent by email, will be accepted only from invited Bidders. Subcontractors or suppliers shall obtain interpretations and clarifications from Contractors to whom they are bidding. Telephone inquiries will not be entertained.

.2 All questions must reference the applicable Drawing or Specification section

.3 Any interpretation of, or change in quotation documents prior to date specified for receipt of quotations will be made only by written addendum issued by Consultant to each Bidder to whom quotation documents have been issued and such addenda shall become part of quotation documents. Verbal answers are binding only when confirmed by written addenda.

.4 No other interpretation or explanation shall be valid.

.5 Questions will be accepted up to 48 hours of quotation closing time.

1.5 **QUOTATION DOCUMENTS AVAILABILITY**

.1 Quotation documents will only be issued to Contract Bidders.

.2 One set of full size prints of all Drawings and 1 copy of the Specifications have been issued to each Bidder free of charge. Bidder may print at its own expense additional reproductions from such prints and Specifications for bidding purposes.

.3 Upon receipt of quotation documents, each prime Bidder shall verify that they are complete. Immediately notify Consultant should quotation documents be incomplete.

.4 Immediately notify Consultant upon finding discrepancies or omissions in quotation documents.

1.6 **QUOTATION SUBMISSIONS**

.1 Bidders shall be solely responsible for the delivery and submission of their quotation in the manner and within the time prescribed.

.2 No oral, email or telephone proposals will be considered.

1.7 **QUOTATION SIGNING**

.1 The quotation shall be signed under seal by the Bidder.

.2 Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Affix seal.

.3 Limited Company or Corporation: Signature of duly authorized signing officer with the corporate seal affixed is required. If the quotation is signed by officials other than the company President, Secretary or Treasurer of the company, a copy of the by-law resolution of the Board of Directors authorizing them to do so must also be submitted with the quotation in the quotation envelope.

.4 If the Bidder is a Joint Venture each party to the Joint Venture shall execute the quotation under seal in the manner appropriate to such party.

1.8 **QUOTATION INELIGIBILITY**

.1 Quotations that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations or irregularities of any kind may be regarded informal and subject to rejection.

.2 Quotation Forms and enclosures which are improperly prepared may be declared informal and subject to rejection.

.3 Bids from unsolicited Bidders will be returned unopened.

.4 Quotations shall be for a Stipulated Lump Sum without escalation clauses. Quotations containing escalation clauses will not be considered.

2 Quotation Enclosures - Requirements

2.1 **SECURITY DEPOSIT**

.1 Quotation shall be accompanied by a security deposit as follows:

.1 Bid Bond in the amount of 10% of the quotation price.

.2 Cash Deposit for bid documents is not required.

.2 Endorse the Bid Bond in the name of the Owner as Obligee, signed and sealed by the Principal and Surety.

.3 The security deposit will be returned after delivery to the Owner of the required Performance Bond (and a Labour and Material Bond) by the accepted Bidder.

.4 Each quotation must be accompanied by an "Agreement to Bond" from a surety acceptable to the Owner for the provision of a Performance Bond for 50% of the Contract Price and a Labour and Material Payment Bond for 50% of the Contract Price.

2.2 **PERFORMANCE ASSURANCE**

.1 The accepted Bidder shall provide a Performance bond and Labour and Material Payment Bond stated herein, covering the faithful performance of the Contract.

.2 Performance Bond and a Labour and Material Payment Bond must show original signature and seal of the bonding company.

.3 Submit on Quotation Form the unit price(s) applicable to pay for the cost of specified bonding.

2.3 **INFORMATION WITH QUOTATION**

.1 Include with the quotation the following documents:

.1 Bar Chart Schedule showing how the Bidder proposes to meet the Owner's required completion dates. The schedule shall indicate the start and finish dates for the work, including engineering, shop drawings review, fabrication and erection, commissioning and hand over of equipment.

.2 Organization Chart illustrating senior office and field staff with corresponding resumes, to be assigned to this Contract:

.1 Project Manager, Site Superintendent

.1 Names and responsibilities

.2 10 years minimum experience on projects of equal or greater scope and complexity. List project experiences. List 3 references from past project clients. Provide resume to confirm the foregoing.

.3 Confirm full time assignment for the full duration of the Contract and shall not be changed without the written approval of the Consultant.

.3 Bidder’s company safety policy, an outline of Health and Safety Program and a copy of current CAD7 calculations from WS&IB.

2.4 **ALTERNATIVES AND SUBSTITUTIONS**

.1 The quotation shall be based on the specifications and any addenda thereto.

3 Qualifications

3.1 **ACCEPTANCE OF QUOTATION**

.1 Bid shall be valid for acceptance within sixty days from Bid closing date.

.2 The Owner reserves the right to accept or reject any or all quotations or accept any quotation that best suits its requirements for the project.

.3 It shall be noted that prior to award of the Work a meeting may be held to review the quotation and the Contractor's understanding of the scope of Work, the terms and conditions which will apply and the requirements of the schedule.

.4 Bid shall be on a firm price basis for the required delivery; escalation shall not be allowed.

.5 The Owner will issue the successful bidder a written quotation acceptance or Purchase Order.

.6 The successful Contractor shall sign a formal contract document with the Owner based on the Stipulated Price Contract specified herein.

3.2 **HARMONIZED SALES TAX**

.1 The Ontario Harmonized Sales Tax is not to be considered an applicable tax for the purpose of this contract. Bidders shall therefore not include any amount in their bid prices for the said HST. The successful Contractor shall bill the Owner, upon each progress payment certificate, the appropriate amount of HST the Owner is legally obliged to pay. This amount will be paid to the Contractor in addition to the amount certified for payment under the contract and will therefore not affect the Contract price.

4 Assigned Work

4.1 **ASSIGNMENT TO GENERAL CONTRACTOR**

.1 The successful Bidder will enter into a subcontract with the successful General Contract bidder at a later date.

.2 The Agreement, General Conditions and Supplementary Conditions herein are to be issued as tender conditions to General Contractors at a later date and are included with these documents as a guide to each Bidder for submitting his quotation.

4.2 **SAFETY**

.1 Bidders shall note that job site safety is paramount.

.2 The successful Contractor will be required to attend the Project Safety Orientation and to be familiar with the project Safety Manual and the Occupational Health and Safety Act and Regulations for Construction Project. The Contractor shall have a Safety Representative assigned to the project, to be available at all times and to attend project safety and coordination meetings.

4.3 **CONFIDENTIALITY**

.1 All supplier document information provided herein is to be considered confidential and is not to be copied or made available to others.

End Of Section

/dd/

1 Name Of Bidder _____

QUOTATION FOR: Power Transformer for NOTL MTS No.2

TO: Niagara-on-the-Lake Hydro Inc. [**NOTL Hydro**]
8 Henegan Road
Virgil, Ontario
L0S 1T0

2 Quotation Price (NET exclusive of all applicable taxes)

The Undersigned (hereinafter referred to as "Contractor") proposes to provide all labour, supervision, material, equipment and all other services for the proper completion of the Work of the referenced Contract, in accordance with the Instructions to Bidders, General Conditions, Supplementary Conditions, Specifications and Drawings included with the Quotation Documents, as prepared by IBI Group (Canada) Inc., for the Stipulated Lump Sum Quotation Price (hereinafter referred to as "Quotation Price") of:

_____

_____ /100 Dollars ($_____)

in Canadian Funds which includes all prime costs, allowances, freight, duties, and government excise or sales taxes in force at this date, except the Harmonized Sales Tax and as otherwise provided in the Quotation Documents.

Provide HST associated with installation services:

_____ /100 Dollars ($_____)

3 Alternative Prices

The following are our prices for the Alternative Work items listed hereunder. Such alternative work items and amounts are NOT included in our Stipulated Lump Sum Quotation Price. The Owner reserves the right to accept any or all alternatives and adjust the Contract Price or Quotation Price by the amount or amounts stated. No other cost adjustments will apply. All quotations shall be firm and valid for acceptance.

	Description of Work	Amount
.1	Complete Services for receiving, off-loading, installation on foundations, complete assemble of the unit and associated systems, complete vacuum oil filling of unit, site inspections, site testing, site commissioning, site acceptance testing and start-up services for Power Transformer T1	$_____ (Add)
.2	Guaranteed High efficiency, low losses and guaranteed low sound level type.	$_____ (Add)
.3	Overload Capacity Rating (Limit Time Rating)	$_____ (Add)
.4	Full warranty period of two (2) years	$_____ (Add)

.5 Full warranty period of three (3) years $_____ (Add)

.6 Full warranty period of four (4) years $_____ (Add)

.7 Full warranty period of five (5) years $_____ (Add)

3.2 **QUOTATION ACCEPTANCE**

The Contractor agrees that this Quotation is open to acceptance for a period of thirty (30) days from quotation closing date.

3.3 **PRICE ADJUSTMENTS**

The above stated quotation price includes fully for all increases, for whatever cause, in cost or price of labour, materials, equipment or fuels. Escalation shall not apply for the duration of the Contract.

3.4 **BONDING**

.1 The following amounts for providing a 50% Performance Bond and a 50% Labour and Material Payment Bond are included in the Quotation Price.

PERFORMANCE BOND $_____ (Total Amount included)

PAYMENT BOND $_____ (Total Amount included)

.2 The following all-inclusive unit rates apply to bonding cost adjustments for the duration of the Contract.

PERFORMANCE BOND RATE $_____/$1,000.00 CONTRACT VALUE

PAYMENT BOND RATE $_____/$1,000.00 CONTRACT VALUE

3.5 **DOCUMENTS AND ADDENDA**

The undersigned submits that he has thoroughly reviewed the Instructions to Bidders, Quotation Form and Appendices, General Conditions of Contract, Supplementary Conditions, General Requirements, Drawings, Specifications, Reference Documents and the following Addenda and hereby accepts and agrees to all provisions and conditions stated therein and has included fully for all requirements in the Quotation Price:

Addendum _____ dated _____

Addendum _____ dated _____

Addendum _____ dated _____

Note: If no addenda have been received write in "NONE".

3.6 **INSTALLATION SUBCONTRACTOR**

The undersigned submits that the transformer installation will be performed by the following Subcontractor:

Name: _____

Address: _____

3.7 **ASSIGNMENT**

.1 The Contractor agrees that, if awarded the Contract for this Work and if so required by the Owner, he will enter into a Subcontract agreement with a subsequently appointed General Contractor.

4 Fees For Changes In The Work

For all changes in the Work which may be ordered by the Owner which are not covered by the stated or agreed Unit Prices, the following percentages shall be used, as applicable, in Contract Price adjustments in accordance with the General Conditions.

4.1 **MATERIAL**

The percentage mark-up on MATERIAL is: _____%

- Material costs shall be calculated using the actual invoiced cost to Contractor (including H.S.T., if any) plus cost of transportation.

4.2 **LABOUR**

The following is the schedule of all-inclusive hourly rates (**blended for foreman, journeyman, apprentice**) which includes the costs of vacation and statutory holiday pay, burdens, benefits, home office administration and overhead, warranty, small tools and consumable allowance, clean-up, all field overheads including supervision above working foreman level and all other indirect costs, overhead and profit. Rates EXCLUDE only the Harmonized Sales Tax and Bonding.

Trade	Straight Time	Overtime
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____

4.3 **EQUIPMENT (THIRD PARTY)**

Rental equipment from arms-length third parties shall be reimbursed at invoiced cost plus: _____%

- Reimbursement for transportation is at cost if the equipment is not on the Site.

4.4 **CONTRACTOR'S SUBCONTRACTORS (THIRD PARTY, ARMS-LENGTH)**

The percentage to be added to the invoiced cost of extra work completed by a Subcontractor to the Contractor is: _____%

- Included in this percentage is the applicable compensation to cover all of Contractor's supervision, overhead, profit and all other costs.

4.5 **SUBCONTRACTOR'S MARK-UPS**

The percentage mark-ups, used by Contractor's Subcontractor shall not exceed Contractor's markup rates specified in 4.1 above, unless prior written authorization has been given by Owner and any such additional authorization shall be for burden adjustments only.

5 Project Staff And Labour Agreements

.1 The Contractor shall provide full time supervision throughout the duration of the project to the satisfaction of the Owner, for which the Contractor proposes the following persons:

Project Manager _____

General Superintendent _____

Site Safety Coordinator _____

.2 Contractor is signatory to agreements with the following crafts to be utilized for this Work:

Organization/Craft	Local No.	Location	Expiry Date
.1			
.2			
.3			
.4			
.5			
.6			

.3 Contractor's **Subcontractors** are signatories to agreements with the following crafts to be utilized for this Work:

Organization/Craft	Local No.	Location	Expiry Date
.1			
.2			
.3			
.4			
.5			
.6			

6 Schedule

The Contractor submits that he has carefully examined the Drawings and Specifications and the site of the proposed Work and has satisfied himself as to his ability and the ability of his Subcontractors and suppliers to meet the requirements for timely progress and completion set out below and to execute the Work in full accordance with Contract Documents.

It is understood and agreed that the Quotation Price stated herein includes all costs on account of premium time or overtime work required in order to meet the completion date (and Owner's partial occupancy requirements, if any), whether or not such work is done by the Contractor's own forces or by his Subcontractors.

The undersigned confirms that the Quotation Price includes working a minimum 40 hour week, based on a minimum of 5 days, 8 hours per day.

	EVENTS	DATES SPECIFIED BY OWNER	DATES SPECIFIED BY CONTRACTOR
.1	Award of Contract	June 06, 2014	
.2	Completed Manufacturer (shop) drawing submissions to Consultant		_____
.3	Completion of Power Transformer Unit: Factory Acceptance Testing (FAT)		_____
.4	Delivery of Power Transformer Unit to Site		_____
.5	Start Work on Site		_____
.6	Substantial Performance on Site		_____
.7	Power Transformer Unit energized		May 01, 2015
.8	No. of weeks to complete from date of award		_____

7 Bidders Understanding

The Contractor represents that he has had a sufficient opportunity to examine and has carefully examined the Site of the Work and the local conditions and all Drawings and Specifications and Reference Documents which relate to the Work; that he has made all investigations essential to a full understanding of the difficulties which may be encountered, and that he has sufficient equipment, experience and forces to perform the Work in accordance with the Drawings and Specifications and the terms of this Contract within the Time specified.

No allowances or extra consideration on behalf of the Contractor will be allowed by the Owner by reason of additional costs, damages or other difficulties incurred by the Contractor for failure to have fully investigated and determined conditions affecting the Work.

8 Execute Contract

The Contractor agrees that if this Quotation is acceptable to the Owner, he will:

- Accept a Letter of Award or Purchase Order as authority to commence work before executing a formal Contract with the Owner.
- Execute a formal Contract with the General Contractor, in accordance with the conditions of the quotation documents.
- Submit immediately, a complete list of subcontractors and suppliers of all major equipment and products intended for use on the Contract.
- If required by Owner, furnish within 7 days, a Performance Bond and Labour and Material Bond issued by a Surety acceptable to the Owner in accordance with the requirements of the Contract, indicating the Owner as "Obligee".
- Furnish within 7 days, certified copies of insurance policies as required by the Conditions of the Contract, naming the Owner and Consultant as additionally named insured.
- Furnish within 7 days, a Certificate of Clearance from the Workplace Safety & Insurance Board.
- Furnish within 7 days, a detailed schedule of Work, showing dates for preparation and submission of shop drawings, fabrication and erection, and a breakdown of items and tags of the Work.
- Furnish within 7 days, a breakdown of the Contract Price in such form and detail as required by the Owner, for progress payments, taxation and internal accounting purposes.
- Submit one month prior to the first application for payment, a cash flow schedule by month for the duration of the Contract, based on net payments. Identify holdback releases.

9 Address, Legal Status And Signature Of Bidder

.1 The Contractor does hereby designate the address, given below as the legal address to which all notices, directions or other communications may be served or mailed:

Street _____

City _____ Province _____

Postal Code _____ Tel _____ Fax _____

.2 Contact for questions relating to this Quotation

Name _____ Title _____

Email Address _____

.3 The undersigned does hereby declare that the Bidder has legal status checked below:

_____ Individual

_____ Partnership

_____ Corporation incorporated under the laws of

_____ Date _____

.4 This Quotation is submitted under seal in the name:

_____
(Company Name - Typed)

SEAL

By _____
(Signature)

Name _____ Title _____
(Typed)

Signed and sealed this _____ day of _____, 2011.

End Of Section

/dd/

1 Contract Documents

.1 Standard Construction Document for Stipulated Contract CCDC2-2008 (pages 1 thru 30) consisting of Agreement Between Owner and Contractor, Definitions, and The General Conditions of the Stipulated Price Contract, Articles GC-1.1 to GC-12.3 inclusive, governing same, including the Supplementary Conditions, is hereby made a part of these Contract Documents.

.2 CCDC2-2008 is a common document in the Canadian construction industry, and Contractor is required to have a copy. For copyright reasons, a copy of CCDC2-2008 is not bound into the Project Manual.

End Of Section

/dd/

The Standard Construction Document for Stipulated Price Contract, 2008 English version, consisting of the Agreement Between Owner and Contractor, Definitions, and General Conditions of the Stipulated Price Contract, Parts 1 to 12 inclusive, governing same is hereby made part of these Contract Documents, with the following amendments, additions and modifications. Where these amendments, additions, and modifications specifically reference a change to the Agreement, Definitions, or General Conditions, these amendments, additions and modifications shall govern.

Agreement

ARTICLE A-5 – PAYMENT

In paragraph 5.1, holdback percentage shall be ten percent (10%).

ARTICLE A-6 – RECEIPT AND ADDRESSES FOR NOTICES IN WRITING

Delete Article A-6.1 and substitute new article 6.1:

6.1 Notices in Writing between the parties or between them and the Consultant shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier or if sent during normal business hours by fax and addressed as set out below. Such Notices in Writing will be deemed to be received by the addressee on the next business day if sent by fax after normal business hours or if sent by overnight commercial courier. Such Notices in Writing will be deemed to be received by the addressee on the fifth Working Day following the date of mailing, if sent by pre-paid registered post, when addressed as set out below. An address for a party may be changed by Notice in Writing to the other party setting out the new address in accordance with this Article.

DEFINITIONS

Delete definition 16. “Provide” and replace with the following:

16. Provide - This term means to Furnish and Install, complete and in place, including accessories, finishes, tests, and services required to render item so specified complete ready for use.

Add the following definitions:

28. Furnish - This term means fabrication or procurement of materials, equipment, or components, or performance of services to the extent specified and shown. Where used with respect to materials, equipment, or components, the term includes crating and delivery to Project Site but is not intended to include installation of item, either temporary or final.

29. Install - This term means placement of materials, equipment, or components, including receiving, unloading, transporting, storage, uncrating and installing, and performance of such testing and finish work as is compatible with degree of installation specified.

30. Commission - The procedure which includes checking, testing, adjusting and measuring performed by the Contractor to demonstrate and verify the installation, operation and performance of all components and the entire system.

1 GENERAL

1.1 Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

GC 1.1 CONTRACT DOCUMENTS

.1 Add to the end of subparagraph 1.1.2.2

Except where the Consultant shall be indemnified as a third party beneficiary as provided in subparagraphs 9.2.7.4, 9.5.3.4 and in 12.1.3.

.2 Add new subparagraph 1.1.7.5:

1.1.7.5 In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the Contract Documents.

GC 2.2 ROLE OF THE CONSULTANT

.1 Add at the end of paragraph 2.2.9. “The Owner and the Contractor shall waive any claims against the Consultant arising out of the making of such interpretations and findings made in accordance with paragraphs 2.2.7, 2.2.8 and 2.2.9”.

.2 Delete the comma after the word “submittals” and add the words “which are provided” before the words “in accordance” in paragraph 2.2.14.

GC 2.4 DEFECTIVE WORK

.1 Add new subparagraphs 2.4.1.1 and 2.4.1.2:

2.4.1.1 The Contractor shall rectify, in a manner acceptable to the Owner and the Consultant, all defective work and deficiencies throughout the Work, whether or not they are specifically identified by the Consultant.

2.4.1.2 The Contractor shall prioritize the correction of any defective work which, in the sole discretion of the Owner, adversely affects the day to day operation of the Owner.

GC 3.1 CONTROL OF THE WORK

.1 Add new paragraph 3.1.3:

3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the Contractor shall verify, at the Place of the Work, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the Work and shall further carefully compare such field measurements and conditions with the requirements of the Contract Documents. Where dimensions are not included or contradictions exist, or exact locations are not apparent, the Contractor shall immediately notify the Consultant in writing and obtain written instructions from the Consultant before proceeding with any part of the affected work.

GC 3.4 DOCUMENT REVIEW

.1 Delete paragraph 3.4.1 in its entirety and substitute new paragraph 3.4.1:

3.4.1 The Contractor shall review the Contract Documents and shall report promptly to the Consultant any error, inconsistency or omission the Contractor may discover. Such review by the Contractor shall comply with the standard of care described in paragraph 3.14.1 of the Contract. Except for its obligation to make such review and report the result, the Contractor does not assume any responsibility to the Owner or to the Consultant for the accuracy of the Contract Documents. The Contractor shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the Contract Documents, which the Contractor could not reasonably have discovered. If the Contractor does discover any error, inconsistency or omission in the Contract Documents, the Contractor shall not proceed with the work affected until the Contractor has received corrected or missing information from the Consultant.

GC 3.8 LABOUR AND PRODUCTS

.1 Add new paragraph 3.8.4:

3.8.4 The Contractor is responsible for the safe on-site storage of Products and their protection (including Products supplied by the Owner and other contractors to be installed under the Contract) in such ways as to avoid dangerous conditions or contamination to the Products or other persons or property and in locations at the Place of the Work to the satisfaction of the Owner and the Consultant. The Owner shall provide all relevant information on the Products to be supplied by the Owner.

GC 3.10 SHOP DRAWINGS

.1 Add the words “AND OTHER SUBMITTALS” to the Title after SHOP DRAWINGS.

.2 Add “and Submittals” after the words “Shop Drawings” in paragraphs 3.10.1, 3.10.2, 3.10.4, 3.10.7, 3.10.8, 3.10.8.2, 3.10.9, 3.10.10, 3.10.11, and 3.10.12.

.3 Delete 3.10.3 in its entirety and substitute new paragraph 3.10.3

GC.3.10.3 Prior to the first application for payment, the Contractor and the Consultant shall jointly prepare a schedule of the dates for submission and return of Shop Drawings and any Submittals.

.4 Delete the words “with reasonable promptness so as to cause no delay in the performance of the Work” and replace with “within 10 working days or such longer period as may be reasonably required” in paragraph 3.10.12.

GC 3.14 PERFORMANCE BY CONTRACTOR

.1 Add new General Condition 3.14.1

3.14.1 In performing its services and obligations under the Contract, the Contractor shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The Contractor acknowledges and agrees that throughout the Contract, the Contractor’s obligations, duties and responsibilities shall be interpreted in accordance with this standard. The Contractor shall exercise the same standard of due care and diligence in respect of any Products, personnel, or procedures which it may recommend to the Owner.

.2 Add new General Condition 3.14.2

3.14.2 The Contractor further represents, covenants and warrants to the Owner that:

.1 The personnel it assigns to the Project are appropriately experienced.

.2 It has a sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the Owner's approval, in the event of death, incapacity, removal or resignation.

GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Add: "Progress payments made prior to January 2015 shall not exceed 20% of the full Contract Price."

.2 Add new subparagraph 5.2.8:

5.2.8 Keep detailed supporting evidence for applications for payment for Work completed prior to January 2015 such that the *Consultant* may reasonably require to establish the value of the Work completed.

GC 5.7 FINAL PAYMENT

.1 In the second (2nd) line of paragraph 5.7.4, change "5 calendar days" to read "20 calendar days".

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

.2 Add new subparagraph 6.4.5:

6.4.5 The Contractor confirms that, prior to bidding the Project, it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.14.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor is not entitled to compensation or to an extension of the Contract Time for conditions which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.

GC 6.5 DELAYS

.1 Delete the period at the end of paragraph 6.5.1, and substitute the following words:

", but excluding any consequential, indirect or special damages."

.2 Add new subparagraph 6.5.6.

6.5.6 If the Contractor is delayed in the performance of the Work by an act or omission of the Contractor or anyone employed or engaged by the Contractor directly or indirectly, or by any cause within the Contractor's control, then the Contract Time shall be extended for such reasonable time as the Consultant may decide in consultation with the Contractor. The Owner shall be reimbursed by the Contractor for all reasonable costs incurred by the Owner as the result of such delay, including all services required by the Owner from the Consultant as a result of such delay by the Contractor and, in particular, the cost of the Consultant's services during the period between the date of Substantial Performance of the Work stated in Article A-1 herein as the same may be extended through the provisions of these General Conditions and any later, actual date of Substantial Performance of the Work achieved by the Contractor.

GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

.1 Add the words “as noted in paragraph 6.6.3” after the words “of the claim” in paragraph 6.6.5 and add the words “and the Consultant”, at the end of paragraph 6.6.5.

GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION

.1 Add the following new paragraphs 8.2.9, 8.2.10, 8.2.11, 8.2.12, 8.2.13, and 8.2.14.

8.2.9 Within five days of receipt of the notice of arbitration by the responding party under paragraph 8.2.6, the Owner and the Contractor shall give the Consultant a written notice containing:

a) a copy of the notice of arbitration

b) a copy of supplementary conditions 8.2.9 to 8.2.14 of this Contract, and;

c) any claims or issues which the Contractor or the Owner, as the case may be, wishes to raise in relation to the Consultant arising out of the issues in dispute in the arbitration

8.2.10 The Owner and the Contractor agree that the Consultant may elect, within ten days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

a) has a vested or contingent financial interest in the outcome of the arbitration;

b) gives the notice of election to the Owner and the Contractor before the arbitrator is appointed;

c) agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.2.6, and,

d) agrees to be bound by the arbitral award made in the arbitration.

8.2.11 If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the respondent receives a copy of the notice of arbitration.

8.2.12 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

a) on application of the Owner or the Contractor, determine whether the Consultant has satisfied the requirements of paragraph 8.2.10, and; b) make any procedural order considered necessary to facilitate the addition of the Consultant as a party to the arbitration.

8.2.13 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant;

8.2.14 In the event of notice of arbitration given by the Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding.

GC 9.1 PROTECTION OF WORK AND PROPERTY

.1 Delete subparagraph 9.1.1.1 in its entirety and substitute new subparagraph 9.1.1.1:

9.1.1.1 errors in the Contract Documents which the Contractor could not have discovered applying the standard of care described in paragraph 3.14.1;

.2 Delete paragraph 9.1.2 in its entirety and substitute the following new paragraph 9.1.2:

9.1.2 Before commencing any Work, the Contractor shall determine the locations of all underground utilities and structures indicated in the Contract Documents, or that are discoverable by applying to an inspection of the Place of the Work the degree of care and skill described in paragraph 3.14.1.

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

.1 Add to paragraph 9.2.6 after the word "responsible", the following new words:

or whether any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner or others,

.2 Add “and the Consultant” after the word “Contractor” in subparagraph 9.2.7.4.

.3 Add to paragraph 9.2.8 after the word "responsible", the following new words:

or that any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner or others,

GC 9.5 MOULD

.1 Add “and the Consultant” after “Contractor” in subparagraph 9.5.3.4.

GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

.2 Delete from the first line of paragraph 10.2.5 the word, “The” and substitute the words:

“Subject to paragraph 3.14.1, the”.

GC 12.1 INDEMNIFICATION

.1 Add new clause 12.1.1.3.

12.1.1. 3. The Contractor shall indemnify and hold harmless the Consultant, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings by third parties that arise out of, or are attributable to, the Contractor's performance of the Contract, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable, and made in writing within a period of 6 years from the date of Substantial Performance of the Work as set out in the certificate of Substantial Performance of the Work, or within such shorter such period as may be prescribed by any limitation statute or the province or territory of the Place of Work.

GC 12.3 WARRANTY

.1 Delete from the first line of paragraph 12.3.2 the word, "The" and substitute the words:

"Subject to paragraph 3.14.1, the…".

GC 13 ADMINISTRATIVE PROCEDURES AND DOCUMENTS (NEW ARTICLE)

.1 The Contractor shall comply with the following documents and procedures, and instructions relating to the Work which will be given to the Contractor by the Consultant by the following means:

13.1 Contemplated Change Notice (CCN)

A CCN represents a notice of proposed change to the Work requiring the submission of quotations in accordance with Article 13.4 herein. A CCN is not an authorization to proceed with changes in the work. A CCN will indicate the items of work to be added, deleted, or revised and will relate to revised drawings issued or referenced in the CCN.

A CCN may provide clarifications or additional details consistent with the work included in the Contract and not requiring a change in price. A CCN may also be used for transmittal of information such as colour schedules, detail sketches, etc., not requiring a change in price.

It is recognized that on many tightly scheduled projects, work detailed on CCNs must be proceeded with immediately, pending settlement of the price change. In such instances, the Owner through the Consultant may authorize the work or part of the work covered in the CCN to proceed by the Consultant issuing a Change Directive to the Contractor.

13.2 Supplemental Instruction (SI)

As defined under "DEFINITIONS" in CCDC2-2008

Should the Contractor hold that these instructions involve a change in the contract rice or contract time, Contractor shall notify the Consultant in writing and not proceed with any work until directed by a change order or change directive.

13.4 Quotations

Quotations shall be submitted to the Consultant promptly after receipt of each CCN and Change Directive addressed as follows:

Niagara-on-the-Lake Hydro Inc.
c/o IBI Group (Canada) Inc.
30 International Boulevard
Rexdale, Ontario
M9W 5P3

and identified as follows:

IBI Project No. 24RX14.0062
Power Transformer

A separate quotation is required for each CCN and Change Directive. Quotations shall be complete and account for each item in the CCN or Change Directive.

The Contractor's fees for changes to the work are to be based on the net additional cost of each CCN or Change Directive but not applied to unit price items.

Quotations shall provide a complete breakdown of prices for all items, including quantities and unit material and labour costs. Copies of each subcontractor's breakdown submissions shall accompany all quotations.

Where unit costs are established for items of work in the Contract, quotations shall be based on such unit costs, showing quotations each item.

Three copies of quotations, and 3 copies of subcontractor's quotations and breakdowns, are required.

Quotations shall be submitted within 10 working days of receipt of each CCN or Change Directive or sooner if requested by the Consultant.

13.5 Change Order

As defined under “DEFINITIONS” in CCDC2-2008.

After satisfying himself as to the correctness of the Contractor's quotation, the Consultant will prepare a Change Order for the Owner's approval. When the Change Order is signed by the Owner, the original and 1 copy of the Change Order will be forwarded to the Contractor who will indicate his acknowledgement and receipt of the Change Order on the copy, and return it to the Consultant for record purposes. The Contractor will retain the original for its records.

13.6 Change Directive

As defined under “DEFINITIONS” in CCDC2-2008.

Unless otherwise stated all materials and workmanship shall be in accordance with the requirements of the Contract. The basis of calculation of the adjustment in contract price and contract time for the work described in the Change Directive shall be determined in the manner described in the contract documents. The actual adjustment in contract price for the work described in the Change Directive shall be on a lump sum basis unless noted otherwise.

GC 14 CONFIDENTIALITY (NEW ARTICLE)

Contractor shall treat as confidential and secret all data, drawings and specifications related to the Project and shall not lend out to others such information or documents.

Data or design provided by or developed under this Contract shall be for the strict use and benefit of the Owner and not to be used for any other purpose.

End Of Section

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1 General

.1 Items to be Submitted For Review

.1 Shop drawings

.2 Operating and maintenance manuals

.3 “As-Built” drawings

.4 Certificates and transcripts

.2 Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work. Failure to submit in adequate time is not considered sufficient reason for an extension of Contract Time and no claim for an extension by reason of such default will be allowed.

.3 Work affected by the submittal shall not proceed until review is complete.

.4 Contractor shall retain one reviewed and stamped copy of each submission on site. Only the stamped copies shall be used on the work.

2 Shop Drawings

2.1 **GENERAL**

.1 The term "Shop Drawing" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.

.2 The Contractor shall arrange for the preparation of clearly identified shop drawings as called for by the Contract Documents or as the Consultant may reasonably request.

.3 Prior to submission to the Consultant, the Contractor shall review all shop drawings. By this review the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data and that he has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date, and signature of a responsible person.

.4 Submittals not stamped, signed, dated and identified as to the specific Contract requirements may be returned without being examined and shall be considered rejected.

.5 The Contractor shall submit shop drawings to the Consultant for his review with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the work of other Contractors. If either the Contractor or the Consultant so requests they shall jointly prepare a schedule fixing the dates for submission and return of shop drawings. At the time of submission the Contractor shall notify the Consultant in writing of any deviations in the shop drawings from the requirements of the Contract Documents.

.6 The Consultant will review and return shop drawings in accordance with schedule agreed upon, or otherwise with reasonable promptness so as to cause no delay. The Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Consultant.

.7 The Contractor shall make any changes in shop drawings which the Consultant may require consistent with the Contract Documents and resubmit unless otherwise directed by the Consultant. When resubmitting, the Contractor shall notify the Consultant in writing of any revisions other than those requested by the Consultant.

.8 The Contractor shall secure from all his subcontractors and material suppliers, uniform size shop drawings showing the construction materials, etc., or as required and upon which the respective Quotations have been based.

.9 Shop drawings shall define the division of responsibility between the trades and all items shown on the shop drawings shall be supplied as part of the contract unless it is specifically noted that certain items are not part of the contract.

.10 Any work done before receiving the Consultant's final review of the shop drawings, shall be at the Contractor's risk.

2.2 **SHOP DRAWINGS IDENTIFICATION**

.1 On the bottom right hand corner of each shop drawing shall appear the following 50 x 40 mm (2" x 1½") stamp:

Client Name NOTL Hydro			
Client Project Reference No. NOTL MTS No.2			
Div. XX	Section YY YY	No. 1	Rev. 0

.2 Top Row: Indicate Consultant's alpha-numeric project number.

.3 Middle Row: If any, indicate Consultant's contract number.

.4 Bottom Row: Using the number of the specification section where the shop drawing is requested, indicate the first 2 digits (division number) and the last 4 remaining digits (section) in 2 separate cells. Use the third cell to indicate the drawing sheet number in sequential order. On the fourth cell show Rev. 0 for first submittal; Rev. 1 for second submittal, etc.

2.3 **REPRODUCTION OF ENGINEERING DRAWINGS**

.1 Reproduction of the engineering Drawings, to serve as Shop Drawings, will be permitted. Cost of reproduction shall be based on the number of electronic Drawing files as indicated below, and shall be paid for by the Contractor in accordance with rates indicated below. Rates are exclusive of HST. Any identification or reference to the Owner or Consultant is to be removed from all Drawings that are used by the Contractor for this Contract.

.1 1 to 10 files: $1,000.00

.2 11 to 20 files: $1,900.00

.3 21 to 50 files: $4,500.00

.4 51 to 100 files: $8,000.00

.5 More than 100 files: $75 rate per file, plus $500.00 administration fee

2.4 **SUBMITTAL SYSTEM - GENERAL**

.1 Submit Portable Data Files (PDF's) of fully detailed and dimensioned shop drawings of the Work.

.2 Shop Drawings will be returned to the Contractor stamped and marked "REVIEWED AS SUBMITTED", or "REVISE AS NOTED - DO NOT RESUBMIT", or "REVISE AND RESUBMIT" or "REVIEW NOT REQUIRED". These stamps are defined as follows:

Stamp	Meaning
REVISE AND RESUBMIT	Revise drawing in accordance with corrections or comments and re-submit to the Engineer for further review
REVISED AS NOTED - DO NOT RESUBMIT	Incorporate corrections or comments and proceed with construction. No other alterations are to be made to the drawings by the Contractor subsequent to receipt of drawings stamped and marked as above. If further changes are made in addition to the Consultant's notations, then the drawings must be resubmitted for further review.
REVIEWED AS SUBMITTED	Drawings reviewed without comments. Proceed with construction.
REVIEW NOT REQUIRED	Drawing does not require Engineer's review

.3 Coordinate shop drawing file sizes with Consultant in advance of submittal. Generally, submit up to 10 megabytes file size only.

.4 Drawings shall be blackline as much as possible to obtain good resolution when printed.

.5 Consultant will print the Shop Drawings and marked manually.

.6 A copy of Shop Drawings with Consultant's comments will be scanned in colour and emailed back to the Contractor or posted on a File Transfer Protocol (ftp) site, if such site exists. The Consultant will retain on its electronic folder, a PDF copy of Shop Drawings returned to the Contractor. Original marked up hardcopy will also be retained by the Consultant.

2.5 **INFORMATION REQUIRED**

.1 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information requested in the individual specification sections or as necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross references to design Drawings and Specifications.

.2 Where a submittal relates to Door Schedule(s), submittal MUST be cross referenced to the Door Schedule(s) indicating door no. and type. Non-compliance will result in the rejection of Shop Drawing.

2.6 **ENGINEER'S STAMP AND SIGNATURE**

.1 Shop drawings of components, apparatus and equipment which are designed by the Contractor shall bear the stamp and signature of an Engineer registered in the Province of Ontario in accordance with the Ontario Building Code and the Professional Engineer's Act.

2.7 **CHANGES**

.1 Adjustments made on shop drawings by the Consultant are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Consultant prior to proceeding with the Work.

.2 Make changes in shop drawings as the Consultant may require and which are consistent with Contract Documents. When resubmitting, notify the Consultant in writing of any revisions other than those requested by the latter.

2.8 **UNITS OF MEASUREMENT**

.1 Shop drawings shall show weights and dimensions in either metric (S.I. units) or Imperial units, consistent with the Consultant's Drawings and Specifications.

2.9 **MISCELLANEOUS**

.1 Fabrication shall not proceed until drawings have been reviewed, unless other authorization is granted in writing by the Consultant.

.2 The Contractor and each Subcontractor is expected to operate as an expert in his respective field. The Contractor shall save Owner and Consultant harmless from any defect resulting from failure in this regard including cost of remedial action necessary before or after completion of the Work.

.3 Drawings shall be prepared specifically for the Work.

2.10 **SUBMISSIONS TO AUTHORITIES HAVING JURISDICTION**

.1 Contact authorities having jurisdiction over the place of Work for required list of submissions for their review.

2.11 **BROCHURES**

.1 Submit 2 copies of product data sheets or brochures, or 1 copy on CDROM(s), scanned file copies in Adobe Acrobat Version 6. Data sheets or brochures are for requirements requested in specification Sections and as the Consultant may reasonably request where customized shop drawings will not be prepared due to standardized manufacture of product.

.2 Brochures or drawings of standard production equipment shall be for one size or model and include all performance data and characteristic curves for such equipment.

.3 Wiring diagrams and schematics shall accompany Shop Drawings for all equipment which have electrical controls furnished with the equipment.

3 Building, Operating And Maintenance Manuals

3.1 **BINDERS**

.1 Binders: Commercial quality, 260 mm x 295 mm; hard covered, jacketed, “D” ring style with 3 rings in size to suit binder thickness.

.2 Covers: Identify each binder with typed or printed title "Building, Operating and Maintenance Manuals"; list title of Project, Owner, and date of manual submission.

.3 Organize contents into applicable categories of work, parallel to Specification sections. When only 1 volume is required, include a complete index. Where more than 1 volume is required, include a complete index of all volumes and each succeeding volume shall contain an index of its own contents.

.1 Provide tabbed fly leaf for each category of work, with typed description of product and major component parts of equipment.

.2 Include names, addresses, telephone number and general email address of Contractor with names of responsible parties; schedule of products and systems, indexed to content of the volume.

.3 For each product or system, list names, addresses, telephone numbers and general email address of Subcontractors and suppliers who can effect repair or maintenance on equipment, including local source of supplies and replacement parts.

.4 Product data: organize to parallel Project Manual (specifications) breakdown. Mark each sheet to clearly identify specific Products and component parts and data applicable to installation; delete inapplicable information. Supplement Product data to illustrate relationships of component parts of equipment and systems to show control and flow diagrams

.5 Typed text information: provide as required to supplement product data. Provide logical sequence of instructions for each procedure incorporating manufacturer's instructions.

.6 For Test information, Manufacturer's printed data, or typewritten data is required.

.7 For Drawings, provide appropriate reinforced binder tabs and bind in with text; fold larger sheets.

3.2 **OPERATING AND MAINTENANCE MANUALS**

.1 Manuals are to contain operational information on equipment, cleaning and lubrication schedules e.g. filters, overhaul and adjustment schedules and similar maintenance information. Give equipment function, normal operation characteristics and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Instructions shall be in such form and language so as to facilitate the Owner in the proper operation and maintenance of building systems.

.3 In addition to information specified, include the following:

.1 Final Shop Drawings and product data of equipment.

.2 Record drawings of mechanical and electrical installations.

.3 Full description of building systems and operations.

.4 Operating Procedure: include start up, break-in, and routing normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter and any special operating instructions.

.5 Controls and operating sequences; wiring diagram of control panels.

.6 Schematic diagram of pneumatic, electrical, oil and/or gas systems.

.7 Non-dimensional layout showing locations of all electrical devices on mechanical equipment.

.8 Complete parts list of assemblies showing manufacturer's names, addresses, nearest replacement sources and telephone numbers.

.9 List of recommended spare parts and quantity of each item to be stocked.

.10 Maintenance Requirements: include preventative requirements; routine procedures and guide for trouble shooting; disassembly, repair, and reassembly instructions and alignment, balancing and checking instructions.

.11 Manufacturer's warranties.

.12 Lubricating instructions, list of lubricants and recommended cycle of lubrication.

.13 Manufacturer's certified reports.

.14 Field testing and commissioning reports.

.15 Factory test reports.

.16 Sequence of controls operation and control diagrams.

.17 Contractor's coordination drawings with installed colour coded piping diagrams.

.18 Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

.19 List of original manufacturer's spare parts, current prices and recommended quantities to be maintained in storage.

.20 Additional requirements: provide as specified in individual Specifications sections.

.4 Requirements specified apply to component parts of equipment whether they are manufactured by supplier of equipment or are supplied as a component part of an item of equipment.

3.3 **SUBMITTAL OF MANUALS**

.1 Two months prior to anticipated date of Substantial Performance, submit to Consultant 1 hardcopy and 1 CD ROM(s) of completed manuals in final form.

.1 Copy will be returned with Consultant's comments.

.2 Revise contents of manuals as required prior to final submittal.

.3 Submit 6 copies of revised manuals in final form within 14 days before Substantial Performance.

.4 CD ROM(s) shall contain scanned file copies in Adobe Acrobat Version 6 or later version, of all building, operating and maintenance manuals. Provide a file for each document, with bookmarking reference for each chapter or section in the document.

4 As-Built Drawings

4.1 **AS-BUILT DRAWINGS**

.1 Produce at own cost, additional sets of drawing prints for use in maintaining “As-Built” information.

.2 Be responsible for creating “As-Builts” from field data collected during the course of the project. Neatly record complete with legible dimensions and notes.

.3 “As-Built” drawings are those prepared by the Contractor as it constructs the project and upon which it documents the actual locations of the building components and changes to the original contract documents.

.4 Field data is defined as information that is not available from the contract documents, addenda, change orders, or site instructions. It is of importance that the Contractor record on the “As-Builts” all field information relating to concealed conditions.

.5 Include adequate monies in Tender Price to provide accurate entries in the “As-Builts”.

.6 Recording must be done on the same day that deviation is made to ensure that important information is not missed from the “As-Builts”.

.7 Hand-mark all recording using red ink. “Clouded” method is unacceptable and “As-Builts” showing such method will be returned to the Contractor.

.8 Identify as "Project As-Built Copy". Maintain in good condition; clean, dry and legible, and make available for inspection on site by Consultant at all times.

.9 Upon completion of the Work and prior to final inspection, submit a clean and legible copy of “As-Built” Drawings to Consultant.

End Of Section

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Attachment "A" to Specification Section 01 33 00
Standard Submittal Form

1. Submittal Title:				
2. To: ATTN:	3. From: ATTN:	4. Project Title & Location:	5. Submittal Date 7. Submittal No.	6. New ☐ Resubmittal ☐
		8. Specification Section No:	9. Partial Submittal No.	10. Resubmittal No.
11. Contract		12. Project No:		IBI/Owner Use Contract No:

13. Page No.	14. Mfr/Contractor	15. Item I.D.	Description	16. Electronic Copy (Yes) (No)	17. No. of Hard Copies Print	Cat.	Samp	Other		Date: Received: Action Code #	Dept. File

18. Contractor's Remarks:

The undersigned certifies that the above submitted items have been reviewed in detail and are correct and in strict conformance with all requirements of the contract documents, except as otherwise noted. Note: Approval of items submitted does not relieve contractor from complying with all requirements of the contract documents.

Name of Contractor _____

Signature _____

Action Codes: Refer to Section 01 33 00 for full text of codes below

1.	Revise and Resubmit	Revise and resubmit to the Consultant's for further review	☐
2.	Revise as Noted – Do Not Resubmit	Incorporate corrections or comments and proceed with construction	☐
3.	Reviewed as Submitted	Drawings reviewed without comments. Proceed with construction	☐
4.	Review not required	Drawing does not require Consultant's review	☐

Consultant Comment:

Route	Dept.	Ck'd by	Date	Action
	Civil			
	Arch.			
	Struct			
	Mech.			
	Elect.			
	I &C			
	PM			

Received

Tracking Number

Copies to:

Primary Dept. Checker

Review completed on

Control Administrator

Returned to contractor on

By _____

Date _____

IBI Group

Instructions for Use of Standard Submittal Form

1. Use an individual copy of this form for each and every required project submittal.
2. Contractor shall fill in all blank spaces above the "Owner Comment" box and to the left of the "Action Codes", including the following:
    - Box 1 - Indicate generically what is being submitted i.e. “structural steel”, “overhead doors”, “plumbing fixtures”, “wiring diagrams”, etc.
    - Box 3 - Contractor's return address
    - Box 5 - Submittal date
    - Box 6 - Indicate "New" or "Resubmittal"
    - Box 7 - Submittal number
    - Box 8 - Specification Section number submittal is in response to
    - Box 9 - Indicate if this is a partial submittal by using root number with part number (A5-00-01 – Part A, A5-00-01 – Part B, etc.)
    - Box 10 - Indicate if this is a resubmittal by using original root number with revision number
    - Box 11 - Indicate appropriate contract name
    - Box 13 - Indicate specification page number
    - Box 14 - Identify the manufacturer/vendor/subcontractor
    - Box 15 - Describe the submitted item
    - Box 16 - Indicate if electronic submittal
    - Box 17 - Indicate the quantity of submittal copies
    - Box 18 - Include appropriate remarks as required and sign the certification
3. The remainder of the submittal form will be completed by the Consultant, and returned to the Contractor with the submittal.

End of Attachment

1 General

1.1 **BIDS**

.1 Provide the bids for the transformers as follows:

.1 Transformer No. T1.

1.2 **RELATED WORK**

.1 Related work includes but is not limited to the following:

.1 Refer to and comply with commercial documents.

1.3 **SITE CONDITIONS**

.1 The site is located at 770 Concession 5 Road, Niagara-on-the-Lake, Ontario, Canada.

.2 The equipment will be subject to the following conditions:

.1	Height above sea level	less than 1000 m
.2	Temperature range	-40°C min to 40°C max
.3	Maximum humidity	95%
.4	Location	Outdoor
.5	Snow conditions	mean annual depth 500 mm
.6	Lightning conditions	mean annual thunderstorm days 35
.7	Ice loading	heavy

1.4 **PREDESIGN REVIEW**

.1 Within 10 days of receipt of order, and also prior to shop drawing preparation, the manufacturer's design engineers are required to attend predesign review meetings at IBI office in Toronto, Ontario.

1.5 **REFERENCES**

.1 Comply with electrical code authority, local, provincial and federal laws where applicable and with authorities having jurisdiction.

1.6 **SUBMITTALS**

.1 Power Transformer

.1 Submit the following with tender:

.1 Appendix “ED”

.2 General outline dimension drawings;

.1 Plan view

.2 Elevation view (three sides)

.3 General base drawings

.4 General information on the weights

.5 General information on the volume of insulating oil of the transformer

.6 Descriptive literature on transformer

.7 Descriptive literature on major components of the transformer;

.1 Primary (H) bushing

.2 Capacitive bushing voltage device

.3 Secondary (X) bushing and secondary neutral (X0) bushing

.4 Secondary line surge arrester

.5 Load tap changer

.8 General bill of material

.9 Permissible continuous and short time over-excitation graphs for the transformer

.10 Permissible overload graphs for the transformer

.11 Transformer through-fault protection graphs for faults which occur infrequently and frequently

.12 Guaranteed transformer no-load loss, full load loss, and total loss.

.13 Guaranteed transformer sound level

.14 Estimated transformer sound level in dBA, in tabular form for each one-third octave band for the range of 0-20,000 Hz.

.15 Transformer test summary

.2 Submit the following for review after issue of purchase order:

.1 Detailed outline dimension drawings.

.1 Plan view

.2 Elevation views (minimum three sides)

.3 Illustrating detail dimensions

.4 Illustrating and identifying major and minor devices, components and accessories

.5 Illustrating the radial clearances dimension from live parts to maintain the voltage insulation and lighting impulse level ratings

.6 Illustrating external entry/exit points

.2 Detailed base mounting and anchoring drawings;

.1 Transformer tank assembly

.2 Transformer radiator bank/main conservator tank assembly

.3 Transformer primary termination, detail drawings;

.1 Primary line termination

.4 Transformer secondary (X) termination, detail drawings.

.1 Secondary line (X) termination

.2 Secondary neutral (X0) termination

.3 Secondary surge arrester termination

.5 Detailed control panel layout drawings

.1 Front view

.2 Interior views

.3 Illustrate, identify and tag the following:

.1 Each device and component

.2 Wireway

.3 Terminal strips

.6 Detailed electrical AC and DC system schematic diagrams. The schematic diagrams to comply with ANSI/IEEE standard schematic symbols. Schematic diagrams illustrate, identify and tag the schematic representation of each equipment, device and component of the following:

.1 Protection systems

.2 Control systems

.3 Monitoring systems

.4 Communication system

.5 Auxiliary system

.6 External interface terminals

.7 External entry/exist terminals

.8 Terminal blocks complete with terminal numbers

.9 Terminals, used or unused on equipment, devices and components, complete with terminal numbers

.10 Each used or unused coil and contact of equipment, devices and components

.11 Wire, complete with wire numbers

.7 Composite system drawing for the transformer load tap changer control,. illustrating the following:

.1 .

.2 Electrical schematic representation of the load tap changer controls and voltage regulator system and associated interconnection.

.3 Complete system including devices or components which are remotely located but form part of this integrated system.

.4 External interface terminals.

.5 Terminal blocks complete with terminal numbers.

.6 Terminal used or unused on equipment, devices and components, complete with terminal numbers.

.7 Each used or unused coil or contact of equipment, device and components.

.8 Wire, complete with wire numbers.

.8 Detailed Bill of Material, indicating the identification tag, quantity, detailed description, manufacturer, manufacturer part number

.9 Detailed Nameplate Schedule identifying each equipment, device and component.

.10 Detailed electrical wiring diagrams. The wiring diagrams to illustrate, identify and tag the following:

.1 Each terminal block, used or unused, complete with terminal numbers

.2 Each terminal, used or unused, on each equipment, device or component, complete with terminal numbers

.3 Wiring, complete with wire numbers at each end

.4 Wire routing

.11 Nameplate drawings:

.1 Power transformer

.2 Load tap changer

.3 Bushing current transformers

.4 Capacitive bushing voltage device

.12 Transformer, detailed removal outline dimension drawing:

.1 Illustrating minimum height require for removal

.2 Illustrating the removal of core/coil/load tap changer assembly from the transformer main tank and load tap changer tank

.13 Transformer, transportation outline dimension drawings

.14 Detailed assembly and erection drawings, illustrating the following:

.1 Lifting instruction and information

.2 Lifting details

.3 Installation details for proper assembly

.15 Descriptive literature and technical information on the major and minor equipment, devices and components of the transformer

.16 Detailed information on the weights;

.1 Transformer core and coil assembly only

.2 Completely assembled transformer tank, not including oil

.3 Completely assembled transformer tank, including oil

.4 Radiator bank/main conservator tank assembly, not including oil

.5 Radiator bank/main conservator tank assembly, including oil

.17 Detailed information on the volume of insulating oil of the transformer;

.1 Transformer main tank

.2 Main conservator tank system

.3 Radiator bank system

.4 Load tap changer tank and associated conservator tank system

.5 Total

.18 Detailed continuous and short time over-excitation graphs for the transformer

.19 Detailed overload graphs for the transformer

.20 Transformer through fault protection graphs for faults which occur infrequently and frequently

.21 Current transformers technical data;

.1 Secondary excitation graphs

.2 Secondary resistance values and turns, at each tap position

.3 Ratio and phase angel curves

.4 Accuracy data

.22 Capacitive bushing voltage device technical data;

.1 Ratio and phase angle curves

.2 Accuracy data

.23 Detailed transformer inspection and test summary

.24 Installation, operating and maintenance manuals

1.7 **WORKING DRAWINGS AND DOCUMENTS**

.1 Where the word "HOLD" appears on Drawings and other Contract Documents, the Work is included in the Contract and execute such Work only after verification of dimensions and of materials and obtaining Consultant's written permission to proceed.

1.8 **QUALITY ASSURANCE**

.1 Standards

.1 These Specifications supplement the referenced standards.

.2 Where standards differ between authorities, the most rigid apply.

.3 Where requirements of the specifications exceed referenced standards, the specifications apply.

.2 Material and Equipment

.1 Furnish new material and equipment.

.2 Equipment must bear, on manufacturer's label, certification mark or label acceptable under Ontario Electrical Safety Code.

.3 Where material or equipment requires special inspection and approval, obtain and pay for such approval.

.3 Access to Consultant: Allow access to Consultant during and after fabrication to inspect, observe tests and confirm compliance with these Specifications.

.4 Factory Witness Tests: Provide Consultant with two weeks advance notice of witness testing.

.5 Preparation for Factory Witness Tests: Prior to Consultant attendance at factory for witness testing, perform the following:

.1 Successfully conduct tests to be witnessed.

.2 Following successful testing, inform the Consultant, in writing, that tests to be witnessed have been successfully performed.

.6 Test Reports: Submit certified equipment test reports.

.7 Operating and Maintenance Manuals: Submit operating and maintenance manuals for equipment being supplied, including:

.1 Bill of Materials

.2 Nameplate Schedule

.3 Manufacturer’s general descriptive information and application information on each equipment, device and component

.4 Power transformer technical information and data

.5 Current transformer technical information and data

.6 Capacitive bushing voltage device technical information and data

.7 Installation and erection instructions

.8 Recommended procedures for assembling, dismantling, maintaining and operating components of work

.9 List of recommended spares with catalogue numbers suitable for ordering purposes

.10 Recommended schedule of maintenance checks with minimum and maximum intervals

.11 Certified copy of factory test reports

.12 Certified copy of “As Built” drawings. The drawings previously submitted and reviewed

.8 Quality Assurance Program

.1 Furnish equipment built to Quality Assurance Program ISO9001.

1.9 **WARRANTY**

.1 Furnish equipment warranty including auxiliary and accessory items. Include in warranty parts, labour, travel to and from site, and maintenance for full period of warranty of 18 months.

.2 Full warranty period of 2 years. [Alternate]

.3 Full warranty period of 3 years. [Alternate]

.4 Full warranty period of 4 years. [Alternate]

.5 Full warranty period of 5 years. [Alternate]

1.10 **EQUIPMENT DIMENSIONS**

.1 Provide power transformers with the general arrangement and location of the primary bushings, secondary bushings, secondary neutral bushings (XO), secondary line surge arresters, cooling radiators, main conservator tank, load tap changer control cabinet, and transformer control cabinet as stated in the written specification and illustrated on the specification drawings.

.2 Provide power transformer with the approximate overall dimensions per the specification drawings.

2 Products

2.1 **SILICONE**

.1 Products and materials containing silicone are not permitted.

2.2 **NAMEPLATES**

.1 Nameplates, engraved laminated plastic, black lettering on white background, self-tapping screw and adhesive mounted as follows:

.1 Transformer identification, 50 mm minimum character height

.2 Equipment identification, 15 mm minimum character height.

.3 Identification of each device and component, 9 mm minimum character height.

.4 Functional identification of protection devices.

.5 Terminal block row identification.

.6 Functional identification of instruments, relays.

.2 Warning Signs: White lettering on red background

.1 Danger High Voltage on termination box access covers or doors.

.2 Warning signs and labels, as required by Inspection Authority

2.3 **WIRING AND CONNECTIONS**

.1 Minimum Wire Sizes: Control, No. 14 AWG; current transformer, No. 10 AWG.

.2 At hinges use extra flexible wires with mechanical protection.

.3 At wire ends use solderless type terminals. Terminate not more than two wires on a terminal block point.

.4 Use pressure clamping yoke type (with captive clamping screw) terminal blocks for control wiring.

.5 Use shorting type, pressure clamping yoked (with two captive clamping screws) terminal blocks for current transformer terminal blocks.

.6 15% spare terminal block points.

.7 Use terminal blocks for wiring between shipping splits.

.8 Number terminal blocks with same numbers as wire at that point for circuit identification.

.9 Wire all unused or spare terminals or contacts of equipment, devices or components to terminal blocks.

.10 Shield secondary and control wiring within medium voltage compartment in protective metal covering.

.11 Label wires at both ends with Wieland type or permanent sleeve type marker.

.12 Bottom entry for auxiliary electrical power service, protection and control systems, telemetry systems, including gasketted removable metal plates non-magnetic metal.

2.4 **PHASE COLOUR CODING**

.1 Phase colour coding as follows:

Phase A	-	Left	-	Red	-	X1, Y1 and H1
Phase B	-	Centre	-	White	-	X2, Y2 and H2
Phase C	-	Right	-	Blue	-	X3, Y3 and H3
Neutral	-				-	X0, Y0 and H0

.2 Identify bus phasing in bus and cable compartments with tape per colour code.

2.5 **WIRE AND CABLE IDENTIFICATION**

.1 Identify wires with continuous colouring as follows:

Phase A	-	red
Phase B	-	black
Phase C	-	blue
Neutral	-	white
Ground	-	green
Isolating ground	-	green and yellow
Control	-	red
Interlock	-	yellow
D.C.	-	blue

.2 For larger wire sizes available only in black, install coloured wire marker tape in accordance with above coding.

3 Execution

3.1 **GENERAL**

.1 Refer to Section 26 12 06.

End Of Section

PL/

1 General

1.1 **WORK INCLUDED**

.1 Design, manufacture, factory test, factory acceptance test, delivery to site the Power Transformer Unit and associated items. Including Manufacturer's Site Supervision for the; receiving, off-loading, installation on foundations, complete assemble of the unit and associated systems, complete vacuum oil filling of the unit, site inspections, site testing, site commissioning, site acceptance testing and start-up services of:

.1 Transformer Identification No.: T1

.2 Include any equipment not specifically covered in this Specification for complete operation of transformer.

.3 **[Alternate]**

Complete Services for receiving, off-loading, installation on foundations, complete assemble of the unit and associated systems, complete vacuum oil filling of unit, site inspections, site testing, site commissioning, site acceptance testing and start-up services of:

.1 Transformer Identification No.: T1

1.2 **SPECIFICATION**

.1 This specification supplements the CAN/CSA-C88-M, Power Transformers and Reactors standard. The requirements of the CAN/CSA-C88-M standard apply unless superseded or modified by this specification.

1.3 **REFERENCES**

CAN/CSA-C88-M	-	Power Transformers and Reactors
CAN/CSA-C88.1	-	Power Transformer and Reactor Bushings
ANSI C57.12.30	-	Requirements for Load-Tap-Changing Transformers 230000 Volts and Below, 3750/4687 Through 60000/80000/100000 kVA, Three Phase
ANSI/IEEE No. 62-1	-	Surge Arresters
ANSI/IEEE C57.12.00	-	General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers
ANSI/IEEE C57.12.11	-	Guide for Installation of Oil-Immersed Transformers (10 MVA and Larger, 69-287 kV Rating)
ANSI/IEEE C57.12.14	-	Dielectric Test Requirements for Power Transformers for Operation at System Voltages from 115 kV Through 230 kV
ANSI/IEEE C57.12.80	-	Terminology for Power and Distribution Transformers
AWS A5.8	-	Brazing Filler Metal
IEC 214	-	On Load Tap Changers
ANSI C57.12.90	-	Test Code for Distribution, Power and Regulating Transformers
ANSI Z55.1	-	Gray Finishes for Industrial Apparatus and Equipment
ANSI C57.12.10	-	Requirements for Transformers 230,000 Volts and Below 833/958 Through 8333/10417 kVA, Single Phase, and 750/862 Through 60000/80000/100000 kVA, Three Phase

ANSI/IEEE C57.13	-	Standard Requirements for Instrument Transformers
ANSI C57.12.70	-	Terminal Markings and Connections for Distribution and Power Transformers
ANSI/IEEE C57.12.90	-	Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuiting Testing of Distribution and Power Transformers
ANSI/IEEE C57.92	-	Guide for Loading Mineral-Oil-Immersed Power Transformers Up To and Including 100 MVA with 55°C or 65°C Winding Rise
ANSI/IEEE C57.98	-	Guide for Transformer Impulse Tests
ANSI/IEEE C57.104	-	Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers
NEMA TR-1	-	Transformers, Regulators and Reactors
CAN/CSA CAN3-C108.3.1	-	Limits and Measurement Methods of Electromagnetic Noise from AC Power Systems, 0.15 - 30 MHz
ANSI/IEEE C57.109	-	IEEE Guide for Transformer Through-Fault Current Duration
CAN/CSA-C60044-1	-	Instrument Transformers-Part 1: Current Transformers
CAN/CSA-C60044-2	-	Instrument Transformers-Part 2: Inductive Voltage Transformers
CAN/CSA-C60044-5	-	Instrument Transformers-Part 5: Capacitor Voltage Transformers
CAN/CSA-C60044-6	-	Instrument Transformers-Part 6: Requirements for Protective Current Transformers for Transient Performance
CAN/CSA-C71-1	-	Insulation Coordination-Part 1: Definitions, Principles and Rules
CAN/CSA-C71-2	-	Insulation Coordination-Part 2: Application Guide
CSA C50	-	Mineral Insulating Oil, Electrical, for Transformers and Switches
CSA W47.1	-	Certification of Companies for Fusion Welding of Steel
CSA W59	-	Welded Steel Construction (Metal-Arc Welding)
EEMAC GL 1-2	-	Power Transformer and Reactor Bushings
EEMAC L10-1	-	Load Tapchanging Paralleling Schemes
EEMAC L13-1	-	Dielectric Tests and Test Procedures for Power Transformers
EEMAC L14-1	-	Liquid Level Indicators for Power Transformers
EEMAC L15-1	-	Temperature Indicators for Power Transformers
EEMAC Y1-2	-	Performance Specification for Finishing Systems for Outdoor Electrical Equipment
NETA ATS	-	International Electrical Testing Association Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
Ontario Electrical Safety Code	-	Ontario Electrical Safety Code
	-	The Requirements of Electrical Safety Authority (ESA)
	-	The requirements of the local authorities having jurisdiction over the apparatus

2 Products

2.1 **MANUFACTURERS**

.1 Acceptable Manufacturers and their manufacturing plant

.1 This tender has been sent to a number of manufacturers who are not identified in this specification document.

2.2 **DESCRIPTION**

.1 Power transformer, outdoor, oil immersed, conservator type liquid preservation system, two winding type Dyn1 (single secondary winding), complete with secondary on-load load tap changer.

.2 Guaranteed Standard efficiency losses and guaranteed standard sound level type.

.3 **[Alternate]**

Guaranteed High efficiency low losses and guaranteed low sound level type.

2.3 **DESIGN**

.1 Uniformity of Design

.1 Identical electrical and mechanical design for the same capacity and rated transformers.

.2 All equipment, devices and components interchangeable between same capacity and rated transformers.

.2 Design and manufacture the transformers with wiring and devices in junction boxes, terminal boxes, and control cabinets for normal operation to a maximum internal ambient temperature of 50°C continuous.

.3 Design and manufacture the transformers such that wiring and devices immersed in oil are capable of operating at the maximum oil temperature at loading beyond rated MVA (overload) as specified herein without any physical or electrical characteristic change during the life of the transformer.

.4 Protection, Control and Auxiliary Contracts

.1 Provide all protection, control and auxiliary contacts rated for 120 VAC , 125 VDC and 48VDC

.2 Provide all protection and control contacts which are electrically isolated and have both normally open and normally closed contacts with a common pole, NEMA type C.

.3 Provide all auxiliary contacts which are electrically isolated and normally open, NEMA type A.

.5 Circuit Breakers

.1 Provide circuit breakers only, with auxiliary contacts for remote monitoring, for protective devices required in any protection system, control system and auxiliary system. Fuses are not acceptable.

.2 Minimum interrupting rating of circuit breakers, at 120VAC and at240VAC: 10,000A.

.6 Isolation Switches

.1 Provide isolation switch for each protection and alarm point

.2 Acceptable unit;

.1 ABB, type Flexitest FT-1

.7 Intelligent Electronic Device Unit

.1 Wire all remote alarm contacts, remote status contacts and all remote analog signals to Intelligent Electronic Device unit located in the transformer control cabinet.

.2 Provide intelligent electronic device with dual, fiber optic Ethernet capabilities and facilities.

.3 Provide two (2) independent fiber optic Ethernet patch panels for connections and integration of intelligent electronic devices to the dual, fiber optic local area network.

.4 Intelligent electronic device shall be connected to the two (2) fiber optic Ethernet patch panels.

2.4 DIMENSIONS OF POWER TRANSFORMER (EXCLUDING THE HEIGHT DIMENSION)

.1 Require to provide a Power Transformer assembly with the most optimal overall Base Dimensions, and the most optimal overall Width by Depth Dimensions (overall 'X axis' and 'Y axis' Dimensions). Such that the minimal modifications are required to the overall dimensions (overall 'X axis' and 'Y axis' Dimension ONLY) of the existing power transformer foundation pad and the associated overall dimensions of the existing oil containment pit.

.2 For Information ONLY, refer to the Reference Drawing and the overall 'X axis' and 'Y axis' Dimensions ONLY, of the existing power transformer foundation and the associated existing oil containment pit.

2.5 MODES OF OPERATION

.1 Transformers continuously operate in the modes of operation listed in the table, for all conditions specified herein including but not limited to the following simultaneous conditions:

.1 No-load to the maximum continuous rating

.2 **[Alternate]** No-load to Overload Rating [Limited Time Rating (LTR)]

.3 Minimum to maximum system primary voltage condition

.4 Minimum to maximum system frequency condition

.5 Maintaining each secondary terminal voltage at 29.3 kV to 29.0 kV Phase to Phase, and 16.92 kV to 16.74 kV Phase to Neutral

.6 Secondary Neutral (XO) solidly grounded

T1 = Proposed Power Transformer Unit

T2 = Future Power Transformer Unit which is identical to the Proposed Power Transformer Unit T1

Winding / Modes of Operation

	1	2	3	4	5
T1 (H)	IN SERVICE				
T1 (X)	R	P	O	O	R
T2 (H)	IN SERVICE				
T2 (X)	O	P	R	O	R

R = Radial Operation [independent operation, not in parallel operation]

P = Parallel Operation [Continuous: T1(X) ll T2(X)]

O = Open Circuit [Energized only, not supply load]

2.6 **TRANSFORMER OUTPUT SUPPLY TO THE SECONDARY ELECTRICAL DISTRIBUTION SYSTEM**

.1 Transformer continuously operate radial or in parallel to supply electrical power to a 27.6 kV, 3 phase, 4 wire, 60 Hz, effectively grounded system, with unbalanced line to line and line to neutral secondary loads.

.2 No-load to the maximum continuous rating

.3 **[Alternate]** No-load to Overload Rating [Limited Time Rating (LTR)]

.4 Transformer continuously operate with unbalanced secondary load conditions as follows:

.1 Unbalanced secondary three phase loads, from balanced to 30% unbalanced

.2 Unbalanced secondary single phase loads which are connected between the transformer secondary line terminal and the transformer secondary neutral terminal, from balanced to 25% unbalanced

2.7 **ELECTRICAL-MAGNETIC INTERFERENCE**

.1 Transformer will not cause interference to television systems, radio systems, telecommunication systems, protection systems, control systems or monitoring systems in excess of the limits specified in CAN/CSA CAN3-C108.3.1.

2.8 **ELECTRICAL POWER TRANSMISSION SYSTEM**

.1 Transformer designed to connect to and continuously operate from a 115 kV electrical power transmission system.

.2 Principal electrical characteristics of the 115 kV electrical power transmission system.

.1 One (1) 115 kV supply circuit from an independent 115 kV transmission circuit.

.2 Voltage characteristics:

- Nominal Voltage Rating = 115 kV (L-L)

- Continuous Operating Voltage Range;
  = 115 kV ,+12 kV, -2 kV (L-L)
  Maximum = 127 kV (L-L)
  Minimum = 113 kV (L-L)

- Limited Long Time Operating Voltage Range, up to 20 hours per day:
  = 115 kV, + 17 kV, - 9 kV (L-L)
  Maximum = 132 kV (L-L)
  Minimum = 106 kV (L-L)

- Limited Emergency Time Operating Voltage Range, up to 8 hours per day:
  = 115 kV, + 25 kV, - 15 kV (L-L)
  Maximum = 140 kV (L-L)
  Minimum = 100 kV (L-L)

.3 Frequency characteristics

- Nominal Frequency Rating = 60 Hz

- Continuous Operating Frequency Range:
  = 60.00 Hz $\pm$ 0.5 Hz

- Limited Long Time Operating Frequency Range, up to 18 hours per day:
  = 60.00 Hz, $\pm$ 1.0 Hz

- Limited Emergency Time, Operating Frequency Range, up to 8 hours per day:

a) 60.00 Hz $\pm$ 1.5 Hz

.4 Electrical System Fault Capacity:

- Infinite bus

2.9 **EXCITATION CURRENT**

.1 Excitation current on the line connected to the transformer primary terminals not to exceed 0.10% at an applied voltage of 100% of rated primary, for each secondary tap position.

.2 Excitation current on the line connected to the transformer primary terminals not to exceed 0.15% at an applied voltage of 110% of rated primary, for each secondary tap position .

.3 Excitation current on the line connected to the transformer primary terminals not to exceed 0.20% at an applied voltage of 115% of rated primary, for each secondary tap position.

2.10 **THROUGH FAULT WITHSTAND CAPABILITY**

.1 Transformer withstand the simultaneous through fault conditions listed in the table. The prefault terminal voltage 1.15 per unit.

Item	Through Fault Condition		
	1	2	3
Primary Terminals (H)	connected to infinite bus	any type of fault	connected to infinite bus (and any type of fault)
Secondary Terminals (X)	any type of fault	connected to infinite bus	connected to infinite bus (and any type of fault)

.2 Transformer through fault protection curve characteristic in accordance with IEEE C57.109 standard, as follows:

.1 Through-fault protection curves for Liquid-Immersed Category III Transformers (5,001 kVA to 30,000 kVA Three Phase) frequent curve and infrequent curve.

.3 Through-fault protection curve applicable to each type of through fault condition for any type of fault.

.4 Transformer withstand the maximum forces due to the first asymmetrical current peaks for each type of through fault condition for any type of fault.

2.11 **STANDARD SOUND LEVEL TYPE**

.1 Transformer sound level around the tank and coolers not to exceed the standard sound levels specified in the CAN/CSA-C88 standard. Standard sound level for ONAN base rating (forced cooling system off), for ONAF rating (1st stage forced cooling system on) and for ONAF rating (2nd stage forced cooling system on). Guaranteed sound level at each rating.

2.12 **[ALTERNATE]**

LOW SOUND LEVEL TYPE

.1 Transformer sound level around the tank and coolers not to exceed the average sound levels specified as follows:

.1 60 dBA sound level at 0.305 m, operating at; transformer base rating (30 MVA), forced cooling system off, at each Load Tap Changer position with an applied voltage of 110% of the rated primary voltage (110% excitation). Guaranteed sound level.

.2 62 dBA sound level at 1.83 m, operating at; 1st stage forced cooling continuous capacity rating of the transformer (40 MVA), 1st stage forced cooling system on, at each Load Tap Changer position with an applied voltage of 110% of the rated primary voltage (110% excitation). Guaranteed sound level.

.3 65 dBA sound level at 1.83 m, operating at; maximum continuous capacity rating of the transformer (50 MVA), 2nd stage forced cooling system on, at each Load Tap Changer position with an applied voltage of 110% of the rated primary voltage (110% excitation). Guaranteed maximum sound level.

2.13 **CAPACITY RATINGS**

.1 Transformer Capacity Ratings (continuous duty):

.1 30/40/50 MVA, three phase, 60 Hz
ONAN/ONAF/ONAF
65°C/65°C/65°C temperature rise, @ maximum ambient temperature 40°C, @ average daily ambient temperature 30°C

.2 Capacity rating of individual winding system

	Capacity (MVA) @ 65°C Temperature Rise		
	ONAN	ONAF	ONAF
Primary Winding (H)	30	40	50
Secondary Winding (X)	30	40	50

.3 Duty: continuous

.4 Temperature rise: 65°C Maximum

.1 At each rated capacity

.2 At 40°C maximum ambient temperature

.3 At 30°C average daily ambient temperature

.5 Number of phases: 3.

.6 Frequency: 60 Hz.

.2 Transformer neutral current rating:

.1 Secondary Winding Neutral System (X0)

.1 Continuous current rating identical to the phase system of the secondary (X) winding

.3 Secondary winding (X), rated for continuous operation with secondary neutral (X0) solidly grounded.

2.14 **VOLTAGE RATINGS, WINDING CONNECTIONS AND WINDING TAPS**

.1 Primary Winding (H)

.1 Nominal rated voltage: 115.5 kV (L-L)

.2 Number of phases: 3

.3 Nominal rated frequency: 60 Hz

.4 Winding connection:

.1 Delta, complete with Delta Break

.2 Secondary winding (X)

.1 Nominal rated voltage: 28 kV (L-L)

.2 Number of phases: 3

.3 Nominal rated frequency: 60 Hz

.4 Winding connection

.1 Wye, with external neutral (X0)

.2 Secondary neutral (X0), externally connected solidly to ground

.3 Secondary Load Tap Changer (LTC)

.1 Location: secondary windings

.2 Number of positions

.1 33 positions;
+ 16 equal positions above neutral position
- 16 equal positions below neutral position
1 neutral position

.3 Secondary voltage regulation

.1 28.000 kV ± 5.600 kV (L-L)

.1 LTC position No. 33: 33.600kV (L-L)

.2 LTC neutral position: 28.000 kV (L-L)

.3 LTC position No. 1: 22.400 kV (L-L)

.2 + 16 equal steps of 350 V each (L-L) above neutral position, full capacity rated

.3 - 16 equal steps of 350 V each (L-L) below neutral position, full capacity rated

.4 Secondary voltage regulation 28.000 kV (L-L) ± 20%, full capacity rated

2.15 TRANSFORMER PRIMARY VOLTAGE REGULATION AND SECONDARY VOLTAGE REGULATION

.1 Provide Power Transformer designed and manufactured to facilitate primary and secondary voltage regulation, by the simultaneous or independent methods as follows;

.1 Variable volts per turn method (variable magnetic flux density method)

and/or

.2 Constant volts per turn method (constant magnetic flux density method)

.2 The On Load Tap Changer located in the secondary windings (X Winding) to facilitate secondary voltage regulation, by the simultaneous or independent methods as follows;

.1 Variable volts per turn method (variable magnetic flux density method)

and/or

.2 Constant volts per turn method (constant magnetic flux density method)

2.16 PERMISSIBLE OVEREXCITATION AND OVERVOLTAGE

.1 Transformer capable of withstanding overfluxing conditions and overvoltage conditions, without any determent and without exceeding the maximum temperature rise 65°C due to the following overvoltage and underfrequency conditions:

.1 Condition No.1: Continuously operate as follows;

- at no load
- the On Load Tap Changer at any position
- the applied continuous primary voltage, 1.20 times the primary voltage rating [1.20 X 115.5kV(L-L) = 138.6kV(L-L)]

- applied continuous system frequency equal to 100% of the rated system frequency
  [1.0 x 60Hz = 60Hz]

- therefore:

  Applied continuous primary voltage = 1.20 times the primary voltage rating

  Applied continuous system frequency = 60Hz

  Corresponding continuous secondary voltage at 60Hz (X Winding);

  - @ tap position No.1 = 1.20 x 22.400kV(L-L)= 26.88kV(L-L)

  - @ tap position No.17 = 1.20 x 28kV(L-L) = 33.6kV(L-L)

  - @ tap position No.33 = 1.20 x 33.600 kV(L-L) = 40.32kV(L-L)

.2 Condition No.2: Continuously operate as follows;

- at no load

- the On Load Tap Changer at any position

- the applied continuous primary voltage, 1.17 times the primary voltage rating [[1.17 X 115.5kV(L-L) = 135.135kV((L-L)

- applied system frequency of 97.5% of the rated system frequency [= 0.975 x 60Hz = 58.5Hz]

- therefore;

  Applied continuous primary voltage = 1.17 times the primary voltage rating

  Applied continuous system frequency = 58.5Hz

  Corresponding continuous secondary voltage at 58.5Hz (X Winding);

  - @ tap position No.1 = 1.17 x 22.400kV(L-L)= 26.208kV(L-L)

  - @ tap position No.17 = 1.17 x 28kV(L-L) = 32.76kV(L-L)

  - @ tap position No.33 = 1.17 x 33.600 kV(L-L) = 39.312kV(L-L)

.3 Condition No.3: Continuously operate as follows;

- at maximum continuous transformer capacity rating, H Winding = 50MVA, X Winding = 50MVA

- the On Load Tap Changer at any position

- the applied continuous primary voltage, 1.19 times the primary voltage rating [1.19 X 115.5kV(L-L) = 137.7445kV((L-L)

- applied continous system frequency of 59.5Hz

- the load power factor = 0.80 lagging

- therefore;

  Applied continuous primary voltage = 1.19 times the primary voltage rating

  Applied continuous system frequency = 59.5Hz

  the On Load Tap Changer at any position

  Corresponding continuous secondary voltage at 59.5Hz (X Winding);

  - from 26.656kV (L-L) to 39.984kV (L-L)

.4 Condition No.4: Continuously operate as follows;

- at maximum continuous transformer capacity rating, H Winding = 50MVA, X Winding = 50MVA
- the On Load Tap Changer at any position
- the applied continuous primary voltage, from 1.0 to 1.19 times the primary voltage rating
- applied continuous system frequency from 59.5Hz to 60.5Hz
- the load power factor = from 0.80 lagging to 1.0 unity
- therefore;

  Applied continuous primary voltage = 1.0 to 1.19 times the primary voltage rating

  Applied continuous system frequency = 59.5Hz to 60.5Hz

  the On Load Tap Changer at any position

  Corresponding continuous secondary voltage from 59.5Hz to 60.5Hz (X Winding);

  - from 26.656kV (L-L) to 39.984kV (L-L)

2.17 **VECTOR RELATIONSHIP**

.1 The transformer vector group

.1 Dyn1

.2 The secondary (X) line to neutral voltage phasor lags 30 degrees behind the primary line to neutral voltage phasor.

2.18 **INSULATION RATINGS**

.1 Primary winding insulation ratings (H1, H2, H3).

.1 Low Frequency, Applied Potential Rating:
- @ 60 Hz for 1 minute
- @ line to ground
= 1.5 x 1.20 x 115.5 kV rms
= 207.9 kV rms (L-GRND)

.2 Low Frequency, Induced Potential Rating (Long Duration):

.1 - for 7200 cycles
- 3 phase, line to line
= 1.7 x 1.20 x 115.5 kV
= 235.62 kV (3 PH, L-L)

AND

.2 - for 1.0 hour
- 3 phase, line to line
= 1.5 x 1.20 x 115.5 kV
= 207.9 kV (3 PH, L-L)

.3 Lightning Impulse Rating (1.2 x 50 microsecond):

.1 Full Wave: 550 kV crest

.2 Chopped Wave: 630 kV crest

.3 Chopped Wave minimum time to flash over: 3.0 microsecond

.4 Front of Wave: 825 kV crest

.5 Front of Wave time to spark over: 0.825 microsecond

.4 Switching Surge Rating: 460 kV crest

.2 Secondary winding (X) insulation ratings, at the line and neutral (X1, X2, X3 and X0)

.1 Secondary windings including the secondary neutral: 35 kV voltage class

.2 Low Frequency, Applied Potential Rating:
- @ 60 Hz for 1 minute
- @ line and neutral, to ground
= 70 kV rms (L-GRND)

.3 Low Frequency, Induced Potential Rating:
- for 7200 cycles
- 3 phase, line to line
= 2 x 1.30 x 28 kV
= 72.8 kV (3 PH, L-L)

.4 Lightning Impulse Rating (1.2 x 50 microsecond):

.1 Full Wave: 200 kV crest

.2 Chopped Wave: 230 kV crest

.3 Chopped Wave minimum time to flash over: 3.0 microsecond

.4 Front of Wave: 345 kV crest

.5 Front of Wave time to spark over: 0.5 microsecond

.5 Switching Surge Rating: 140 kV crest

.3 Primary Line Bushing Ratings (H1, H2, H3)

.1 Voltage classification: 123 kV

.2 Withstand Rating:

.1 Dry
- @ 60 Hz for 1 minute
- @ line to ground
= 280 kV

.3 Lightning Impulse Rating

.1 Full Wave: 550 kV crest

.2 Chopped Wave: 605 kV crest

.3 Chopped Wave minimum time to flash over: 3 microsecond

.4 Switching Surge Rating:

.1 Wet: 460 kV crest

.4 The physical dimensions and clearances at the primary line terminals, external connections to the primary line terminals and external equipment connected to the primary line terminals, designed for a Lightning Impulse rating 550 kV crest and Switching Surge rating 460 kV crest.

.5 Secondary Line and Neutral Bushing ratings (X1, X2, X3, X0)

.1 Voltage Classification: 35 kV

.2 Withstand Rating:

.1 Dry
- @ 60 Hz for 1 minute
- @ line to ground
= 95 kV

.2 Wet
- @ 60 Hz for 10 minutes
- @ line to ground
= 75 kV

.3 Lightning Impulse Rating:

.1 Full Wave: 200 kV crest

.2 Chopped Wave: 220 kV crest

.3 Chopped Wave minimum time to flash over: 3 microsecond

.6 The physical dimensions and clearances at the secondary line terminals, external connections to the secondary line terminals and external equipment connected to the secondary line terminals, designed for a Lightning Impulse rating 200 kV crest

2.19 **IMPEDANCES**

.1 Transformer impedance requirements in accordance with the requirements of CAN/CSA-C88-M standard for continuous parallel operation.

.2 Manufacturers tolerance on specified impedance values: ±7.5%.

.3 Design value for the transformer impedances:

Interwinding Positive Sequence Impedance

$\%Z'_{H-X} = 8.5\%$, @ LTC position No. 17 (neutral position)
, @ 30 MVA base (3 PH)
, @ 115.5kV primary voltage base (L-L)
, @ 28 kV secondary voltage base (L-L)

$\%Z'_{H-X} = 5.90\%$, @ LTC position No. 33 (maximum turn position)
, @ 30 MVA base (3 PH)

, @ 115.5kV primary voltage base (L-L)
; @ 33.6 kV secondary voltage base (L-L)

$\%Z'_{H-X}$ = 13.28% , @ LTC position No. 1 (minimum turn position)
, @ 30 MVA base (3 PH)
, @ 115.5kV primary voltage base (L-L)
; @ 22.4 kV secondary voltage base (L-L)

Interwinding Negative Sequence Impedance

Identical to the positive sequence impedance values.

Winding and Interwinding Zero Sequence Impedance

I Line to Grnd Fault (line to ground fault on the Secondary X) = equivalent to Three Phase Fault Current (rms sym)
, @ 29 kV on secondary X
, @ LTC in neutral position
, @ infinite bus source on primary H
, the secondary neutral X0 solidly grounded (includes the sequence impedance of the transformer)

$\%Z^0$H winding = 50% to 80% , with X winding open circuit
, @ any LTC position
, @ 30 MVA base (3 PH)
, @ 115.5 kV primary voltage base (L-L)

.4 Transformer interwinding positive sequence impedance between the primary terminals (H) to the secondary terminals (X), approximately varying directly with the square of the winding turns ratio over the range of the Load Tap Changer (from the maximum to the minimum primary turns position), as specified herein.

.5 The majority of the transformer equivalent impedance be in the secondary windings (X), with an apparent zero in the primary windings.

2.20 **[ALTERNATE]**

OVERLOAD CAPABILITIES

.1 The transformer system including all its components capable of overload performance in accordance with ANSI/IEEE C57.92 standard.

.2 The transformer system including all its components capable of overload performance in accordance with the Load Profile, Diagram ELSK02. The following requirements apply during the entire time of the load profile;

.1 Overload capability profile for a period of 10 days per year for each year of the life of the transformer, without exceeding a loss of insulation life of 0.2% per day, and without exceeding the maximum permissible hot spot temperatures.

.2 Summer Conditions:

.1 Summer average daily ambient temperature: 30°C

.2 Summer maximum daily ambient temperature: 40°C

.3 Summer daily maximum loading = 1.36 x 50 MVA

= 68 MVA

.3 Winter Conditions

.1 Winter average daily ambient temperature: 5°C

.2 Winter daily maximum loading = 1.6 x 50 MVA

= 80 MVA

.4 Maximum hot spot temperature of windings not to exceed 140°C.

.5 Maximum hot spot temperature of windings, leads, current transformers, metallic components and any other metal in contact with or adjacent to solid insulation not to exceed 140°C at any time during loading per load profile.

.6 Maximum temperature of any metallic component in contact with oil only and not in contact with solid insulation not to exceed 160°C.

.7 Top oil temperature not to exceed 110°C.

.8 The applied primary voltage from the transmission system is assumed constant during the load profile cycle, however it can be any value between 113 to 127 kV (L-L).

.9 The secondary terminal voltage (X) maintained constant at 28 kV during the load profile cycle by adjustment of the secondary load tap changer.

.10 Secondary (X) output carrying the total load profile, at a load power factor of 0.85 lagging, at a secondary terminal voltage 28 kV (L-L).

.3 The transformer designed with all the components, not including the windings and insulated line and neutral leads, for a 200% load (100 MVA) for one hour from a continuous preload of 100% (50 MVA), without exceeding a maximum temperature on any of the components of 180°C at an ambient temperature of 30°C.

2.21 **CHARACTERISTICS**

		Location (per ANSI C57.12.10)	Mounting
.1	Bushings		
.1	Primary (H1, H2, H3)	Segment 3	cover
.2	Secondary (X1, X2, X3)	Segment 1	cover
.3	Secondary Neutral (X0)	Segment 1	cover
.2	Radiators		
.1	Tank mounted radiators		
.1	Tank mounted	Segment 2	wall
.3	Conservator Tank		
.1	With tank mounted radiators	Segment 2	cantilevered from tank
.4	Core grounding	core grounded at one location with lead connected to tank bushing and resistor in cover terminal box	

2.22 **VACUUM**

.1 The complete assembled transformer unit designed to withstand a full vacuum (zero absolute pressure) under the following conditions;

	Condition 1	Condition 2	Condition 3
Transformer main tank system (complete)	Full vacuum	Full vacuum	Filled with oil
Transformer load tap changer system (complete)	Full vacuum	Filled with oil	Full vacuum

.2 The transformer main tank system includes the main tank, radiators, main conservator tank, all parts of the oil circulating system, bushings, through connections, relief vents, and auxiliary devices which penetrate the main tank system.

.3 The transformer load tap changer system includes the LTC tank, LTC conservator tank, all parts of the oil system, through connections, relief vents and auxiliary devices which penetrate the Load Tap Changer system.

2.23 **CONSTRUCTION (GENERAL)**

.1 Welding: Conforming to requirements of CSA W59 Welders, or operators, who perform work, qualified to requirements of CSA W47.1.

.2 Hardware: Hardware, including pipe fittings, tube, tube fittings, studs, tapped holes, nuts and bolts, shall be either imperial or metric. A mixture is not acceptable. In the event metric hardware is supplied, prominent nameplates or signs shall indicate this fact.

.3 Drainage: Drain openings provided in enclosed structures or structural members, to drain off liquids that may accumulate.

.4 High Pressure Wash Withstand: Transformer and associated equipment constructed to allow periodic, live line high pressure wash without any adverse effects.

.5 Gasketted Joints and Seals

.1 To maintain oil-tightness, gasketted joints designed and constructed to ensure even and effective pressure, without overstressing gasket. Outer edges protected by metal-to-metal stops or fire resistant stop-gasket material.

.2 Provide gasketted joints and seals which withstand the continuous operating temperature from -40°C to the maximum temperature during overload operation and withstand all weather condition, with no significant loss of life.

.6 Transformer designed for lifting, hauling and rolling the shipping unit from 0 degrees to 15 degree tilt.

.7 Internal Cleanliness: all internal surfaces including tanks, conservators, chambers, valves, pipes, tubes are to be clean and free from foreign matter, mill scale and oxides.

.8 All electrical conductors, leads, wire to be copper only.

.9 External Wiring System

.1 Provide external wiring system consisting of watertight raceway system: rigid galvanized steel conduit and water tight conduit junction boxes with single conductor wires.

.2 Final run to devices (3 m or less) permitted to be, watertight flexible conduit and wire system or oil resistant, watertight flexible cable.

.3 Provide watertight terminations of raceways or cables to control cabinets, terminal boxes, control panels or devices.

.10 Piping and tubing containing oil to be steel, minimum ¾ NPS size and a minimum steel wall thickness of 2.5 mm.

.11 Grade of steel selected to allow making of joints which do not crack during transportation, lifting and handling on site, or vacuum processing, to a minimum ambient temperature of -40°C.

.12 Fabricated steel, free from distortion.

2.24 **FEATURES AND ACCESSORIES**

.1 Gas detector relay with alarm and trip contacts for gas accumulation and sudden pressure (Bucholz Gas Accumulation and Sudden Pressure unit), for main tank complete with flame protective screen on bleeder valve, indicating shutoff valve and ground level sampling.

.2 Pressure relief devices, self-sealing type (Qualitrol units), with trip and alarm contacts, for main tank and for tap changer tank with mechanical flag and shrouds to direct oil away from control cabinet and controls as per CAN/CSA-C88-M.

.3 Sudden pressure relays (Qualitrol units), self resetting with shutoff valve, operation indicator with seal-in relay with alarm and trip contacts, for main tank and for tap changer tank.

.4 Liquid level indicators (Qualitrol units), magnetic type with low level alarm and trip contacts, for main conservator and for tap changer conservator.

.5 Liquid temperature indicator (Qualitrol units), indicating hand with drag hand for maximum indication and separate field adjustable alarm and trip contacts, for main tank and tap changer tank.

.6 Intelligent Transformer Monitoring system for direct winding temperatures, calculated winding temperatures, main tank oil temperatures, load tap changer temperature, ambient temperature and control of transformer forced cooling system, complete with fiber optic temperature probe system and load current monitoring system of secondary windings (X) via current transformers. Qualitrol type 509 ITM system.

.7 Fiber optic temperature probes.

.8 Main tank, padlockable, open/close indicator valves

.1 Gate valve for removal of all oil and for lower filter press connection

.2 Gate valve with angle needle valve for sampling

.3 Gate valve for upper filter press connection

.4 Gate valve for upper vacuum spray connection

.9 Tap changer tank padlockable, open/close indicator valves

.1 Gate valve with angle needle valve suitable for complete drainage, lower filter press connection and sampling

.2 Gate valve for upper filter press connection

.10 Gas bleeder valves on cover manholes and turrets.

.11 Tank mounted heat detectors (four minimum) wired to terminals in control box. Provide number and location for heat detectors for proper monitoring.

.12 Pressure/vacuum gauge for shipping.

.13 Fault gas and moisture in oil monitoring system, GE Hydran M2, complete with ball valve connection.

2.25 **TRANSFORMER MONITORING AND DIAGNOSTIC SYSTEM**

.1 Provide complete transformer monitoring and diagnostic system.

.2 Provide all programming, integration and installation of complete Transformer Monitoring System (including but not limited to Transformer Monitoring System IED unit, GE Hydran M2 unit and Qualitrol 509 ITM Unit).

.3 Transformer monitoring and diagnostic system consisting of the following;

.1 Multifunction Intelligent Electronic Device (IED), (Identification: IED-1) as follows;

.1 Host communications

.2 Data gathering for other devices (GE Hydran M2, and Qualitrol 509 ITM)

.3 Transformer diagnostic models

.4 Transformer analysis models

.5 Load tap changer monitoring and diagnostic models

.6 Load tap changer maintenance action planner models

.7 Logic algorithms

.8 Input and output consolidation of sensors

.9 Consolidation of system analog and digital inputs and outputs

.10 Input and output interface with sensors

.11 Two redundant remote telemetry signals (Fibre Optic)

.12 Spares;

.1 Two (2) spare analog inputs

.2 Two (2) spare analog outputs

.3 Two (2) spare digital inputs

.4 Two (2) spare digital outputs

.2 Fault gas and moisture in oil monitoring system, GE Hydran M2, as follows;

.1 Continuously measures a composite value of four dissolved gas levels in the transformer oil

.2 Continuously measures oil moisture in the transformer oil

.3 Telemetry interface with IED-1

.3 Telemetry interface between IED-1 and the intelligent transformer monitoring system (Qualitrol 509 ITM)

.4 Sensors

.1 LTC position monitor

.2 LTC temperature sensor (via telemetry interface with Qualitrol 509 ITM)

.3 LTC motor current sensor

.4 Forced cooling system motors current sensors

.5 Transformer top oil temperature sensor (via telemetry interface with Qualitrol 509 ITM)

.6 Ambient temperature sensor

.5 Application Software

.1 Transformer diagnostic and analysis application software

.2 GE Hydran application software

.3 Qualitrol ITM application software

.6 Outdoor cabinet, NEMA type 4, mounted on transformer tank, complete with stainless steel vibration dampers

.4 Patch panels for the interface of two redundant, remote, telemetry signals which are fibre optic and will interface with the IED-1 unit.

.1 Optical Fiber Patch Panel

.1 Two (2) optical fiber patch panels, 6 ST type connectors, multimode 62.5 μm, complete with one meter of plenum cable with male MTP connector and MTP adapter.

.2 Quantity: two.

2.26 **LOAD TAP CHANGER**

.1 Load tap changer (LTC), with automatic adjustment of winding in equal steps above and below rated voltage using vacuum interrupters.

.2 Load tap changer (LTC) features;

.1 Vacuum interrupter type

.2 Maintenance free up to 300,000 operations for specified transformer application

.3 No time based maintenance requirements

.4 No oil carbonization

.5 No oil filtration requirements

.6 No contact replacement requirements

.7 No arcing in the insulating oil

.3 Low temperature lockout relay (Qualitrol unit) to prevent operation of the load tap changer at temperatures below -40°C.

.4 No damage to LTC equipment shall result from drive interruption at any time during course of a tap change operation.

.5 Motor drive circuit shall be designed to “seal-in” after receiving a single raise or lower pules. On a continuous signal, LTC shall make successive steps for duration of signal. Control circuit shall be compatible with LTC automatic voltage regulation system.

.6 The oil in LTC compartment shall be kept separate from oil in main tank. This compartment and LTC conservator shall have relevant features described herein.

.7 The LTC provided with adjustable limit switches, set to limit the travel of LTC to any intermediate range of tap positions.

.8 For information only, the Load Tap Changer control system for independent operation and parallel operation using voltage regulating relay system incorporating main voltage regulator and back-up voltage regulator.

.9 The LTC equipment must be able to resume operation after a power interruption of electrical power supply during the course of a tap changing operation.

.10 The Load Tap Changer control cabinet, NEMA type 4, weatherproof, steel housing, hinged gasketted door, three-point locking mechanism with handle, provision for padlocking.

.11 Tap changer control cabinet, accessible from ground level, containing the following equipment unless noted otherwise:

.1 Mechanical tap position indicator visible through a shatterproof window when manually operating the tap changer.

.2 Mechanical operations counter.

.3 "Raise/Off/Lower" selector switch.

.4 "Local/Remote" selector switch.

.5 "Manual-Automatic" selector switch.

.6 "Normal-Off-Test" selector switch.

.7 Indicator lights for raise and lower.

.8 Time delay relay, adjustable from 0 to 120 seconds.

.9 Out of step relay, indicating light and buzzer.

.10 Relay adjustable from 100% - 200% of full load current, to immediately interrupt the drive, should an overload or fault occur. Manufacturer to set this relay. Motor drive circuit wiring connected to a pair of terminals to facilitate remote tapchanger blocking by others.

.11 Facility for remote "Raise/Off/Lower" selector switch.

.12 Facility for remote operation and remote position indication off-site through SCADA system.

.13 Facility for remote position indicator.

.14 Motor drive circuit designed to "seal-in" after receiving a single raise or lower pulse. On a continuous signal, tapchanger makes successive steps for duration of signal.

.15 Door actuated light, rated 120 V ac.

.16 Thermostatically controlled anti-condensation heater.

.12 Electrically separate alarm and trip contacts wired to control cabinet for:

.1 Tap changer jammed.

.2 Tap changer - upper limit.

.3 Tap changer - lower limit.

.4 Tap changer trouble.

.5 Tap changer overpressure switch.

.6 Loss of tap changer motor voltage.

.7 Loss of tap changer control voltage.

.13 Wire control devices to terminal blocks for remote controls and monitoring.

.14 Acceptable manufacturers

.1 Reinhausen Manufacturing, type VACUTAP VM

2.27 **TANK**

.1 Steel enclosure on skids arranged for movement in any of 4 directions. Pulling eyes near tank base located to permit skidding transformer and slewing through an angle of 90 degrees.

.2 Lifting points for hoisting the transformer completely assembled and filled with oil. The lifting points also located at the bottom and provided with sling guides. Lifting points at the top located below the top cover main joint.

.3 Four jacking steps each with capacity for lifting one-half the weight of completely assembled transformer filled with oil.

.4 Jacking step, vertical clearance of 360 mm from underside of step to bottom of transformer base.

.5 Location of jacking step permit the use of two jacks per jacking step, without interfering with the transformer base, shipping skids, the placement of blocking plates or the placement of roller units. Base dimensions of each jack, 300 mm x 300 mm. Minimum free surface area of each jacking step, 150 mm x 510 mm.

.6 Hauling eyes, two on each face of the base skid (total quantity of eight), each pair equidistant from transformer centre of gravity, each hauling eye capable of pulling 10% of completely assembled and oil-filled transformer mass.

.7 Provide four blocking areas, periphery of transformer base, sufficient strength for safe blocking of full assembled and oil-filled transformer by means of stacked steel plates. Blocking areas identified on drawings and marked on transformer base. Total blocking area of 35 cm^2 per megagram of transformer mass.

.8 Transformer base, reinforced to permit moving the fully assembled and oil-filled transformer on rollers. Permit rolling parallel to the two axis of the transformer.

.9 Transformer designed, such that fully assembled unit with or without oil can be tilted 15 degrees and rolled.

.10 Cover: welded to tank, non-skid surface, sloped to shed water, with four lifting lugs.

.11 Center of gravity for "shipped" condition permanently marked on sides of tank close to baseplate. Marking by means of letter stamps in steel, having a letter size of 20 mm the "as shipped" center of gravity "CGS" highlighted by a red arrow. Center of gravity of fully assembled and oil-filled tank marked in a similar manner with mark "CGA" and highlighted with a black painted arrow. Both marks on all 4 sides of transformer.

.12 Manholes, bushings and other openings in transformer with flanges raised minimum of 10 mm, to accommodate bolts with nuts. Threaded studs welded to tank are not acceptable.

.13 Provision for replacement of bushing type current transformers without removing tank cover.

.14 Handholes and manholes in suitable locations to afford access to terminal boards, current transformers and lower ends of bushings. Lifting eyes on manhole covers.

.15 Provision for removable safety guardrail.

.16 Ladder with barrier and padlock facility.

.17 Filling plug (50 mm dia.) in cover.

.18 Each manhole shall be of sufficient size to permit entry of a 465 mm diameter sphere.

.19 Transformers provided with a welded joint in the top of the tank for removal of core and coils. Welded joints provided with flanges to permit repeated opening and rewelding.

.20 On tank covers, a raised flange welded for purposes of mounting a pressure sensing element and pressure relief element.

.21 Interior surfaces primed and painted white.

2.28 **RADIATORS AND CONSERVATOR TANK**

.1 Radiators designed for tank mounting or free-standing remote mounting on a concrete foundation with interconnecting pipe to main tank. Location of radiators as specified herein.

.2 Radiator flanges with gaskets, bolted to flanged headers welded onto tank wall.

.3 Tank headers equipped with built-in valves, with position indicating handles, to permit removal of radiators without removal of oil from tank.

.4 Valves with handles, which clearly indicate the position of the valve. These valves shall have provision for padlocking.

.5 Radiators suitable for vacuum oil filling.

.6 Each radiator shall have NPS 1 solid brass plugs at the top and at the bottom for venting and draining.

.7 Each conservator and radiator equipped with suitable lifting eyes so that it can be lifted into, or out of, its installed location (when empty of oil) by means of a crane.

.8 Provide oil conservator mounted on the main tank. The conservator is to be supplied complete with mounting saddles of box type construction suitably drilled for bolting to support structure on the main tank.

2.29 **OIL CONSERVATOR TANKS**

.1 Each transformer shall be provided with 2 conservator tanks; 1 for the main tank and 1 for tap changer.

.2 Provide in each conservator tank, a transformer conservator membrane air-bag, compatible with transformer oil, abrasion resistant, extremely flexible and high temperature rated.

.3 Conservator tanks shall breath through independent maintenance-free silica gel breathers, which shall be readily accessible to a man standing on the ground. Breathers shall have oil filled traps. Breather pipes shall be designed to permit capping near tank. Breathers shall be designed so that silica can be easily replaced.

.4 Conservator tanks shall be sloped 25 mm so that a drain valve with a brass plug is at lowest point and connecting pipe with a gate valve and position indicator is at highest point. Connecting pipe shall project at least 25 mm into the conservator tank.

.5 Conservator tanks shall have 1 capped valve suitable for filling.

.6 Conservator tanks shall have lifting eyes, manholes suitable for cleaning and inspection, and shall be rated for full vacuum.

2.30 **CORE AND WINDINGS**

.1 Transformer core shall be grounded at 1 point. Core ground connection shall be brought through tank by a bushing (1 kV minimum rating) and connected to ground through a resistor of 250 to 500 ohms and of 25 watts minimum rating. Bushing and resistor assembly enclosed in its own weatherproof compartment.

.2 Cores clamped and braced to resist distortion caused by short circuit stresses or transportation handling. Nuts and bolts of clamping structures secured so that they will not be loosened by vibration incident to transportation and operation.

.3 Suitable lifting attachment shall be provided for untanking core and coils with a minimum of head room. Design and location of lifting points such as to preclude distortion of core or damage to the core bolt insulation under lifting stresses. Lifting stress shall not be transferred between top and bottom core clamps through core iron.

.4 Winding insulation material shall be paper.

.5 Winding spacers manufactured from pre-compressed transformer board.

.6 Windings: circular design with concentric coil placement.

.7 Copper conductors only.

.8 Core: stacked, high-quality grain-oriented silicon steel laminations, circular core shape, utilizing step lap and fully mitered principals.

2.31 **ELECTRICAL CONNECTIONS**

.1 With the following exceptions, joints shall be made by compression connection, welding or brazing. If brazing, filler metal shall conform to AWS A5.8.

.2 Joints shall be made by bolted connection for those joints, which must be disconnected to permit untanking of core and coil assembly.

.3 Joints may be made by bolted connection for tap changer terminations.

.4 Bolted connections shall have double locking on fasteners, and be located to permit inspection without untanking the core and coil assembly.

2.32 **FORCED AIR COOLING**

.1 Two Stage Cooling

.1 Two stage forced cooling to increase the output capacity of the naturally ventilated unit.

.2 Each stage of forced cooling sub-divided into separate and independent groups of cooling such that the failure of any one individual group of fans will only reduce the forced cooled output capacity at any stage by no more than 33%.

.3 The fan units each consisting of integral unit of motor-fan-guard. Motor is, totally enclosed, weatherproof, squirrel cage,. Galvanized steel guard, guard slots prevent accidental contact. Guards shall comply with the latest requirements of the OHSA regulations.

.4 Mount fan units on anti-vibration supports. Mounting of fan units on top of radiators is not acceptable.

.5 Each fan group serviced by combination of circuit breaker (with auxiliary status contact), overload relay (with auxiliary alarm contact) and starter (with auxiliary status contact). Wire auxiliary contacts to terminal blocks.

.6 The forced air cooling system equipped with protection and control device and relays for manual and automatic control of each stage of forced air cooling.

.7 Motor leads connected through watertight flexible plug-in connectors for the last 3.0 m.

.8 Each fan unit identified by permanent tag with corresponding tagging at terminal blocks and associated combination starter.

.9 Fan Failure Alarm System

.1 Provide a fan failure monitoring system for each cooling stage which monitors for the following conditions but initiate one general alarm condition for each stage;

.1 Circuit breaker which supply the individual fan group is open or tripped open

.2 Fan group fails in operation when required to operate by the control system

.2 Provide quantity two remote alarm contacts per general alarm.

.3 This general alarm contact is in addition to the auxiliary contacts specified.

2.33 **TRANSFORMER CONTROL CABINET**

.1 Control cabinet, NEMA type 4, dust tight, rain tight, sleet proof, gasketted doors, hinged on the vertical edge, three point latching with door handle, padlockable in the closed position with padlock hasps.

.2 Door swings open 180 degrees, clear of any obstructions on the transformer, latching in the open position.

.3 Control cabinet mounted on support channels, channels mounted on the transformer tank.

.4 Interior, stand-off stud mounted removable back and side mounting plate, mounting plate for mounting devices and components, white mounting plates.

.5 Interior painted with anti-condensation coating. Interior white.

.6 Control cabinet at a height readily accessible to an operator standing at base level.

.1 Cabinet to house the following equipment:

.1 Breather.

.2 Pressure type terminal blocks for ground, protection, control and auxiliary circuits plus fifteen percent spares. Shorting type CT terminals. CT terminals shall have two screws per terminal.

.3 Disconnect switch, starters and control equipment, including manual/automatic selector switch for cooling fans.

.4 Two independent thermostatically controlled anti-condensation heater systems (120 VAC). Each heater to be powered from separate sources.

.5 Duplex, ground fault interrupter type, convenience receptacle rated 120 VAC.

.6 Door activated fluorescent light complete with outdoor ballast rated 120 VAC.

.7 Terminals for two independent 240/120VAC, 1Phase – 3Wire power supplies and two independent 125 volt DC supplies.

.8 Removable plate at the bottom of the cabinet for incoming and outgoing cables.

.9 Protection, control and communication devices with electrically separate contacts wired to terminal blocks.

.10 Both sides of wires identified with Electrovert type Z markers.

.11 Silver plated copper ground bus, 25 x 6 x 450 mm, tapped with screws

.12 Isolation switches

.13 Terminals to be non brittle - Phoenix CONTACT DIN rail mounted terminals or equivalent.

2.34 **OUTLET BOXES FOR LEADS**

.1 Water tight, hinged covered, gasketted, outlet box with oil drain hole located at the bottom.

2.35 **CURRENT TRANSFORMER LEADS AND OUTLET BOX**

.1 Secondary current transformer lead wired through outlet boxes and raceway system to transformer control cabinet.

.2 Current transformer connections made at current transformer, at each side of component which passes through the oil compartment to the outlet box.

.3 Crimped connections for current transformer leads.

.4 Each current transformer tap wired to the transformer control cabinet, terminate on a shorting current transformer terminal block.

2.36 **BUSHINGS AND CONNECTORS**

.1 General

.1 To CSA Standards

.2 Porcelain

.3 Current rating of primary phase (H), not less than 200% of 50 MVA rating

.4 Current rating of secondary phase (X) and neutral (X0) not less than 200% of 50 MVA rating

.2 Primary winding bushings

.1 H1, H2, H3 bushing, oil filled, condenser type, magnetic oil level indicator, indicator legible to personnel standing on grade. Voltage tap for connection to bushing potential device

.2

.3 Bushings shall have threaded studs without terminal connections.

.4 Bushings shall conform to CSA standards.

.5 Bushings shall be wet process porcelain with the following colour:

.1 ANSI Grey

.6 Bushings shall be capable of withstanding full vacuum imposed on main tank during filling.

.3 Secondary (X) winding bushings

.1 X1, X2, X3 bushing, spade type terminals, standard NEMA 4 hole drilling.

.2 X0 bushing mounted on top of transformer to facilitate connection to ground via cable. X0 bushing shall have threaded studs without terminal connection.

.3 Bushing, dry type

.4 Bushings shall be capable of withstanding full vacuum imposed on main tank during filling.

2.37 **BUSHING CURRENT TRANSFORMERS**

.1 Refer to drawing ELSK01 for current transformer number, ratios and accuracy classes.

.2 Bushing current transformer requirements:

.1 Connect to #10 AWG size conductors and terminate in terminal blocks in control cabinet. Terminal blocks of double clamp type (2 screws at each end), complete with test pins, shorting lines and test links.

.2 Wiring with wire numbers at points of termination including terminal boards where leads exit main tank.

.3 Bushing current transformer for revenue metering to be approved by Measurement Canada.

.4 Bushing current transformer to have a minimum continuous current factor 2.0 at each tap position.

.5 Current transformers windings, tapped sections uniformly distributed around the core.

2.38 **BUSHING POTENTIAL DEVICE**

.1 Bushing potential device located in the vicinity of a bushing. Connection to bushings via shielded weatherproof cable with bending radii greater than 180 mm.

.2 Bushing potential device connected to provide the voltage outputs shown on the drawing. Adjustments for reactance, ratio and power factor. Protective spark gap and grounding switch, which may be closed for, short periods to remove voltage from the potential device during inspection and adjustment.

.3 Bushing potential device located in a weatherproof housing, hinged gasketted door, three-point locking mechanism with handle, lifting eyes, provision for padlocking and complete with heater. All terminals wired to transformer control cabinet.

.4 Bushing potential device mounted on support channels, which are mounted on the tank.

.5 Acceptable Unit

.1 Asea Brown Boveri, type PBA2

.2 Or approved equal

2.39 **RATING/DESCRIPTIVE PLATE**

.1 Provided rating/descriptive plates for the following;

.1 Transformer

.2 Load tap changer

.3 Bushing current transformers

.4 Transformer insulating oil

.5 Primary and secondary bushings

.6 Capacitive bushing voltage device

.2 Stainless steel metal rating plate engraved or etched so that character and line depths are 0.5 mm minimum.

2.40 **SURGE ARRESTERS**

.1 Surge arresters, polymer housing, insulated sub base with discharge counter for each arrester located for reading by personnel standing on grade elevation and spade type line terminal with standard NEMA 4 hole drilling.

.2 Supports at main tank arranged for arrester top at same elevation as secondary bushing top.

.3 Acceptable surge arrester manufacturers:

.1 General Electric, Tranquell XE

.2 Ohio Brass, DynaVar

2.41 **SECONDARY LINE SURGE ARRESTER**

.1 Class: Station Class.

.2 Type: Gapless, metal-oxide.

.3 Maximum Continuous Operating Voltage Rating: 19.5 kV rms

.4 Maximum Discharge Voltage (8 x 20 microsecond current wave):

.1 @ 10 kA
= 60 kV crest

.2 @ 20 kA
= 67.3 kV crest

.3 @ 40 kA
= 77.1 kV crest

2.42 **FINISH**

.1 Transformers and components shall be thoroughly cleaned and painted with at least 2 coats of corrosion inhibiting primer and at least 2 finish coats.

.2 Interior shall be finished in oil resistant white. Exterior shall be finished in oil resistant light gray, ANSI No. 70 with an overall dried thickness of at least 0.076 mm.

.3 Transformer paint shall conform to EEMAC-Y1-2.

.4 Spray cans with equivalent volume of 5L of touch-up paint shall be provided for each transformer.

2.43 **OIL**

.1 Provide transformer insulating oil for filling the complete transformer assemblies to the required oil level.

.2 Oil to comply with CSA C50 standard.

.3 Provide oil with oil inhibitor.

.4 Ensure that oil is free of PCB contaminants (less than 2 ppm).

.5 Do not ship oil to Owner unless a PCB certificate is issued.

.6 Take samples from each tanker or tank car at point of delivery. Samples tested in accordance with ASTM Standards. Any oil not meeting the requirements of the standard for new oil will not be accepted. Oil samples made available.

.7 Take samples from transformer 24 hr after filling the unit on site. Samples tested in accordance with ASTM Standards. Any oil not meeting the requirements of the standard for new oil will not be accepted.

.8 Provide identification and descriptive nameplate for the transformer insulating oil permitted to be used mounted adjacent the transformer rating plate.

2.44 **IMPACT RECORDER**

.1 For shipment, install impact recorders. Include instructions for examining and interpreting results of impact record.

2.45 **SPARE PARTS**

.1 One set of spare gaskets, for each transformer, for all bushings, handhole covers and openings. Ship gaskets with transformer.

2.46 **LOSS EVALUATION AND LIQUIDATED DAMAGES**

.1 Guarantee losses quoted in Appendix "ED".

.2 Failure to meet guaranteed losses for each transformer shall require reimbursement to the Owner for the amount equal to the difference between guaranteed and actual loss evaluation at ONAN 65°C rating. Reimbursement to Owner calculated on following basis:

.1 Total evaluated cost based on actual losses = A

.2 Total evaluated cost based on guaranteed losses = B

.3 Amount to be reimbursed to Owner = (A-B)

.3 Cost of losses calculated on following basis:

.1 Tap position on normal tap 215.5 kV

.2 Transformer load 75 MVA, ONAN 65°C rise

.3 Cooling equipment losses neglected

.4 No load loss evaluation cost $5000 per kW

.5 Load loss evaluation cost $2800 per kW

.4 Transformers bid evaluation to be calculated on following basis:

.1 Total evaluated cost = Tender Price

+ (guaranteed No Load Losses x $5000/kW)

+ (guaranteed Load Losses x $2800/kW)

2.47 **SOURCE QUALITY CONTROL**

.1 **[Alternate]**

Test for Loading Beyond Rated MVA

.1 This test (heat run) shall simulate loading during the emergency period shown in the Load Profile. The test shall be performed for summer conditions. Top oil temperature corresponding to the preload conditions for the summer profile shall first be established. Then, starting from the first peak load the test shall be performed for a minimum duration of 26 hours. The manufacturer may shorten the total duration by eliminating the run for 7 hours at 1.2 pu. Two (2) oil samples

shall be taken before the test, two (2) after the one-hour peak load and two (2) at the end of the test (4 hours after the last shutdown). One of each of these samples (or more) shall be sent to an outside laboratory for gas-in-oil analysis. Thermocouples shall be placed on tie plates and end frames in what is estimated to be the highest temperature spots to confirm maximum temperature values. Temperature scanning shall be performed to measure outside surface temperatures during the tests. Two shutdowns shall be done during this test on the highest temperature winding, the first after the one-hour peak loading and the second after the two-hour peak loading.

.2 This test shall be done prior to any dielectric tests.

.3 The test shall be performed on the first transformer manufactured.

.4 The manufacturer shall provide, within six months after notification of award of contract, a proposed test sequence and the calculated temperatures of winding hot spot, coil end leads, tie plate and end frame during the load cycle to the load profile.

.5 Results of the gas-in-oil analysis are to be made available before shipment of the transformer. Gas-in-oil analysis performed in accordance with ANSI/IEEE C57.104.

.2 Factory Tests: shall include but not be limited to the following:

.1 Point-to-point wiring verification tests.

.2 High potential test on wiring, with solid state equipment disconnected at 1500 V, 60 Hz, for 1 minute.

.3 Full functional test of equipment from the panel terminals with external equipment and interlocks simulated.

.4 Relay testing and calibrating.

.5 Configuring relays to conform with the specified sequence of operation.

.3 Test equipment at factory to determine performance and operating characteristics and whether specified requirements have been met. Execute tests called for in ANSI/IEEE C57.12.90 and CAN/CSA-C88-M and the following:

.1 Resistance measurements of windings on all taps

.2 Ratio tests

.3 Polarity and phase relationship tests

.4 Excitation current and no load loss measurements

.5 Impedance and load loss measurements

.6 Applied potential tests

.7 Induced potential tests

.8 Tank and cooling system pressure tests

.9 Operational tests for all devices. Initiate fans and alarms by heating temperature gauges, injecting gas pressure, etc.

.10 Insulation tests on auxiliary devices and wiring

.11 Core insulation tests

.12 Measurement of losses of auxiliary devices

.13 Temperature rise test

.4 Lightning impulse tests and switching impulse tests, for each transformer, on all terminals of all windings, including neutrals, with a full sequence of tests, including one reduced full wave, two chopped waves and one full wave.

.5 Insulation dissipation factor or power factors tests on all windings in accordance with method 2 of ANSI C57.12.90 after transformer is completely assembled and filled with oil. Power factor measured in the range of from 20°C to 30°C not to exceed 0.5% when test results are corrected to 20°C.

.6 Perform core insulation resistance test at a minimum of 1000V with required results greater than 100 Megohm.

.7 Test current transformers for ratio, polarity, phase angle, internal resistance, saturation characteristics and insulation resistance.

.8 Apply three-phase power at 115.5 kV to bushings and adjust bushing potential devices for power factor, phase angle and voltage using the manufacturers adjustment procedure. Record settings of all adjustments in the factory Test Report.

.9 Load Tap Changer

.1 Test the LTC unit and control equipment.

.2 Function test the LTC:

.1 Switching test at full current, operated through the entire tapping range. Graphical record of currents in all three phases during each operation.

.2 Switching test at full voltage, operated through the entire range. Graphical record of voltage and magnetizing current in all three phases during each operation.

.10 Sound level test in accordance with CAN/CSA-C88-M.

.11 Perform gas in oil analysis before and after test program in accordance with ANSI/IEEE C57.104.

.12 Calibrate temperature gauges and devices, including transducers, against known standards.

.13 Immediately prior to shipment and after loading on transport vehicle, perform the following tests:

.1 If shipped in dry air or nitrogen, measure dew point of shipping gas and ensure that it is below -40°C.

.2 Measure core insulation at 1000 volts and correct reading to 20°C.

.3 Install impact recorder as specified herein.

.14 Perform witness testing in presence of Owner and Owner's Inspector for the following for each unit:

.1 Applied and induced potential tests.

.2 Lightning impulse tests and switching impulse tests.

.3 Heat run test.

3 Execution

3.1 **[ALTERNATE]**

INSTALLATION

.1 Receive equipment, off-load, install on foundations, complete assembly of units and associated systems, test and commission, and energization, including the following:

.1 Examine and interpret impact recorder results prior to unloading and after placing on pad.

.2 Visual inspection to ensure that there is no damage resulting from shipment. Report damage to Owner's Representative immediately.

.3 Assemble transformers, with cooling radiators, fans and controls, bushings, surge arresters, accessories and ancillary equipment and wiring as necessary to make transformer fully functional. Lower oil level as required to install bushings.

.4 Verify that alarm, control, and trip settings on temperature indicators are as specified.

.5 Verify that cooling fans operate correctly and that fan motors have correct overcurrent protection.

.6 Verify operation of all alarm, control, and trip circuits from temperature and level indicators, pressure relief devices, and sudden pressure relays.

.7 Verify correct liquid level in all tanks and bushings.

.8 Verify correct operation of "load tap changer”.

.9 Verify operation of nitrogen gas system.

.10 Measure core insulation at 1000V and correct reading to 20°C.

.11 Test oil prior to adding same to transformer.

.12 Touch-up damaged paintwork.

.13 Should the transformer to shipped without oil, the installation services shall include vacuum filling and degasification.

.2 Test and commission the Transformer Monitoring System.

.3 Submit a test report confirming that the transformers are in good working condition, ready for testing by an independent testing company, when all external control wiring is completed.

.4 Perform the testing and commissioning of the units by the independent testing company. Submit a testing and commissioning report confirming that transformers are in good working condition and ready for energization.

.5 Test and commission the Load Tap Changer.

.6 Testing and commission the transformer per the requirements of the manufacturers and the NETA ATS standard. The applicable section of the NETA ATS standard apply as follows:

.1 Transformers

.2 Protective relays

.3 Instrument transformers

.4 Regulating apparatus

.5 Surge arresters

.6 Reactors

.7 Telemetry

.8 System function tests

.7 Acceptable companies are:

.1 Testing and Commissioning Companies:

.1 Siemens – Technical Services

.2 Eaton – Engineering Services

.3 K-Tek-Electro Services Limited

End Of Section

PL/

1.1 **INSTRUCTIONS**

.1 This information, filled out in full, is required with submission of Tender. Failure to supply all information will be cause for rejection of Tender. Check Yes or No, or enter data.

		Yes	No	Data
1.2	**GENERAL INFORMATION**			
.1	Submittals with tender (per Section 26 05 03)	_____	_____	
.2	Predesign review meetings at IBI Group office in Toronto, Ontario	_____	_____	
.3	Equipment built to Quality Assurance Program ISO9001	_____	_____	
.4	Transformer nameplate bear certification mark or label acceptable under Ontario Electrical Safety Code	_____	_____	
.5	Transformer;			
.1	Manufacturer			_____
.2	Manufacturing plant			_____
1.3	**GENERAL DESIGN INFORMATION**			
.1	Transformer capable of full vacuum oil filling	_____	_____	
.2	Transformer capable of being tilted to 15 degrees	_____	_____	
.3	Transformer capable of high pressure wash	_____	_____	
.4	Each stage of forced cooling system sub-divided into separate independent groups such that failure of any individual group will reduce forced air cooling capacity by no more than 3 MVA	_____	_____	
1.4	**MODES OF OPERATION**			
.1	Transformers continuously operate in the modes of operation, specified in Section 26 12 06, article "Modes of Operation"	_____	_____	
1.5	**TRANSFORMER OUTPUT SUPPLY**			
.1	Transformers continuously operate to supply 3 phase, 4 wire unbalanced loads as specified in Section 26 12 06, article "Transformer Output Supply to the Secondary Electrical Distribution System	_____	_____	

		Yes	No	Data
1.6	**PERMISSIBLE OVEREXCITATION AND OVERVOLTAGE**			
.1	Transformers capable of operations as specified in Section 26 12 06, article "Permissible Overexcitation and Overvoltage"	_____	_____	
.2	Transformer continuous overexcitation and overvoltage ratings			
	- @ no load - @ any tap position			
	.1 Maximum overvoltage rating (p.u.)			_____
	.2 Maximum Volts/Hertz rating (p.u.)			_____
	.3 Minimum underfrequency rating (p.u.)			_____
.3	Transformer continuous overexcitation and overvoltage ratings			
	- @ maximum continuous capacity 50 MVA - @ any tap position - @ load power factor, 0.80 lagging to 0.90 lagging			
	.1 Maximum overvoltage rating (p.u.)			_____
	.2 Maximum Volts/Hertz rating (p.u.)			_____
	.3 Minimum underfrequency rating (p.u.)			_____
1.7	**[ALTERNATE]**			
	OVERLOAD CAPABILITIES			
.1	Transformers capable of overload capabilities as specified in Section 26 12 06, article "Overload Capabilities"	_____	_____	
.2	Wires and devices immersed in oil capable of operating at the maximum oil temperature without any loss of life	_____	_____	
1.8	**TRANSFORMER INFORMATION AND RATINGS**			
.1	Oil immersed, conservator type liquid preservation system	_____	_____	

			Yes	No	Data
	.2	Continuous Rated Capacity; @ maximum ambient temperature 40°C @ average daily ambient temperature 30°C			
		.1 ONAN, 65°C temperature rise (MVA)			_____
		.2 ONAF, 1st stage, 65°C temperature rise (MVA)			_____
		.3 ONAF, 2nd stage, 65°C temperature rise (MVA)			_____
	.3	Number of phases (ex. 3)			_____
	.4	Rated frequency (Hz)			_____
	.5	Primary winding configuration (ex. Delta)			_____
	.6	Primary winding complete with Delta Break	_____	_____	
	.7	Secondary (X) winding configuration (ex. Wye with external secondary neutral)			_____
	.8	Vector relationship (ex. Dyn1)			_____
	.9	Secondary line to neutral voltage phasor lags 30 degrees behind the primary line to neutral voltage phasor	_____	_____	
1.9		**PRIMARY WINDING INFORMATION AND RATINGS**			
	.1	Primary winding rated voltage (kV L-L)			_____
	.2	Primary winding insulation rating (H1, H2, H3),			
		.1 Primary winding insulation, continuous voltage rating;			
		.1 Phase to phase (kV)			_____
		.2 Phase to ground (kV)			_____
		.2 Low frequency, applied voltage rating (kV)			_____
		.3 Low frequency, induced voltage rating;			
		.1 7,200 cycles (kV)			_____
		.2 1.0 hour (kV)			_____
		.4 Lighting impulse rating;			
		.1 Full Wave (kV)			_____
		.2 Chopped Wave (kV)			_____
		.3 Front of Wave (kV)			_____
		.5 Switching surge rating (kV)			_____

				Yes	No	Data
1.10		**SECONDARY WINDING INFORMATION AND RATINGS**				
	.1	Secondary winding rated voltage (kV L-L)				_____
	.2	Secondary winding insulation rating (X1, X2, X3 and X0)				
		.1	Secondary winding, insulation, continuous voltage rating;			
			.1 Phase to phase (kV)			_____
			.2 Phase to ground (kV)			_____
		.2	Low frequency, applied voltage rating (kV)			_____
		.3	Low frequency, induced voltage rating (kV)			_____
		.4	Lighting impulse rating;			
			.1 Full Wave (kV)			_____
			.2 Chopped Wave (kV)			_____
			.3 Front of Wave (kV)			_____
		.5	Switching surge rating (kV)			_____
	.3	Secondary neutral operate continuously grounded		_____	_____	
	.4	Secondary neutral continuous current rating identical to secondary phase		_____	_____	
1.11		**LOAD TAP CHANGER (LTC)**				
	.1	Manufacturer				Reinhausen
	.2	Type				_____
	.3	Location of LTC (ex. secondary windings)				_____
	.4	Number of positions				
		.1	Total			_____
		.2	Number of equal positions above neutral			_____
		.3	Number of equal positions below neutral			_____
		.4	Full capacity rated at each position	_____	_____	
	.5	Secondary voltage regulation				
		.1	Neutral position voltage rating (kV)			_____
		.2	Regulation above neutral, @ full capacity (kV)			+ _____

			Yes	No	Data
	.3	Regulation below neutral, @ full capacity (kV)			- _____
	.4	Voltage per step (kV)			_____
.6		Lifetime operation rating at transformer full load current			_____
.7		Maintenance interval (years)			_____

1.12 **[ALTERNATE]**

PERFORMANCE INFORMATION, HIGH EFFICIENCY - LOW SOUND LEVEL TYPE UNIT

.1 Estimated voltage regulation;

- @ 85°C
- @ 115.5 kV applied primary voltage
- @ 28 kV tap position
- @ 30 MVA load

.1	Load power factor 1.0 (%)	_____
.2	Load power factor 0.9 lagging (%)	_____
.3	Load power factor 0.85 lagging (%)	_____

.2 Estimated efficiency;

- @ 85°C
- @ 115.5 kV applied primary voltage
- @ 28 kV tap position
- @ 30 MVA load
- @ load power factor 0.9 lagging

.1	100% load (%)	_____
.2	75% load (%)	_____
.3	50% load (%)	_____

.3 Guaranteed losses;

- @ 85°C
- @ 115.5 kV applied primary voltage
- @ 100% excitation
- @ 28 kV tap position
- @ 30 MVA load

.1	No load losses (kW)	_____
.2	Load losses (kW)	_____
.3	Total losses (kW)	_____

.4 Estimated losses;

- @ 85°C
- @ 115.5 kV applied primary voltage

			Yes	No	Data
-	@ 100% excitation				
-	@ 28 kV tap position- @ 30 MVA load				
	.1	No load losses (kW)			_____
	.2	Load losses (kW)			_____
	.3	Total losses (kW)			_____
.5	Guaranteed sound level;				
-	@ 85°C				
-	@ 110% excitation at each tap position				
	.1	30 MVA, ONAN, 65°C temp. rise rating (dBA)			_____
	.2	40 MVA, ONAF, 65°C temp. rise rating (dBA)			_____
	.3	50 MVA, ONAF, 65°C temp. rise rating (dBA)			_____
.6	Estimated sound level;				
-	@ 85°C				
-	@ 110% excitation at each tap position				
	.1	30 MVA, ONAN, 65°C temp. rise rating (dBA)			_____
	.2	40 MVA, ONAF, 65°C temp. rise rating (dBA)			_____
	.3	50 MVA, ONAF, 65°C temp. rise rating (dBA)			_____

1.13 **PERFORMANCE INFORMATION, STANDARD EFFICIENCY - STANDARD SOUND LEVEL TYPE UNIT**

.1	Estimated voltage regulation;				
-	@ 85°C				
-	@ 115.5 kV applied primary voltage				
-	@ 28 kV tap position				
-	@ 30 MVA load				
	.1	Load power factor 1.0 (%)			_____
	.2	Load power factor 0.9 lagging (%)			_____
	.3	Load power factor 0.85 lagging (%)			_____
.2	Estimated efficiency;				
-	@ 85°C				
-	@ 115.5 kV applied primary voltage				
-	@ 28 kV tap position				
-	@ 30 MVA load				

			Yes	No	Data
-	@ load power factor 0.9 lagging				
	.1	100% load (%)			_____
	.2	75% load (%)			_____
	.3	50% load (%)			_____
.3	Guaranteed losses;				
-	@ 85°C				
-	@ 115.5 kV applied primary voltage				
-	@ 100% excitation				
-	@ 28 kV tap position				
-	@ 30 MVA load				
	.1	No load losses (kW)			_____
	.2	Load losses (kW)			_____
	.3	Total losses (kW)			_____
.4	Estimated losses;				
-	@ 85°C				
-	@ 115.5 kV applied primary voltage				
-	@ 100% excitation				
-	@ 28 kV tap position				
-	@ 30 MVA load				
	.1	No load losses (kW)			_____
	.2	Load losses (kW)			_____
	.3	Total losses (kW)			_____
.5	Guaranteed sound level;				
-	@ 85°C				
-	@ 110% excitation at each tap position				
	.1	30 MVA, ONAN, 65°C temp. rise rating (dBA)			_____
	.2	40 MVA, ONAF, 65°C temp. rise rating (dBA)			_____
	.3	50 MVA, ONAF, 65°C temp. rise rating (dBA)			_____
.6	Estimated sound level				
-	@ 85°C				
-	@ 110% excitation at each tap position				
	.1	30 MVA, ONAN, 65°C temp. rise rating (dBA)			_____
	.2	40 MVA, ONAF, 65°C temp. rise rating (dBA)			_____

			Yes	No	Data
	.3	50 MVA, ONAF, 65°C temp. rise rating (dBA)			_____
1.14		**EXCITATION CURRENT**			
	.1	100% excitation at any tap position, 30 MVA base (%)			_____
	.2	110% excitation at any tap position, 30 MVA base (%)			_____
1.15		**TRANSFORMER IMPEDANCE**			
	.1	Interwinding positive sequence impedance;			
		.1 % Z^1_{H-X} (%)			_____
		- @ LTC neutral position - @ 30 MVA base - @ 115.5 kV base - @ 28 kV base			
		.2 % Z^1_{H-X} (%)			_____
		- @ LTC maximum turn position (Tap Position No. 33) - @ 30 MVA base - @ 115.5 kV base - @ 33.6 kV base			
		.3 % Z^1_{H-X} (%)			_____
		- @ LTC minimum turn position (Tap Position No. 1) - @ 30 MVA base - @ 115.5 kV base - @ 22.4 kV base			
	.2	Interwinding negative sequence impedance equal to the positive sequence impedance	_____	_____	
	.3	Zero sequence impedance;			
		.1 % $Z°_{H-X}$ (%)			_____
		- @ neutral LTC position - @ 30 MVA base - @ 115.5 kV base - @ 28 kV base			
		.2 % $Z°_{H}$ primary winding (%)			_____
		- @ X winding open circuit - @ 30 MVA base - @ 115.5 kV base			

				Yes	No	Data
	.3	% $Z°_X$ secondary winding	(%)			_____
	- @ H winding open circuit - @ 30 MVA base					
	- @ neutral LTC position - @ 28 kV base					
.4	Manufacturers tolerance on the impedance values		(%) (%)			+ _____ - _____

1.16 **TRANSFORMER PRIMARY BUSHING**

.1	Primary line bushing ratings (H1, H2, H3)					
	.1	Voltage classification (kV)				_____
	.2	Withstand rating;				
		.1	Dry (kV)			_____
		.2	Wet (kV)			_____
	.3	Lighting impulse rating;				
		.1	Full Wave (kV)			_____
		.2	Chopped Wave (kV)			_____
	.4	Switching impulse rating;				
		.1	Dry (kV)			_____
		.2	Wet (kV)			_____
.2	The physical dimension and clearances around the transformer primary terminals meet or exceed primary bushing ratings			_____	_____	
.3	Top mounted line bushing			_____	_____	

1.17 **TRANSFORMER SECONDARY BUSHING**

.1	Secondary bushing ratings (X1, X2, X3 and X0)			
	.1	Voltage classification (kV)		_____
	.2	Withstand rating;		
		.1	Dry (kV)	_____
		.2	Wet (kV)	_____
	.3	Lighting impulse rating;		
		.1	Full Wave (kV)	_____
		.2	Chopped Wave (kV)	_____
	.4	Switching impulse rating;		
		.1	Dry (kV)	_____
		.2	Wet (kV)	_____

			Yes	No	Data
	.2	Secondary bushings (X1, X2, X3) top mounted	_____	_____	
	.3	Secondary neutral bushing (X0) top mounted	_____	_____	
1.18		**SECONDARY LINE SURGE ARRESTER**			
	.1	Class: Station Class	_____	_____	
	.2	Type: gapless, metal-oxide	_____	_____	
	.3	Polymer housing	_____	_____	
	.4	Maximum continuous operating voltage rating (kV rms)			_____
	.5				
1.19		**CORE**			
	.1	Core design or shell design			_____
	.2	Circular core shape	_____	_____	
	.3	Fully step lap and fully mitered principals	_____	_____	
	.4	High-quality grain-oriented silicon steel laminations	_____	_____	
1.20		**WINDINGS**			
	.1	Primary and secondary windings material			_____
	.2	Circular design with concentric coil placement	_____	_____	
1.21		**OIL**			
	.1	Oil			_____
	.2	Oil with oil inhibitor	_____	_____	
1.22		**GENERAL WIRING AND CONNECTION**			
	.1	Junction boxes, terminal boxes and control cabinets and associated wires, terminals, devices and components capable of normal operation to a maximum ambient temperature of 50°C	_____	_____	
	.2	Protection, Control and Auxiliary Contacts;;			
		.1 Rated 120VAC, 125 VDC and 48 VDC	_____	_____	

			Yes	No	Data
	.2	Protection and Control Contacts, electrically isolated, NC and NO with common poles, 'Form C'	_____	_____	
	.3	Auxiliary Contacts, electrically isolated, NO contacts 'Form A'	_____	_____	
.3		Circuit breakers only, complete with auxiliary contact NO FUSES	_____	_____	
.4		Isolation switches;			
	.1	Isolation switch for each trip and alarm point	_____	_____	
	.2	Manufacturer ABB, type Flexitest FT-1	_____	_____	
.5		Each unused or spare terminal or contacts of equipment, devices and components wire to terminal blocks	_____	_____	
.6		C.T. wire size, minimum #10 AWG	_____	_____	
.7		Control wiring size, minimum #14 AWG	_____	_____	
.8		All wiring; copper	_____	_____	
.9		Captive screw, pressure clamping yoke type terminal blocks	_____	_____	
.10		15% spare terminal blocks	_____	_____	
.11		Each terminal block labelled	_____	_____	
.12		Each wire labelled at both ends permanent wire sleeve marker	_____	_____	
.13		Shorting type two captive screw, pressure clamping yoke type terminal blocks for current transformers	_____	_____	
.14		All remote wiring terminals from control cabinet of transformer	_____	_____	

1.23 **PROTECTION, DETECTION AND I.E.D. DEVICES**

.1 (provide a list)

1.24 **DRAWINGS**

.1 Drawings and Data submitted with Proposal:

_____

_____

_____

_____

1.25 **EXCEPTIONS**

.1 List in detail any and all exceptions taken to this Specification. In absence of such a list, it will be understood and agreed that the bidder's proposal is based on strict conformance of this Specification in all respects.

_____

_____

_____

_____

_____

_____

_____
Signature of Bidder

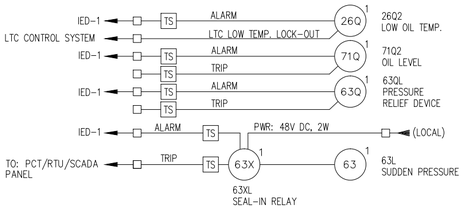
_____
Date of Bid

End Of Section

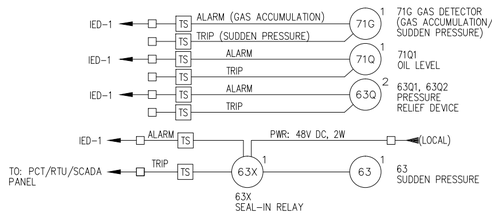
PL/ds/

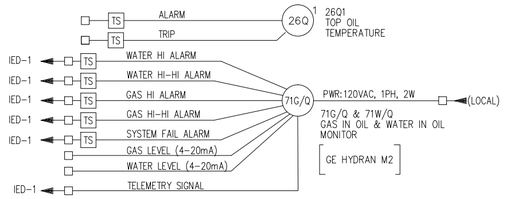
TRANSFORMER T1

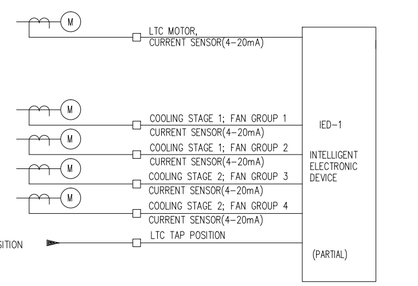
LOAD TAP CHANGER (UNIT & CONSERVATOR)

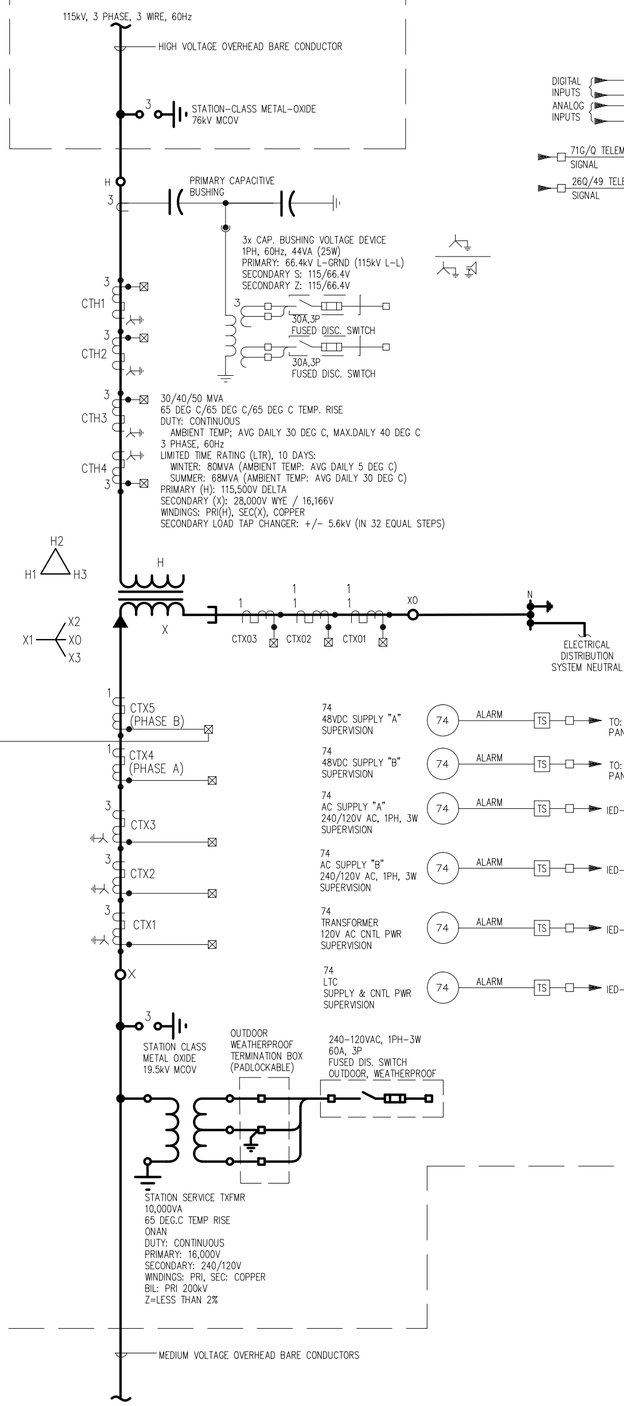


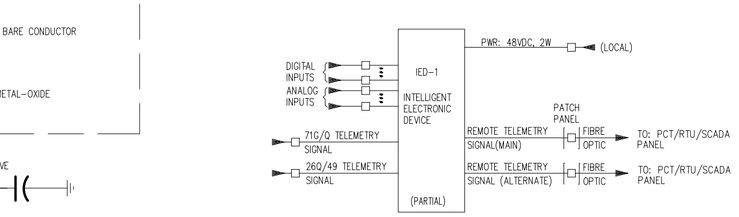
TRANSFORMER (MAIN TANK & CONSERVATOR)



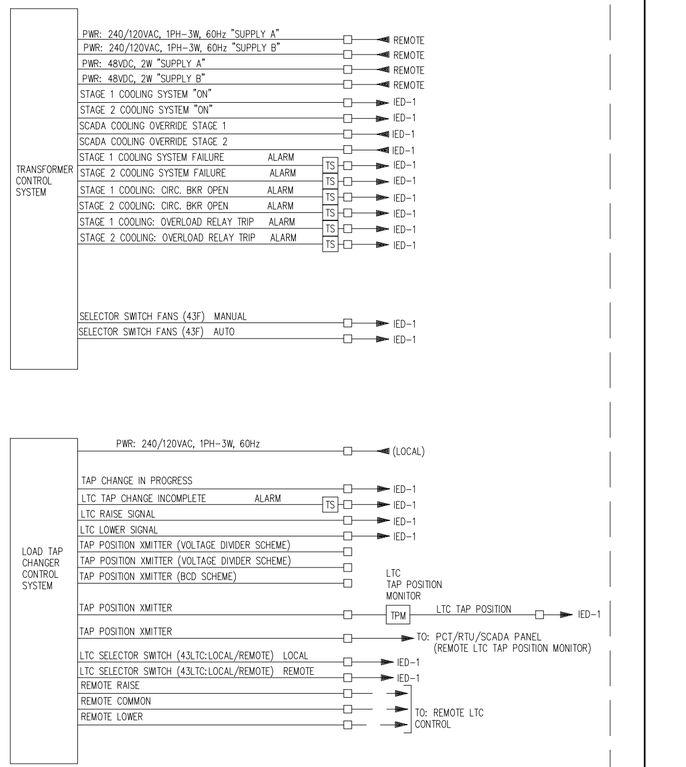








DESCRIPTION	CURRENT TRANSFORMER No.
1200/800/300/200-5A MULTI-RATIO C800, 0.3B1.8 @ 800-5A CCRF= 2.0 AT ALL TAPS	CTH1, CTH2, CTH3, CTH4 CTX01, CTX02, CTX03,
TRANSFORMER WINDING HOT SPOT TEMPERATURE CURRENT TRANSFORMER MULTI-RATIO CCRF= 2.0 AT ALL TAPS	CTX5
4000/3000/2000/500-5A MULTI-RATIO C800, 0.3B1.8 @ 1200-5A CCRF= 2.0 AT ALL TAPS	CTX1, CTX2, CTX3
FOR LTC CONTROL MULTI-RATIO 0.3B1.8 CCRF= 2.0 AT ALL TAPS	CTX4



IBI GROUP
IBI Group
30 International Boulevard
Toronto ON M9W 5P3 Canada
tel 416 679 1930
fax 416 675 4620

DATE	ISSUED FOR	REV
MAR 18/14	POWER TXFMR TENDER	0
MAR 12/14	REVISIONS	B
FEB 26/14	DRAFT	A

CLIENT NIAGARA-ON-THE-LAKE HYDRO INC.

PROJECT NOTL HYDRO – NOTL MTS No.2

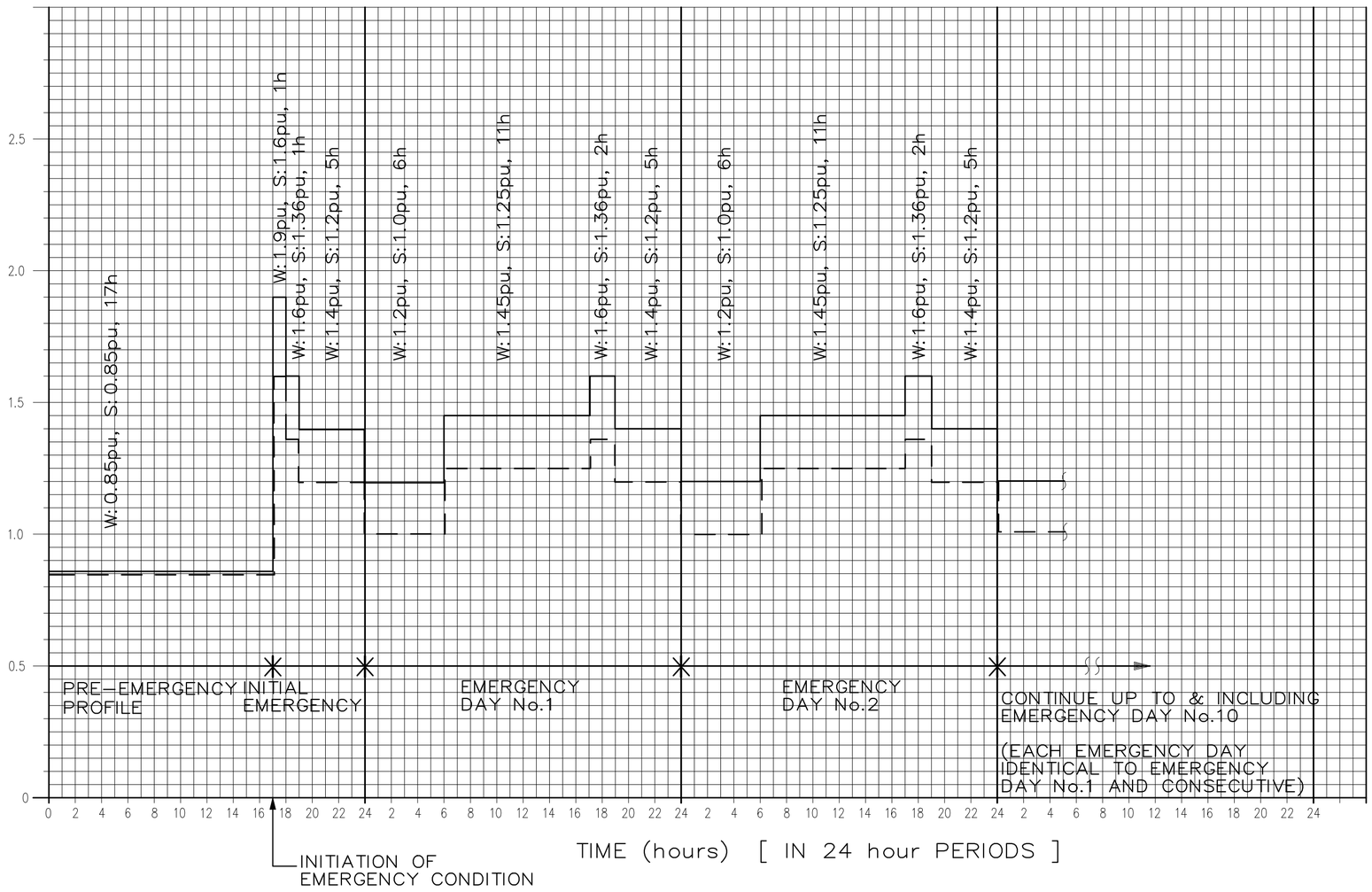
DRAWING TITLE
POWER TRANSFORMER T1
ELECTRICAL
SINGLE LINE DIAGRAM

PROJECT No. 24RX14.0062.00

DRAWING No. ELSK01

EMERGENCY OVERLOAD PROFILE FOR INDIVIDUAL POWER TRANSFORMER

INDIVIDUAL POWER TRANSFORMER:



LEGEND:

——— WINTER

— — — SUMMER

W: WINTER

S: SUMMER

AVERAGE DAILY AMBIENT TEMPERATURE;
WINTER = 5 DEG C
SUMMER = 30 DEG C

IBI GROUP
IBI Group
30 International Boulevard
Toronto ON M9W 5P3 Canada
tel 416 679 1930
fax 416 675 4620

DATE	ISSUED FOR	REV
MAR 18/14	POWER TXFMR TENDER	0
MAR 12/14	REVISIONS	B
FEB 26/14	DRAFT	A

CLIENT: NIAGARA-ON-THE-LAKE HYDRO INC.

PROJECT: NOTL HYDRO – NOTL MTS No.2

DRAWING TITLE: POWER TRANSFORMER T1 EMERGENCY OVERLOAD PROFILE

PROJECT No. 24RX14.0062.00

DRAWING No. ELSK02

LINEAR DIMENSIONS
DECIMALIZED NUMBERS INDICATE METRES
WHOLE NUMBERS INDICATE MILLIMETRES

TO MUNICIPAL DRAIN

1065 B NPS 3

3.500 2.500

TO MUNICIPAL DRAIN

SINGLE GATE *

98.000

CLF

98.000

90°

8.740 7.000 TYP

℄ OF 115kV BUS SUPPORT STR FDN. TOP ELEV. 98.600

2.740 TYP 2.740 TYP

SEE D2

HV TERMINATION POLE STR

1626 1626

610

SEE D2

℄ OF 115kV PAR BUS STR FDN TOP ELEV. 98.600

SEE D1

℄ OF 115kV PAR BUS STR FDN TOP ELEV. 98.600

R W B 115kV HV ENTRANCE

1.372 1.372

2A 2C

5A 5C

NOTE: STR. FDNS TO BE TREATED FOR FROST SUSCEPTIBLE SOIL EDB-3.300 (S2-S2)

SEE D2

SEE D1

1829 1829

℄ I.T. 220 HV SW STR. TOP ELEV. 98.300

2B 2D

5B 5D

SEE D2

℄ OF 115kV WEST. "TPS" SW MTG. ℄ PEDESTAL FDN TOP ELEV. 98.300

2.440 TYP 2.440 TYP

SEE D3

SEE D3

℄ OF 115kV SA PEDESTAL FDN ℄ TOP ELEV 98.300

WEED CONTROL AT FENCE LINE AS PER EDB-3.760

OIL CONTAINMENT PIT

15.000

DIRECTION OF DRAINAGE FLOW

47.000

1065 B NPS 3

90°

2.250 (TYP) 2.250 (TYP)

4.000 TYP

1500 (TYP) 1500 (TYP)

4.000 TYP

TRANSFORMER FOUNDATION

TRANS FDN TOP ELEV 98.150 (TYP)

℄ MANHOLE

REF LINE ℄ OF TRANS CONTAINMENTS TOP ELEV

SPILL 98.300

1065 B NPS 3

47.000

5.700 TYP 5.700 TYP 1.300 TYP

A SEE D1

M SEE D1

℄ OF LV STR FDN TOP ELEV. 98.600

T1

T2

SEE D2

G K T

℄ OF LV BUS TIE STR FDN TOP ELEV. 98.600

ACCESS ROAD

DIRECTION OF DRAINAGE FLOW

CLF

5.790 2.510 5.270 3.658 3.172 4.000 4.600 5.000 3.130 3.130 2.440 4.300

29.000

18.000

18.000

8.000 3.500 10.000 3.130 3.870 3.870 3.130 10.000 3.500 2.500

NOTE: OCR PADS TO BE TREATED FOR FROST SUSCEPTIBLE SOIL EDB-3.300 (S1-S1)

SEE D1 SEE D1

B BB WN N

℄ LV STR FDN TOP ELEV. 98.600

610 (TYP)

1220

℄ OF 3Ø OCR PADS TOP ELEV. 89.150

DUCT WORK UNDER OCR CONC. PAD TO BE COMPLETED PRIOR TO PLACING THE POLYSTYRENE FOAM

1.070 (TYP)

2.140 (TYP)

98.000

DOUBLE GATE *

CLF

DOUBLE GATE *

98.000

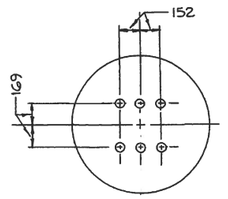
2.000

3.000 MAX (TYP)

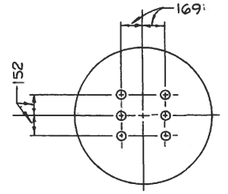
6.700 6.100 8.700 4.675 4.650 4.675 8.700 6.100 1.200

21.500 14.000 16.000

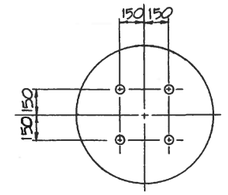
51.500



D1



D2



D3

REFERENCE DWG'S

DWG & BILL OF MATERIAL INDEX DS31677GA SH1
DS31677A SH2
DS31678A SH3

SITE PLAN ----- DS31369F

* ADJUST GATE HINGES TO PREVENT GATE FROM OPENING INTO THE FENCED AREA PAST THE FENCE LINE. THIS SHOULD ELIMINATE THE POSSIBILITY OF STEP OR TOUCH POTENTIAL BETWEEN THE END OF THE GATE & THE MAIN GROUND BUS.

mf roll number	rev no	date	particulars	dwn chkd	appd
	0		SUPERSEDES DWG DS31652D03.		

NIAGARA-ON-THE-LAKE D.S.

FOUNDATION LOCATION
FENCE PLAN & DETAILS

Ontario Hydro
GRID System
Transmission Projects

dwn BES	designed by		
chkd			plot scale
date yr/month/day	design approved		dist. code
scale 1 : 100	authorized		electronic filename C6G00L00
w.o. 690-03551			
dwg no NQN2003-D1S-25000-0002			rev 00

CLASS No. 40

A1 (594 x 841)

standard drawing number

RC

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX E

Transformer Bid Evaluation

Project: Niagara-On-The-Lake Hydro Inc. [NOTL Hydro]

NOTL MTS No.2
Power Transformer RFR (Request for Proposal)

Date: May 27, 2014

Item	Criteria	Maximum Points	Maximum Points (Percentage)	Vendor A	Vendor B	Vendor C	Vendor D	Vendor E	Vendor F
1	Base Bid Price	50	30%	50	44	-	-		
2	Loss Evaluation	10	6%	8	10	-	-		
3	Delivery	30	18%	25	30	-	-		
4	Experience	30	18%	20	30	-	-		
6	Technical Compliance	30	18%	20	30	-	-		
7	Warranty	10	6%	10	10	-	-		
8	Manufacturing Facility in Canada	5	3%	0	5	-	-		
	Score (Total)	165	100%	133	159	Proposed Cost for the Power Transformer Unit significantly exceeds the Budget	Proposed Cost for the Power Transformer Unit significantly exceeds the Budget	Did Not Submit a Proposal	Declined to Submit a Proposal
	Score (Percentage)			81%	96%	-	-	-	-

Criteria No.1 : Base Bid Price

	Vendor		Total	Difference	Penalty	Points
1	Vendor A	$	1,318,366	$ -	0	50
2	Vendor B	$	1,380,723	$ 62,357	6	44
		$	1,318,366			

Criteria No.2 : Loss Evaluation

	Vendor	No Load Losses (kW)	$5000/kW Value	Load Losses (kW)	$2800/kW Value	Total Loss Value	Total Loss Value	Difference	Penalty	Points
1	Vendor A	20	$ 100,000	95.6	$ 267,680	$ 367,680	$ 367,680	$ 28,880	2	8
2	Vendor B	28	$ 140,000	71	$ 198,800	$ 338,800	$ 338,800	$ -	0	10

Total Overall Cost

	Vendor	Total Overall Cost		Power Transformer Cost **ONLY**	Installation Cost **ONLY**
1	Vendor A	$1,318,366	=	$1,224,553	$93,813
2	Vendor B	$1,380,723	=	$1,305,723	$75,000
		$1,318,366			

Criteria No.3: Delivery

	Vendor	Delivery		Points
1	Vendor A	37 - 42 Weeks Shipment from Plant,	from P.O.	25
2	Vendor B	January 24, 2015 at Site (33 Weeks at Site),	from P.O.	30

Criteria No.4: Experience

	Vendor	Experience	Points
1	Vendor A	Limited Experience in the Supply and Installation of Power Transformers in the Province of Ontario (Canada)	20
2	Vendor B	Extensive Experience in the Design, Manufacturing and Factory Acceptance Testing (FAT) of Power Transformers: • for Transmission Systems in Canada and in the Province of Ontario (Canada) • for Local Distribution Companies (LDC) in the Province of Ontario (Canada) • for Transmitters in the Province of Ontario (Canada) [Hydro One Networks Inc. (HONI)] Extensive Experience in the Supply and Installation of Power Transformers: • in Canada • in the Province of Ontario (Canada)	30

Criteria No.5: Technical Compliance with the Specification

	Vendor	Compliance Rating	Points
1	Vendor A	Not in Full Compliance with the Specification	20
2	Vendor B	Full Compliance with the Specification	30

Criteria No.6: Warranty

No.	Vendor	Meets Mandatory Basic Requirements	Cost for Additional Years (One Transformer) 2	3	4	5	Points
1	Vendor A	√				√ No Additional Cost	10
2	Vendor B	√				√ No Additional Cost	10

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX F

Council Resolution

Department of Corporate Services
1593 Four Mile Creek Road
P.O. Box 100, Virgil, ON L0S 1T0
905-468-3266 • Fax: 905-468-2959
www.notl.org

THE CORPORATION OF THE TOWN OF NIAGARA-ON-THE-LAKE

OFFICE OF THE TOWN CLERK

DATE: **JUNE 23, 2014** RESOLUTION NO. _____

MOVED BY COUNCILLOR: _____

SECONDED BY COUNCILLOR: _____

THAT Council rise from the closed meeting to consider matters that qualify under the Municipal Act 2001, as amended:

- Section 239.(2) (a) the security of the property of the municipality or local board, specifically Niagara-on-the-Lake Hydro Inc. (The Corporation of the Town of Niagara-on-the-Lake 100% shareholder) with the following report:

  THAT Niagara-on-the-Lake Hydro Inc. be authorized to replace one 25MVA Niagara-on-the-Lake station transformer with a new 50MVA transformer.

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX G

Hydro One CCRA

Niagara-on-the-Lake MTS No 2
CONNECTION AND COST RECOVERY AGREEMENT (CCRA) – MINI

THIS MINI CONNECTION AND COST RECOVERY AGREEMENT made between Hydro One Networks Inc. **("Hydro One")** and Niagara-on-the-Lake Hydro Inc. **(the "Customer")** dated this 15th of July, 20 14.

WHEREAS

(a) the Customer is planning to replace and upgrade the capacity of an existing 15/20/25 MVA transformer (T2) with a 30/40/50 MVA unit at its Niagara-on-the-Lake (NOTL) MTS No 2. The Customer has requested Hydro One to integrate these modifications at NOTL MTS NO. 2 to the Hydro One 115 kV system **(the "Project")**; and

(b) Hydro One is agreeable to performing the work required for the Project on the following terms and conditions, including but not limited to the Project cost and the Project schedule being subject to the Customer executing and delivering this Agreement to Hydro One by no later than **30th day of June, 2014 (the "Execution Date")**.

NOW THEREFORE in consideration of the mutual covenants, agreements, terms and conditions herein and other good and valuable consideration, the receipt and sufficiency of which is hereby irrevocably acknowledged, the parties agree as follows:

1. Each of the Parties hereto confirms the truth and accuracy of the recitals and agrees that the recitals form part of this Agreement.

2. Subject to Section 13 and the termination rights herein, the Agreement shall be in full force and effect and binding on the parties as of the date that Hydro One executes the Agreement **(the "Effective Date")** and shall expire on the date that the Customer pays Hydro One the final invoice in full for the Work Chargeable to Customer or Hydro One issues a refund to the Customer in accordance with Section 10 hereof.

3. Each party represents and warrants to the other that:

(a) it is duly incorporated, formed or registered (as applicable) under the laws of its jurisdiction of incorporation, formation or registration (as applicable);

(b) it has all the necessary corporate power, authority and capacity to enter into the Agreement and to perform its obligations hereunder;

(c) the execution, delivery and performance of the Agreement by it has been duly authorized by all necessary corporate and/or governmental and/or other organizational action and does not (or would not with the giving of notice, the lapse of time or the happening of any other event or condition) result in a violation, a breach or a default under or give rise to termination, greater rights or increased costs, amendment or cancellation or the acceleration of any obligation under (i) its charter or by-law instruments; (ii) any Material contracts or instruments to which it is bound; or (iii) any laws applicable to it;

(d) any individual executing this Agreement, and any document in connection herewith, on its behalf has been duly authorized by it to execute this Agreement and has the full power and authority to bind it;

(e) the Agreement constitutes a legal and binding obligation on it, enforceable against it in accordance with its terms;

(f) it is registered for purposes of Part IX of the Excise Tax Act (Canada). The HST registration number for Hydro One is 87086-5821 RT0001 and the HST registration number for the Customer is as specified in Schedule "C" of the Agreement; and

(g) no proceedings have been instituted by or against it with respect to bankruptcy, insolvency, liquidation or dissolution.

Part A: Work Chargeable to Customer and Customer Work

4. The Customer and Hydro One shall perform their respective obligations outlined in the Agreement in a manner consistent with Good Utility Practice and the Transmission System Code, in compliance with all Applicable Laws, including, but not limited to the requirements of the Electrical Safety Code, and using duly qualified and experienced people.

5. The parties acknowledge and agree that:

(a) Hydro One is responsible for obtaining any and all permits, certificates, reviews and approvals required under any Applicable Laws with respect to the Work Chargeable to Customer;

(b) the Customer is responsible for obtaining any and all permits, certificates, reviews and approvals required under any Applicable Laws with respect to the Customer Work;

(c) the Customer shall perform the Customer Work at its own expense;

(d) the Customer is responsible for installing equipment and facilities such as protection and control equipment to protect its own property, including, but not limited to the Customer's Facilities;

(e) the Customer shall provide Hydro One with Project data required by Hydro One, including, but not limited to (i) the same technical information that the Customer provided the IESO during any connection assessment and facility registration process associated with the Customer's Facilities in the form outlined in the applicable sections of the IESO's public website and (ii) technical specifications (including electrical drawings) for the Customer's Facilities;

(f) Hydro One may participate in the commissioning, inspection or testing of the Customer's Work at a time that is mutually agreed by Hydro One and the Customer and the Customer shall ensure that the work performed by the Customer and others required for successful commissioning, inspection or testing of protective equipment is completed as required to enable Hydro One witnessing and testing to confirm satisfactory performance of such systems;

(g) unless otherwise provided herein, Hydro One's responsibilities under the Agreement with respect to the Connection of the New or Modified Connection Facilities to Hydro One's transmission system shall be limited to the performance of the Work Chargeable to Customer;

(h) Hydro One is not permitted to Connect any new, modified or replacement Customer's Facilities unless any

required Connection authorizations, certificate of inspection or other applicable approval have been issued or given by the Ontario Electrical Safety Authority in relation to such facilities;

(i) Hydro One may require that the Customer provide Hydro One with test certificates certifying that the Customer's Facilities have passed all relevant tests and comply with the Transmission System Code, the Market Rules, Good Utility Practice, the standards of all applicable reliability organizations and any Applicable Laws, including, but not limited to any certificates of inspection that may be required by the Ontario Electrical Safety Authority;

(j) in addition to the Work Chargeable to Customer described in Schedule "A", Hydro One shall provide the Customer with such technical parameters as may be required to assist the Customer in ensuring that the design of the Customer's Facilities is consistent with the requirements applicable to Hydro One's transmission system and the basic general performance standards for facilities set out in the Transmission System Code, including Appendix 2 thereof;

(k) if Hydro One requires access to the Customer's Facilities for the purposes of performing the Work Chargeable to Customer or the Customer requires access to Hydro One's Facilities for the purposes of the Customer's Work, the parties agree that Section 27.13 of the Connection Agreement shall govern such access and is hereby incorporated in its entirety by reference into, and forms an integral part of the Agreement. All references to "this Agreement" in Section 27.13 shall be deemed to be a reference to this Agreement;

(l) the Customer shall enter into a Connection Agreement or amendment as required with Hydro One at least 14 calendar days prior to the Connection; and

(m) the Customer shall provide Hydro One with copies of the documentation specified in Schedule "C" of the Agreement under the heading "Documentation Required", acceptable to Hydro One, within 120 calendar days after the Ready for Service Date. The Customer shall ensure that Hydro One may retain this documentation for Hydro One's ongoing planning, system design, and operating review. The Customer shall also maintain and revise such documentation to reflect changes to the Customer's Facilities and provide copies to Hydro One on demand and as specified in the Connection Agreement.

6. The Work Chargeable to Customer and Hydro One's rights and requirements hereunder, including, but not limited to Hydro One's:

(i) specifications of the protection equipment on the Customer's side of the Connection Point;

(ii) review and acceptance of power system components on the Customer's side of the Connection Point;

(iii) acceptance of the technical specifications (including electrical

drawings) for the Customer's Facilities; and

(iv) participation in the commissioning, inspection and testing of the Customer's Facilities;

are solely for the purpose of Hydro One ensuring that the Customer's Facilities will not materially reduce or adversely affect the reliability of Hydro One's transmission system and do not adversely affect other customers connected to Hydro One's transmission system.

7. Hydro One shall use reasonable efforts to complete the Work Chargeable to Customer by **31st day of May, 2015 (the "Ready for Service Date")** provided that:

(a) the Customer is in compliance with its obligations under the Agreement;

(b) any work required to be performed by third parties has been performed in a timely manner and in a manner to the satisfaction of Hydro One, acting reasonably;

(c) there are no delays resulting from Hydro One not being able to obtain outages from the Independent Electricity System Operator required for the Work Chargeable to Customer or from the IESO making changes to the Work Chargeable to Customer or the scheduling of all or a portion thereof;

(d) Hydro One does not have to use its employees, agents and contractors performing the Work Chargeable to Customer elsewhere on its transmission system or distribution system due to an Emergency (as that term is defined in the Transmission System Code) or a Force Majeure Event;

(e) Hydro One is able to obtain the materials and labour required to perform the Work Chargeable to Customer with the expenditure of Premium Costs where required;

(f) there are no delays resulting from Hydro One being unable to obtain materials or equipment required from suppliers in time to meet the project schedule for any portion of the Work Chargeable to Customer provided that such delays are beyond the reasonable control of Hydro One; and

(g) the Customer executed the Agreement on or before the date specified as the Execution Date in the Recitals.

8. Upon completion of the Work Chargeable to Customer, Hydro One shall own, operate and maintain all equipment and facilities installed by Hydro One as part of the Work Chargeable to Customer in, under, on, over, along, upon, through and crossing Hydro One's Property(ies).

The Customer acknowledges that:

(i) ownership and title to the equipment referred to above shall throughout the Term and thereafter remain vested in Hydro One and the Customer shall have no right of property therein; and

(ii) that any portion of the equipment referred to above that is located on the Customer's property shall be and remain the property of Hydro One and shall not be or become fixtures and/or part of the Customer's property.

9. The Customer acknowledges and agrees that Hydro One is not responsible for the provision of power system components on the Customer's Facilities, including, without limitation, all transformation, switching, metering and auxiliary equipment such as protection and control equipment.

All of the power system components on the Customer's side of the Connection Point including, without limitation, all transformation, switching and auxiliary equipment such as protection and control equipment shall be subject to the acceptance of Hydro One with regard to Hydro One's requirements to permit Connection of the new or Modified Connection Facilities to Hydro One's transmission system and shall be installed, maintained and operated in accordance with all Applicable Laws, codes and standards, including, but not limited to, the Transmission System Code, at the expense of the Customer.

Where Hydro One has equipment for automatic reclosing of circuit breakers after an interruption for the purpose of improving the continuity of feeder connection, it shall be the obligation of the Customer to provide adequate protective equipment for the Customer's facilities that might be adversely affected by the operation of such reclosing equipment. The Customer shall provide such equipment as may be required from time to time by Hydro One for the prompt disconnection of any of the Customer's apparatus that might affect the proper functioning of Hydro One's reclosing equipment.

Part B: Work Chargeable to Customer

10. The Customer shall pay Hydro One's Engineering and Construction Cost (plus applicable Taxes) of the Hydro One Connection Work described as Work Chargeable to Customer in Schedule "A" of the Agreement which is estimated to be the amounts specified in Schedule "C" of the Agreement in the manner specified in Schedule "C" of the Agreement.

Within 180 days after the Ready for Service Date, Hydro One shall provide the Customer with an invoice or a credit memorandum specifying the actual Engineering and Construction Cost of the Work Chargeable to Customer (plus applicable Taxes). Any difference between the Engineering and Construction Cost of the Work Chargeable to Customer (plus applicable Taxes) and the amount already paid by the Customer shall be paid within 30 days after the issuance of the invoice or credit memorandum by:

(a) Hydro One to the Customer, if the amount already paid by the Customer exceeds the Engineering and Construction Cost of the Work Chargeable to Customer (plus Taxes); or

(b) the Customer to Hydro One, if the amount already paid by the Customer is less than the Engineering and Construction Cost of the Work Chargeable to Customer (plus Taxes).

Part C: Events of Default

11. Each of the following events shall constitute an "Event of Default" under the Agreement:

(a) failure by the Customer to pay any amount due under this Agreement, including any amount payable pursuant

to Section 10 within the time stipulated for payment;

(b) breach by the Customer or Hydro One of any Material term, condition or covenant of the Agreement; or

(c) the making of an order or resolution for the winding up of the Customer or of its operations or the occurrence of any other dissolution, bankruptcy or reorganization or liquidation proceeding instituted by or against the Customer.

For greater certainty, a dispute will not be considered an Event of Default under the Agreement. However, a Party's failure to comply with the terms of a settlement or resolution of a dispute by the OEB will be considered an Event of Default under the Agreement.

12. Upon the occurrence of an Event of Default by the Customer hereunder (other than those specified in Section 11(c) of this Agreement, for which no notice is required to be given by Hydro One), Hydro One shall give the Customer written notice of the Event of Default and allow the Customer 30 calendar days from the date of receipt of the notice to rectify the Event of Default, at the Customer's sole expense. If such Event of Default is not cured to Hydro One's reasonable satisfaction within the 30 calendar day period, Hydro One may, in its sole discretion, exercise the following remedy in addition to any remedies that may be available to Hydro One under the terms of the Agreement, at common law or in equity: deem the Agreement to be repudiated and, after giving the Customer at least 10 calendar days' prior written notice thereof, recover, as liquidated damages and not as a penalty, the balance of the amounts payable by the Customer pursuant to Section 10.

13. Upon the occurrence of an Event of Default by Hydro One hereunder, the Customer shall give Hydro One written notice of the Event of Default and shall allow Hydro One 30 calendar days from the date of receipt of the notice to rectify the Event of Default at Hydro One's sole expense. If such Event of Default is not cured to the Customer's reasonable satisfaction within the 30 calendar day period, the Customer may pursue any remedies available to it at law or in equity, including at its option the termination of the Agreement.

14. All rights and remedies of Hydro One and the Customer provided herein are not intended to be exclusive but rather are cumulative and are in addition to any other right or remedy otherwise available to Hydro One and the Customer respectively at law or in equity, and any one or more of Hydro One's and the Customer's rights and remedies may from time to time be exercised independently or in combination and without prejudice to any other right or remedy Hydro One or the Customer may have or may have exercised. The parties further agree that where any of the remedies provided for and elected by the non-defaulting party are found to be unenforceable, the non-defaulting party shall not be precluded from exercising any other right or remedy available to it at law or in equity.

Part D: Disputes

15. All disputes, including, but not limited to, disputes related to:

(a) the cost and the allocation of the costs under this Agreement;

(b) the cost and the allocation of costs of the Hydro One Connection Work and notwithstanding Hydro One's decision not to allocate or to allocate any part of the costs of this work to the Customer at this time; or

(c) any other costs and the allocation of any other costs associated with, related to, or arising out of the connection of the Project to Hydro One's transmission system or Hydro One's policies in respect of connections generally,

shall be dealt with in accordance with the dispute resolution procedure set out in the OEB-Approved Connection Procedures.

16. Before and after the existence of OEB-Approved Connection Procedures, if a dispute arises while Hydro One is performing the Work Chargeable to Customer, Hydro One shall not cease the work or slow the pace of the work without leave of the OEB.

Part E: Incorporation of Liability and Force Majeure Provisions

17. PART III: LIABILITY AND FORCE MAJEURE (with the exception of Section 15.5 thereof) and Sections 1.1.12 and 1.1.17 of the Connection Agreement are hereby incorporated in their entirety by reference into, and form an integral part of the Agreement. Unless the context otherwise requires, all references in PART III: LIABILITY AND FORCE MAJEURE TO "this Agreement" shall be deemed to be a reference to the Agreement and all references to the "the Transmitter" shall be deemed to be a reference to Hydro One.

For the purposes of this Section 17, the Parties agree that the reference to:

(i) the Transmitter in lines 3 and 4 of Section 15.1 means the Transmitter or any party acting on behalf of the Transmitter such as contractors, subcontractors, suppliers, employees and agents; and

(ii) the Customer in lines 3 and 4 of Section 15.2 means the Customer or any party acting on behalf of the Customer such as contractors, subcontractors, suppliers, employees and agents.

The parties agree that the aggregate liability of Hydro One under the Agreement and in particular under this Section 17 shall at no time exceed the actual Engineering and Construction Cost of the Work Chargeable to Customer.

Part F: General

18. This Agreement is subject to the Transmission System Code and the OEB-Approved Connection Procedures. If any provision of this Agreement is inconsistent with the:

(a) Transmission System Code, the said provision shall be deemed to be amended so as to comply with the Transmission System Code;

(b) OEB-Approved Connection Procedures, the said provision shall be deemed to be amended so as to comply with the OEB-Approved Connection Procedures; or

(c) Connection Agreement made between the parties, associated with the new customer connection facilities, the Connection Agreement governs.

19. The failure of any party hereto to enforce at any time any of the provisions of the Agreement or to exercise any right or option which is herein provided shall in no way be construed to be a waiver of such provision or any other provision nor in any way affect the validity of the Agreement or any part hereof or the right of any party to enforce thereafter each and every provision and to exercise any right or option. The waiver of any breach of the Agreement shall not be held to be a waiver of any other or subsequent breach. Nothing shall be construed or have the effect of a waiver except an instrument in writing signed by a duly authorized officer of the party against whom such waiver is sought to be enforced which expressly waives a right or rights or an option or options under the Agreement.

20. Other than as provided in this Agreement, no amendment, modification or supplement to the Agreement shall be valid or binding unless set out in writing and executed by the parties with the same degree of formality as the execution of the Agreement.

21. Any written notice required by the Agreement shall be deemed properly given only if either mailed or delivered to the General Counsel, Hydro One Networks Inc., 15th Floor, North Tower, 483 Bay Street, Toronto, Ontario, M5G 2P5, fax no: (416) 345-6056 on behalf of Hydro One, and at the address specified in the customer notice section of Schedule "C" on behalf of the Customer.

A faxed notice will be deemed to be received on the date of the fax if received before 3 p.m. or on the next business day if received after 3 p.m. Notices sent by courier or registered mail shall be deemed to have been received on the date indicated on the delivery receipt. The designation of the person to be so notified or the address of such person may be changed at any time by either party by written notice.

22. The Agreement shall be construed and enforced in accordance with, and the rights of the parties shall be governed by, the laws of the Province of Ontario and the laws of Canada applicable therein, and, subject to Section 15, the courts of Ontario shall have exclusive jurisdiction to determine all disputes arising out of the Agreement.

23. The Agreement may be executed in counterparts, including facsimile counterparts, each of which shall be deemed an original, but all of which shall together constitute one and the same Agreement.

24. The obligation to pay any amount due and payable hereunder, including, but not limited to, any amount due under Section 10 shall survive the termination of the Agreement.

25. **Invoices and Interest.** Invoiced amounts are due 30 days after invoice issuance. All overdue amounts including, but not limited to amounts that are not invoiced but required under the terms of this Agreement to be paid in a specified time period, shall bear interest at 1.5% per month compounded monthly (19.56 percent per year) for the time they remain unpaid.

26. This Agreement constitutes the entire agreement between the parties with respect to the subject matter of this Agreement and supersedes all prior oral or written representations and agreements concerning the subject matter of this Agreement. Appendix A attached hereto and Schedules "A", "B" and "C" are to be read with and form part of this Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by the signatures of their proper authorized signatories, as of the date written below.

NIAGARA-ON-THE-LAKE HYDRO INC.

Name: Hassan Syed, PMP
Title: Operations Manager
I have the authority to bind the Corporation

James Huntingdon
Director

DAVE EKE
DIRECTOR

HYDRO ONE NETWORKS INC.

Name: Brad Colden
Title: Manager, Key Accounts Management
Date: July 15, 2014
I have the authority to bind the Corporation

Appendix "A": Definitions

In the Agreement, unless the context otherwise requires, terms which appear therein without definition, shall have the meanings respectively ascribed thereto in the Transmission System Code and unless there is something in the subject matter or context inconsistent therewith, the following words shall have the following meanings:

"Agreement" means the Mini Connection and Cost Recovery Agreement, Appendix "A" and Schedules "A", "B" and "C" attached hereto.

"Applicable Laws" means any and all applicable laws, including environmental laws, statutes, codes, licensing requirements, treaties, directives, rules, regulations, protocols, policies, by-laws, orders, injunctions, rulings, awards, judgments or decrees or any requirement or decision or agreement with or by any government or government department, commission board, court authority or agency.

"Business Day" means a day other than Saturday, Sunday, statutory holiday in Ontario or any other day on which the principal chartered banks located in the City of Toronto, are not open for business during normal banking hours.

"Connection Agreement" means the form of connection agreement appended to the Transmission System Code as Appendix 1, Version A.

"Connection Point" means the point where the Customer's Facilities are connected to Hydro One's transmission system or are connected to Third Party Facilities connected to Hydro One's transmission system, as the case may be.

"Customer Work" means the work to be performed by the Customer, at its sole expense, which is described in Schedule "B" of this Agreement.

"Customer's Facilities" has the meaning set forth in the Transmission System Code.

"Customer's Property(ies)" means any lands owned by the Customer in fee simple or where the Customer has easement rights.

"Engineering and Construction Cost" means Hydro One's charge for equipment, labour and materials at Hydro One's standard rates plus Hydro One's standard overheads as well as interest during construction using Hydro One's capitalization rate in effect during the construction period.

"Electricity Act, 1998" means the Electricity Act, 1998 being Schedule "A" of the Energy Competition Act, S.O. 1998, c.15, as amended.

"Force Majeure Event" has the meaning ascribed thereto in the Connection Agreement.

"Good Utility Practice" has the meaning set forth in the Transmission System Code.

"Hydro One's Property(ies)" means any lands owned by Hydro One in fee simple or where Hydro One now or hereafter has obtained easement rights.

"IESO" means the Independent Electricity System Operator continued under the Electricity Act, 1998.

"IESO Rules" means the Independent Electricity System Operator (IESO)

administered Market Rules, including, but not limited to Chapter 6 thereof.

"In Service Date" has the same meaning ascribed to the term "comes into service" in the Transmission System Code.

"Interest" means the interest rates specified by the Ontario Energy Board to be applicable to security deposits in the form of cash as specified in Subsection 6.3.11(b) in the Transmission System Code.

"Material" relates to the essence of the contract, more than a mere annoyance to a right, but an actual obstacle preventing the performance or exercise of a right.

"New or Modified Connection Facilities" means the facilities owned by Hydro One as specified in Schedule "C" of the Agreement.

"OEB" means the Ontario Energy Board.

"OEB-Approved Connection Procedures" means Hydro One's connection procedures as approved by the OEB from time to time.

"Ready for Service Date" means the date upon which the Work Chargeable to Customer is fully and completely constructed, installed, commissioned and energised to the Connection Point. The Customer's disconnect switches must be commissioned prior to this date in order to use them as isolation points.

"Taxes" means all property, municipal, sales, use, value added, goods and services, harmonized and any other non-recoverable taxes and other similar charges (other than taxes imposed upon income, payroll or capital).

"Transmission System Code" means the code of standards and requirements issued by the OEB on July 25, 2005 that came into force on August 20, 2005 as published in the Ontario Gazette, as it may be amended, revised or replaced in whole or in part from time to time.

"Work Chargeable to Customer" means the work to be performed by Hydro One described in Schedule "A" of this Agreement.

Schedule "A" Integrate NOTL MTS No. 2 modifications to Hydro One system

PROJECT SCOPE - WORK CHARGEABLE TO CUSTOMER

Hydro One will:
Hydro One's scope of work to integrate modifications planned at NOTL MTS No. 2 by the Customer to the Hydro One 115kV system is as follows:

- The work at Hydro One facilities includes engineering, modifications, and commissioning at Hydro One facilities.
- Prepare new or revise existing drawings, applicable to Hydro One's facilities.
- Conduct a review of documents, drawings and designs, submitted by the Customer pertaining to the Customer's facilities interfacing with Hydro One's facilities.
- Arrange for the 115 kV system outages required for the execution of project activities.
- Confirm the Customer's Verification Evidence Report (COVER) for the work required at the interface of Hydro One's facilities with the Customer's facilities.

Notes:
(i) The review by Hydro One of the documents/drawings/designs, submitted by the Customer, is limited to the interface of the Hydro One facilities with the Customer's facilities.

Review of the Customer's documents/ drawings/designs is from the perspective that Hydro One's facilities are not adversely impacted by the Customer's facilities.
The Customer is responsible for designing and installing adequately rated equipment to protect the Customer's facilities.

(ii) No new protections, teleprotections are required at the Hydro One facilities, as no changes to the existing protections at NOTL MTS No. 2 have been confirmed by the Customer.

(iii) The Customer shall provide Hydro One with a copy of the IESO SIA for the Proposed Project.
Hydro One's estimates are based on SIA identifying no additional equipment requirements at Hydro One facilities for the modifications at NOTL MTS No 2. Costs for any additional requirements identified by the IESO in SIA will be fully recoverable from the Customer.

(iv) The ready for service date of Hydro One's work is contingent upon:
- The availability of outages required to complete the work.
- The Customer completing the work and providing information to Hydro One by the dates identified in this CCRA.
- The Customer providing the required information to Hydro One by as described in this Agreement, including, but not limited to those identified in Schedule "A".

Schedule "B" Integrate NOTL MTS NO. 2 modifications to Hydro One system

CUSTOMER WORK

The Customer will:

Customer is responsible for all work associated with replacement of the existing 115.5/29.5kV 10/15/25 MVA transformer (T2) with a 30/40/50 MVA unit at NOTL MTS No 2.

(i) The Customer is responsible for designing and installing adequately rated equipment to protect the Customer's facilities.

(ii) The Customer is responsible, at its cost, to obtain all applicable regulatory approvals and permits such as municipal, provincial, Federal, Independent Electricity System Operator (IESO), Ontario Energy Board (OEB), Electrical Safety Authority (ESA), etc and meeting all regulatory requirements for its facilities.

(iii) the Customer completing the work as described in this Agreement, including, but not limited to the work the customer is responsible for as described in Schedule "A"

Notes:

i) Customer has provided the following data for the transformer that will replace the existing T2 transformer :

- Voltage rating -High Voltage(HV)/ Low Voltage(LV): 115.5kV / 28kV
- Winding Connection (HV/LV): Delta/Wye
- Thermal rating:30/40/50 MVA
- LV neutral grounding: solidly grounded.
- Impedance (HV-LV): 8.5%
- Number of ULTC steps: -10%/+20%, 32 steps

Customer will confirm to Hydro One if there are any changes in the above transformer data.

ii) Customer confirms that:

- There is no change in the operating philosophy for the NOTL MTS No 2 with the proposed replacement and upgrade of an existing transformer (T2).
- The 10/15/25 MVA rating of the T1 transformer remains unchanged.The Customer is required to submit a separate application to Hydro One for the scope of work and associated costs if the Customer plans to modify ratings of T1 transformer.
- The T1 and T2 transformers bus tie disconnect switch will be operated normally open.
- There is no change to the existing protection and control system to the NOTL MTS No 2 with the proposed replacement/upgrade of an existing transformer (T2).
- There is no generation in feed to the Hydro One system at NOTL MTS No. 2.

iii) The Customer will install station class surge arrestors at the HV and LV terminals of the 115- 27.6 kV transformer

iv) Customer will provide Hydro One with a copy of the IESO System Impact Assessment for the proposed modifications to NOTL MTS No. 2 within 2 weeks of signing this CCRA.

v) Customer will provide four sets of single line diagrams for the proposed revisions at the NOTL MTS No.2 within 2 weeks of signing this CCRA.

vi) Customer will provide four sets of technical descriptions of the operating philosophy of the electrical equipment, and the protection and control philosophy of the Customer's Facilities that could affect Hydro One's transmission system within 2 weeks of signing this CCRA.

vii) The Customer is responsible for designing and installing adequately rated protection, control,

telecommunication equipment to protect its facilities.

viii) The Customer is responsible for providing the SCADA remote end functionality and providing real-time telemetry to Hydro One in accordance with the Transmission System Code and Hydro One requirements.

ix) To meet operations requirements, the Customer will:

- Provide SCADA telemetry quantities to the OGCC, as required.
- Provide SCADA telemetry quantities to the IESO, as required.
- Meet the requirements for 3% and 5% Voltage Reductions as required by the IESO.
- Provide Under Frequency Load Shedding relay as required by IESO.
- Provide adequate Underload Tap changer control, as required.

The following data will be required by Hydro One and be made available by the Customer's ready for service date.

- Status of the high tension (HT) interrupter or transformer HT disconnect switches.
- Status of the transformer secondary breaker(s) or applicable transformer secondary isolating device(s). Status of the bus-tie breaker, if applicable
- Status of the capacitor breaker(s) if applicable.
- The ULTC tap position for the transformer.
- Common trip annunciation for any trips that open the HT interrupter, or HT disconnect switches or send a Transfer Trip (TT) if applicable.
- Breaker Fail annunciation for HT interrupter(s) or for the transformer secondary breakers if HT interrupters are installed.
- MW quantity & direction for the transformer.
- MVAR quantity & direction for the transformer.
- HT voltage if available.
- Three phase low tension (LT) bus voltage.

Niagara-on-the-Lake MTS No 2
CONNECTION AND COST RECOVERY
AGREEMENT (CCRA) – MINI

Schedule "C" (Project Title):

Part 1: Estimate of Engineering and Construction Cost of the Work Chargeable to Customer:

The estimate of the Engineering and Construction Cost of the Work Chargeable to Customer (excluding HST) is summarized as follows:

Project Description	**Estimated Engineering and Construction Cost ($)**
Project Management	$13,000
Engineering	$31,000
Equipment & Materials	-
Construction	-
Stations &Operations	$33,000
Sub-Total	$77,000
Contractor's Contingency	$14,000
AFUDC* & Overheads	$13,000
Total Price ($)	$104,000

(*) AFUDC = Allowance for Funds Used During Construction and is the term used in the OEB accounting procedures meaning interests during construction if applicable.

Notes:
1. Price for Preliminary Engineering (preparing estimates for both NOTL MTS No.1 and NOTL MTS No. 2) is not included in any of the prices above.
2. Contingency of 18% is included in the total.
3. Capital Overheads are included in the total price.
4. Capital Interest is included in the total price.
5. HST is not included in the estimate.

Part 2: Manner of Payment

The Engineering and Construction Cost of the Work Chargeable to Customer is estimated to be $104,000 (excluding HST) (the "Cost Estimate"). Should the Customer default in paying any amount to Hydro One, Hydro One reserves the right to add the AFUDC as it deems necessary.

The Customer shall pay Hydro One the Cost Estimate (plus HST) by making the progress payments specified below on or before the Payment Milestone Date specified below. Hydro One will invoice the Customer for each progress payment 30 days prior to the Payment Milestone Date.

Payment Milestone Date	**Work Chargeable to Customer ($)**
June 30, 2014	$34,000**
January 1, 2015	$70,000

As noted above, HST is not included in the Cost Estimate and will be collected when Hydro One renders the invoice for each progress payment.

**Based on the estimated cost of the Work ($104,000 plus HST) chargeable to Customer under this CCRA, the following provides the information for the payments from the customer:

i) Payment made by Customer under the Study Agreement =$60,000

ii) Estimated cost incurred by Hydro One to prepare estimates for:
NOTL MTS No.1 =$15,500
NOTL MTS No, 2 =$15,500
Total =$31,000

iii) Credit applied towards the payments under this CCRA [$60,000-$31,000] = $29,000.

The amount required for June 30, 2014 payment [$34,000-$29,000] = $5,000 plus HST.

The amount required for January 1, 2015 payment= $70,000 plus HST.

2.2 Scope Change

Any change in the Project Scope as detailed and documented in Schedule "A" whether they are initiated by the Customer may result in a change to the Project costs estimated in this Schedule "C" and the Project schedule, including the Ready for Service Date.

All Customer initiated scope changes to this Project must be in writing to Hydro One.

Hydro One will advise the Customer of any cost and schedule impacts of any Customer initiated scope changes.

Hydro One will not implement any Customer initiated scope changes until written approval has been received from the Customer accepting the new pricing and schedule impact.

Part 3: Miscellaneous

New or Modified Connection Facilities:

The Customer is planning to replace and upgrade an existing 10/15/25 MVA transformer (T2) with a 30/40/50 MVA unit at its NOTL MTS No. 2. The low voltage bus tie between the T1 and T2 transformers will be operated normally open.

Customer's HST Registration Number:
HST # 863605929RT

Documentation Required (after in service):

The Customer will provide the single line drawings (AC/DC drawings), the drawings/designs showing protections, and protection scheme description, the station layout drawing, the technical data for major equipment such as transformers, breakers, generators, motors etc. For details refer to the Transmission System Code.

Revenue Metering: IESO compliant revenue metering to be provided by the Customer

Customer Notice Info:

Niagara-on-the-Lake Hydro Inc.
P.O. Box 460
8 Henegan Road,
Virgil, ON
L0S 1T0

Attention:
Hassan Syed
Operations Manager

Fax #: 905 468 3861

NIAGARA-ON-THE-LAKE HYDRO INC.

APPENDIX H

EPC RFP

1.0 SUMMARY OF WORK

1.1 Includes the investigation, verification, engineering, design, permits, labour, products, materials, equipment, tools, scheduling and supervision necessary including but not limited to the following;

1. The Services shall be complete in all respects and shall ensure that the proposed construction will be performed in a safe, cost effective and efficient manner.

3. Liaise with the agencies having jurisdiction and prepare documentation necessary for the approval process. Obtain and pay for all plan approvals and permits. Schedule permit inspections and obtain final sign-off from the Authorities having jurisdiction.

4. Prepare design concepts for evaluation, review and approval by the Owner and all agencies having jurisdiction.

5. Arrange and meet at appropriate times with the Owner and with external agencies.

6. Inform and obtain approval from the Owner for any deviation from the Contract Documents.

1.2 Health and Safety

1. Responsible for the Health and Safety in accordance with the Occupational Health and Safety Act and its regulations.

1. Initiate and conduct the Health and Safety functions in accordance with the Occupational Health and Safety Act and its regulations.

3. Utilize Ministry of Labour (MOL) Guidelines for Pre-Start Health & Safety Reviews: How to apply Section 7 of the Regulation for Industrial Establishments for further clarifications.

1.3 Standards and Regulations

1. Comply with applicable standards and regulations including but not limited to the following and any specific codes and standards identified in the document.

    1. Occupational Health and Safety Act and its regulations.

    2. The Ontario Building Code.

    3. The Ontario Fire Code.

    4. Transmission System Code [Ontario Energy Board]

    5. Market Rules for the Ontario Electricity Market [Ontario Energy Board]

6. The Ontario Electrical Safety Code.

7. CSA Standards.

8. IEEE Standards.

9. NFPA Standards.

10. All other applicable standards and regulations.

11. All provincial and federal laws that are applicable, and with authorities having jurisdiction.

1.4 IESO and Hydro One

1. Comply with requirements and assessments of the Independent Electricity System Operator **(**IESO) [Market Operator] and Hydro One Networks Inc. [Transmitter] including but not limited to the follow;

    1. Hydro One Networks Inc.:

        1. Connection Impact Assessment

        2. CCRA Requirements

        3. COVER (Confirmation of Verification Evidence Report)

    2. Independent Electricity System Operator **(**IESO)

        1. System Impact Assessment

1.5 Work Assigned

1. Power Transformers T2: Supply and Installation Contract

1.6 Coordination of Work

1. Coordinate all work with the following;.

    1. Hydro One Networks Inc. (Hydro One)

2. Independent Electricity System Operator (IESO)

3. Metering Service Provider (MSP)

4. Power Transformer T2: Supply and Installation Contractor

5. Electrical Safety Authority

6. Niagara-on-the-Lake Hydro (NOTL Hydro)

1.7 Summary of Work

Investigate, Verify, Determine, Engineer, Design, Procure, Supply, Install, Construct, Inspect, Test, Commission, Energization and Scheduling including but not limited to the following;

1. Modified/New Foundation Pad for the New Power Transformer T2 [New T2] at the existing T2 location.

2. Separation of the existing Oil Containment System into two (2) independent Oil Containment Systems.

3. Modified/New Oil Containment System for the New Power Transformer T2 [New T2]

4. Modified/New Oil Containment System for the existing Power Transformer T1 [Existing T1]

5. New Primary Power Conductors and Connectors to the New Power Transformer T2 [New T2]

6. New Secondary Power Conductors and Connectors to the New Power Transformer T2 [New T2]

7. New Ground Conductors and Connectors to the New Power Transformer T2 [New T2]

8. Modification, revision and new AC Station Service connections to the New Power Transformer T2 [New T2]

9. Modification, revision and new Protection Connections to the New Power Transformer T2 [New T2]

10. Modification, revision and new Control Connections to the New Power Transformer T2 [New T2]

11. Modification, revision and new Telecommunication Connections to the New Power Transformer T2 [New T2]

12. Modification, revision and new Telecommunication Connections to the Transformer Monitoring System pertaining to the New Power Transformer T2 [New T2]

13. Modification, Revision and Restoration of the existing Transformer Station Area including but not limited to the station ground grid system, station sub-grade structures and the station insulating surface structures.

14. The assigning of the Supply, Installation and Testing & Commissioning Contract for the New Power Transformer T2 [New T2]

15. Protective Device (Coordination) and Fault Current Study pertaining to the New Power Transformer T2 [New T2] including but not limited to the following;

    1. Protective Device (Coordination) and Fault Current Study Report
    2. Modification and Revision to the protection functions and settings;
        - A87-A50-A51 (HV) [IED: SEL-587]
        - A50-A51-A51N (LV) [IED: SEL-587]
        - B50-B51-B51N (LV) [IED: SEL-551]

16. Inspection, Testing and Commissioning including but not limited to the following, in accordance with the ANSI/NETA ATS [InterNational Electrical Testing Association **-** Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems];

    1. Modified and Revised protection, control and monitoring schemes pertaining to the New Power Transformer T2 [New T2]

    2. Modified and Revised protection, control and monitoring schemes related to and or impacting the Primary Circuit Switcher 52-T2 (2003T2-Q11S)

    3. As required by the Hydro One: COVER (Confirmation of Verification Evidence Report) process

17. De-Energizing, Disconnecting, Removing and Relocating the existing Power Transformer T2 [Old T2] to a temporary storage location in the Transformer Station.

18. Energization of the New Power Transformer T2 [New T2]

19. Organization, Scheduling, Staging and Execution of the Work

1.8 Operating Criteria of the Transformer Station

1. The work requires to be schedule and executed with following operating conditions;

    1. High Voltage 115kV Circuit Q11S, Energized and In-Service
    2. High Voltage Circuit Switcher 52-T1 (2003T1-Q11S), Energized and In-Service
    3. High Voltage Circuit Switcher 52-T2 (2003T2-Q11S), Energized and in the ‘Open Position’
    4. Power Transformer T1, Energized and In-Service
    5. Power Transformer T2, De-Energized and ‘Out of Service’
    6. Medium Voltage 27.6kV System, Energized and In-Service [including but not limited to T1-B1 Switch, B1-B2 Switch, B1-F1 Switch, B1-F2 Switch, B2-F4 Switch, B1 Bus, B2 Bus, F1 Feeder, F2 Feeder and F4 Feeder, Energized and In-Service]
    7. Medium Voltage 27.6kV Switch T2-B2, Energized and in the ‘Open Position’
    8. Protection, Control and SCADA Systems, Operational and In-Service

1.8 Project Schedules and Project Power Shutdowns

1. Require to provide and execute all Project Scheduling and Project Schedules. All Project Schedules require to be in cooperation with and acceptable to NOTL Hydro.

2. Require to determine and provide any equipment or system power shutdown schedules and plans. All Project Power Shutdown Schedules require to be in cooperation with and acceptable to NOTL Hydro.

3. Require to adhere to all the power shutdown requirements and the permissible power shutdown times & schedules of NOTL Hydro.

4. Require to keep the number and duration of Power Shutdowns to an absolute minimum.

1.9 In Service Date

1. All work completed and the New Power Transformer T2 [New T2] energized and In Service by May 8, 2015.

1.11 Optional Work

1. Creation of a 'Power Transformer Storage Area' in the Transformer Station, for the relocation and storage of the existing Power Transformer T2 [Old T2]

    1. New Foundation Pad at the new 'Power Transformer Storage Area' for the placement and storage of the relocated existing Power Transformer T2 [Old T2]

    2. New Oil Containment System at the new 'Power Transformer Storage Area' for the storage of the relocated existing Power Transformer T2 [Old T2]

    3. Modification, Revision and Restoration of the existing Transformer Station Area for the new 'Power Transformer Storage Area' including but not limited to the station ground grid system, station sub-grade structures and the station insulating surface structures.

    4. De-Energizing, Disconnecting, Removing, Relocating and Permanent Storage of the existing Power Transformer T2 [Old T2] including all the associated oil handing, from the existing T2 location to the new 'Power Transformer Storage Area' location.

    5. Grounding of the relocated existing Power Transformer T2 [Old T2] at the new 'Power Transformer Storage Area' location.

2. New Remote Terminal Unit (RTU) System

    1. Investigate, Verify, Determine, Engineer, Design, Procure, Supply, Install, Construct, Inspect, Test, Commission, Place Into Service and Scheduling of the Replacement and Upgrade of the existing Remote Terminal Unit (RTU) System [GE - D20 RTU System] with a new Remote Terminal Unit (RTU) System [SEL – RTAC 3530 and SEL – 2440 RTU System] including but not limited to the following;

        a. Investigate, Verify and Determine all the existing and new Digital Inputs and Digital Outputs, and supply & install in the new RTU System

        b. Investigate, Verify and Determine all the existing and new Analog Inputs and Analog Outputs, and supply & install in the new RTU System

        c. Investigate, Verify and Determine all the existing and new Control Points, and supply & install in the new RTU System

        d. Investigate, Verify and Determine all the existing and new SCADA Points, and supply & install in the new RTU System

        e. Investigate, Verify and Determine all the existing and new Telemetry, Telecommunication and Data Communications, and supply & install in the new RTU System

        f. Supply and Install all associated services and raceway systems to the new RTU System

        g. Supply and Install all associated cabling, wiring and interconnections to the new RTU System

        h. Perform, Execute and Supply & Install all associated settings and programming for the new RTU System

        i. Perform and Execute all the associated System Integration for the new RTU System

        j. Perform and Execute all the associated Testing & Commissioning of the new RTU System

        k. Perform and Execute all the associated Testing & Commissioning of the interface of the new RTU System with the existing Remote Master SCADA System

        l. Perform and Execute all the associated Testing & Commissioning of the new RTU System in accordance with the requirements of the IESO and the Transmitter [Hydro One]

        m. Place into Service the new RTU System

2. The documentation, drawings and information pertaining to the existing Remote Terminal Unit (RTU) System will be provided prior to the start of the design phase

3. New Medium Voltage Re-Closer Unit System, Identification: F3

1. Investigate, Verify, Determine, Engineer, Design, Procure, Supply, Install, Construct, Inspect, Test, Commission, Energization and Scheduling of a new Medium Voltage Re-Closer Unit, Identification: F3, including but not limited to the following;

    a. All associated primary electrical power equipment and components

    b. All associated Protection and Control Systems

    c. All associated SCADA Systems

    d. All associated electrical services and systems

    e. All associated Structural Foundations

    f. The Medium Voltage Feeder Cables, from the new MV Re-Closer Unit to and termination on the existing Overhead Medium Voltage Distribution Line running adjacent to the Transformer Station

    g. Perform, Execute and Supply & Install all associated settings and programming pertaining to the Protection, Control and SCADA Systems

    h. Perform and Execute all the associated System Integration of the new MV Re-Closer Unit into the station RTU System

    i. Perform and Execute all the associated Testing & Commissioning in accordance with the ANSI/NETA ATS [InterNational Electrical Testing Association **-** Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems]

    j. Energization of the new MV Re-Closer Unit

2. The new Medium Voltage Re-Closer Unit System, Identification: F3 to be identical to the existing Medium Voltage Re-Closer Unit System, Identification: F1, F2 and F4

3. The technical requirements and ratings of the new Medium Voltage Re-Closer Unit System, Identification: F3 to be identical to the existing Medium Voltage Re-Closer Unit System, Identification: F1, F2 and F4

4. The new Medium Voltage Re-Closer Unit System F3 requires to make use of the provisional space, location and amenities provided for the future MV Re-Closer Unit

5. The documentation, drawings and information pertaining to the existing Medium Voltage Re-Closer Unit System, Identification: F1, F2 and F4 will be provided prior to the start of the design phase

4. Perform a Soil Resistivity Test, Ground Grid Resistance Test and Driving-Point Impedance Test.

Acceptable Engineering Firms;
- METSCO Energy Solutions
- Kinectrics

5. Perform an Engineering Study to Analyze and Evaluate the existing Transformer Station standalone Ground Grid System but including the associated 27.6kV Medium Voltage Distribution System - Driving Point Impedance. Determine the ground potential rise (GPR), maximum touch voltage and maximum step voltage of the existing transformer station based on the following conditions;

1. The present transmission system short circuit capacity

2. The maximum transmission system short circuit capacity

3. The maximum permissible transmission short circuit capacity that the ground potential rise (GPR), maximum touch voltage and maximum step voltage of the Transformer Station remain within the permissible tolerable limits

Acceptable Engineering Firms;
- METSCO Energy Solutions
- Kinectrics

END OF SECTION

1 Invitation

1.1 **REQUEST FOR QUOTATION**

.1 Quotation for provision of all the Work will be received by

Niagara-on-the-Lake Hydro Inc.
c/o IBI Group (Canada) Inc.
30 International Boulevard
Rexdale, Ontario
M9W 5P3

before 3:00:00 PM LOCAL TIME, FRIDAY, AUGUST 15, 2014, as designated by the receiving office timepiece.

.2 Quotation submitted after above time may be regarded as informal and subject to rejection.

.3 Amendments to a submitted quotation will be permitted if received in writing prior to quotation closing and also endorsed by same party or parties who signed sealed quotation.

1.2 **CONTRACT DOCUMENTS IDENTIFICATION**

.1 The quotation documents are identified as

NOTL MTS No.2

Niagara-on-the-Lake Hydro Inc. [**NOTL Hydro**]

8 Henegan Road
Virgil ON L0S 1T0 Canada

Issued for Quotation on July 24, 2014

1.3 **EXAMINATION OF QUOTATION DOCUMENTS**

.1 Each Bidder shall be responsible for checking all items noted in the quotation documents to ensure that this set of quotation documents is complete. Immediately notify the Consultant of any omissions.

.2 All the quotation documents shall be read in conjunction with one another and it shall be assumed that they are in agreement. Each Bidder shall examine all the quotation documents as soon as possible after receipt thereof and should he discover any discrepancies, omissions, errors, ambiguities or conflicts in or among the quotation documents, or be in doubt as to their meaning or intent, must bring the matter to the attention of the Consultant at least seven (7) business days prior to the date set for receiving quotations.

1.4 **QUERIES - ADDENDA**

.1 Direct questions by email to Consultant:

IBI Group (Canada) Inc., Rexdale office
Attention: Mr. Piero Lucci, P.Eng.

Email: piero.lucci@ibigroup.com

.1 Questions, sent by email, will be accepted only from invited Bidders. Subcontractors or suppliers shall obtain interpretations and clarifications from Contractors to whom they are bidding. Telephone inquiries will not be entertained.

.2 All questions must reference the applicable Drawing or Specification section

.3 Any interpretation of, or change in quotation documents prior to date specified for receipt of quotations will be made only by written addendum issued by Consultant to each Bidder to whom quotation documents have been issued and such addenda shall become part of quotation documents. Verbal answers are binding only when confirmed by written addenda.

.4 No other interpretation or explanation shall be valid.

.5 Questions will be accepted up to 48 hours of quotation closing time.

1.5 **MANDATORY SITE EXAMINATION**

.1 A mandatory site examination is scheduled on Tuesday, August 12, 2014, at 10 am.

.2 Site examination meeting will take place at:

NOTL Hydro MTS No.2
770 Concession 5 Road
Niagara-on-the-Lake, Ontario, Canada

.3 Consultant will take attendance at the Site Examination. Bidders not in attendance will be ineligible to submit a Bid for this Project.

1.6 **QUOTATION DOCUMENTS AVAILABILITY**

.1 Quotation documents will only be issued to Contract Bidders.

.2 One set of full size prints of all Drawings and 1 copy of the Specifications have been issued to each Bidder free of charge. Bidder may print at its own expense additional reproductions from such prints and Specifications for bidding purposes.

.3 Upon receipt of quotation documents, each prime Bidder shall verify that they are complete. Immediately notify Consultant should quotation documents be incomplete.

.4 Immediately notify Consultant upon finding discrepancies or omissions in quotation documents.

1.7 **QUOTATION SUBMISSIONS**

.1 Bidders shall be solely responsible for the delivery and submission of their quotation in the manner and within the time prescribed.

.2 No oral, email or telephone proposals will be considered.

1.8 **QUOTATION SIGNING**

.1 The quotation shall be signed under seal by the Bidder.

.2 Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Affix seal.

.3 Limited Company or Corporation: Signature of duly authorized signing officer with the corporate seal affixed is required. If the quotation is signed by officials other than the company President, Secretary or Treasurer of the company, a copy of the by-law resolution of the Board of Directors authorizing them to do so must also be submitted with the quotation in the quotation envelope.

.4 If the Bidder is a Joint Venture each party to the Joint Venture shall execute the quotation under seal in the manner appropriate to such party.

1.9 **QUOTATION INELIGIBILITY**

.1 Quotations that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations or irregularities of any kind may be regarded informal and subject to rejection.

.2 Quotation Forms and enclosures which are improperly prepared may be declared informal and subject to rejection.

.3 Bids from unsolicited Bidders will be returned unopened.

.4 Quotations shall be for a Stipulated Lump Sum without escalation clauses. Quotations containing escalation clauses will not be considered.

.5 Bidders not present at the Site Examination will be disqualified. Bids received from disqualified Bidders will be returned unopened.

2 Quotation Enclosures - Requirements

2.1 **SECURITY DEPOSIT**

.1 Quotation shall be accompanied by a security deposit as follows:

.1 Bid Bond in the amount of 10% of the quotation price.

.2 Cash Deposit for bid documents is not required.

.2 Endorse the Bid Bond in the name of the Owner as Obligee, signed and sealed by the Principal and Surety.

.3 The security deposit will be returned after delivery to the Owner of the required Performance Bond (and a Labour and Material Bond) by the accepted Bidder.

.4 Each quotation must be accompanied by an "Agreement to Bond" from a surety acceptable to the Owner for the provision of a Performance Bond for 50% of the Contract Price and a Labour and Material Payment Bond for 50% of the Contract Price.

2.2 **PERFORMANCE ASSURANCE**

.1 The accepted Bidder shall provide a Performance bond and Labour and Material Payment Bond stated herein, covering the faithful performance of the Contract.

.2 Performance Bond and a Labour and Material Payment Bond must show original signature and seal of the bonding company.

.3 Submit on Quotation Form the unit price(s) applicable to pay for the cost of specified bonding.

2.3 **INFORMATION WITH QUOTATION**

.1 Include with the quotation the following documents:

.1 Bar Chart Schedule showing how the Bidder proposes to meet the Owner's required completion dates. The schedule shall indicate the start and finish dates for the work, including engineering, shop drawings review, fabrication and erection, commissioning and hand over of equipment.

.2 Organization Chart illustrating senior office and field staff with corresponding resumes, to be assigned to this Contract:

.1 Project Manager, Site Superintendent

.1 Names and responsibilities

.2 10 years minimum experience on projects of equal or greater scope and complexity. List project experiences. List 3 references from past project clients. Provide resume to confirm the foregoing.

.3 Confirm full time assignment for the full duration of the Contract and shall not be changed without the written approval of the Consultant.

.3 Bidder’s company safety policy, an outline of Health and Safety Program and a copy of current CAD7 calculations from WS&IB.

2.4 **ALTERNATIVES AND SUBSTITUTIONS**

.1 The quotation shall be based on the specifications and any addenda thereto.

3 Qualifications

3.1 **ACCEPTANCE OF QUOTATION**

.1 Bid shall be valid for acceptance within sixty days from Bid closing date.

.2 The Owner reserves the right to accept or reject any or all quotations or accept any quotation that best suits its requirements for the project.

.3 It shall be noted that prior to award of the Work a meeting may be held to review the quotation and the Contractor's understanding of the scope of Work, the terms and conditions which will apply and the requirements of the schedule.

.4 Bid shall be on a firm price basis for the required delivery; escalation shall not be allowed.

.5 The Owner will issue the successful bidder a written quotation acceptance or Purchase Order.

.6 The successful Contractor shall sign a formal contract document with the Owner based on the Stipulated Price Contract specified herein.

3.2 **HARMONIZED SALES TAX**

.1 The Ontario Harmonized Sales Tax is not to be considered an applicable tax for the purpose of this contract. Bidders shall therefore not include any amount in their bid prices for the said HST. The successful Contractor shall bill the Owner, upon each progress payment certificate, the appropriate amount of HST the Owner is legally obliged to pay. This amount will be paid to the Contractor in addition to the amount certified for payment under the contract and will therefore not affect the Contract price.

4 Assigned Work

4.1 **ASSIGNMENT TO GENERAL CONTRACTOR**

.1 The successful Bidder will enter into a subcontract with the successful General Contract bidder at a later date.

.2 The Agreement, General Conditions and Supplementary Conditions herein are to be issued as tender conditions to General Contractors at a later date and are included with these documents as a guide to each Bidder for submitting his quotation.

4.2 **SAFETY**

.1 Bidders shall note that job site safety is paramount.

.2 The successful Contractor will be required to attend the Project Safety Orientation and to be familiar with the project Safety Manual and the Occupational Health and Safety Act and Regulations for Construction Project. The Contractor shall have a Safety Representative assigned to the project, to be available at all times and to attend project safety and coordination meetings.

4.3 **CONFIDENTIALITY**

.1 All supplier document information provided herein is to be considered confidential and is not to be copied or made available to others.

End Of Section

/dd/

1 Name Of Bidder _____

QUOTATION FOR: NOTL MTS No.2

TO: Niagara-on-the-Lake Hydro Inc. [**NOTL Hydro**]
8 Henegan Road
Virgil, Ontario
L0S 1T0

2 Quotation Price (NET exclusive of all applicable taxes)

The Undersigned (hereinafter referred to as "Contractor") proposes to provide all labour, supervision, material, equipment and all other services for the proper completion of the Work of the referenced Contract, in accordance with the Instructions to Bidders, General Conditions, Supplementary Conditions, Specifications and Drawings included with the Quotation Documents, as prepared for the Stipulated Lump Sum Quotation Price (hereinafter referred to as "Quotation Price") of:

_____

_____ /100 Dollars ($_____)

in Canadian Funds which includes all prime costs, allowances, freight, duties, and government excise or sales taxes in force at this date, except the Harmonized Sales Tax and as otherwise provided in the Quotation Documents.

Provide HST associated with installation services:

_____ /100 Dollars ($_____)

3 Optional Prices

The following are our prices for the Optional Work items listed hereunder. Such optional work items and amounts are NOT included in our Stipulated Lump Sum Quotation Price. The Owner reserves the right to accept any or all options and adjust the Contract Price or Quotation Price by the amount or amounts stated. No other cost adjustments will apply. All quotations shall be firm and valid for acceptance.

	Description of Work	Amount
.1	Creation of a 'Power Transformer Storage Area' in the Transformer Station, for the relocation and storage of the existing Power Transformer T2	$_____ (Add)
.2	New Remote Terminal Unit (RTU) System	$_____ (Add)
.3	New Medium Voltage Re-Closer Unit System, Identification: F3	$_____ (Add)
.4	Perform a Soil Resistivity Test, Ground Grid Resistance Test and Driving-Point Impedance Test	$_____ (Add)

.5 Perform an Engineering Study to Analyze and Evaluate the existing Transformer Station standalone Ground Grid System $_____
(Add)

3.2 **QUOTATION ACCEPTANCE**

The Contractor agrees that this Quotation is open to acceptance for a period of thirty (30) days from quotation closing date.

3.3 **PRICE ADJUSTMENTS**

The above stated quotation price includes fully for all increases, for whatever cause, in cost or price of labour, materials, equipment or fuels. Escalation shall not apply for the duration of the Contract.

3.4 **BONDING**

.1 The following amounts for providing a 50% Performance Bond and a 50% Labour and Material Payment Bond are included in the Quotation Price.

PERFORMANCE BOND $_____ (Total Amount included)

PAYMENT BOND $_____ (Total Amount included)

.2 The following all-inclusive unit rates apply to bonding cost adjustments for the duration of the Contract.

PERFORMANCE BOND RATE $_____/$1,000.00 CONTRACT VALUE

PAYMENT BOND RATE $_____/$1,000.00 CONTRACT VALUE

3.5 **DOCUMENTS AND ADDENDA**

The undersigned submits that he has thoroughly reviewed the Instructions to Bidders, Quotation Form and Appendices, General Conditions of Contract, Supplementary Conditions, General Requirements, Drawings, Specifications, Reference Documents and the following Addenda and hereby accepts and agrees to all provisions and conditions stated therein and has included fully for all requirements in the Quotation Price:

Addendum _____ dated _____

Addendum _____ dated _____

Addendum _____ dated _____

Note: If no addenda have been received write in "NONE".

3.6 **INSTALLATION SUBCONTRACTOR**

The undersigned submits that the transformer installation will be performed by the following Subcontractor:

Name: _____

Address: _____

3.7 **ASSIGNMENT**

.1 The Contractor agrees that, if awarded the Contract for this Work and if so required by the Owner, he will enter into a Subcontract agreement with a subsequently appointed General Contractor.

4 Fees For Changes In The Work

For all changes in the Work which may be ordered by the Owner which are not covered by the stated or agreed Unit Prices, the following percentages shall be used, as applicable, in Contract Price adjustments in accordance with the General Conditions.

4.1 **MATERIAL**

The percentage mark-up on MATERIAL is: _____%

- Material costs shall be calculated using the actual invoiced cost to Contractor (including H.S.T., if any) plus cost of transportation.

4.2 **LABOUR**

The following is the schedule of all-inclusive hourly rates (**blended for foreman, journeyman, apprentice**) which includes the costs of vacation and statutory holiday pay, burdens, benefits, home office administration and overhead, warranty, small tools and consumable allowance, clean-up, all field overheads including supervision above working foreman level and all other indirect costs, overhead and profit. Rates EXCLUDE only the Harmonized Sales Tax and Bonding.

Trade	Straight Time	Overtime
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____

4.3 **EQUIPMENT (THIRD PARTY)**

Rental equipment from arms-length third parties shall be reimbursed at invoiced cost plus: _____%

- Reimbursement for transportation is at cost if the equipment is not on the Site.

4.4 **CONTRACTOR'S SUBCONTRACTORS (THIRD PARTY, ARMS-LENGTH)**

The percentage to be added to the invoiced cost of extra work completed by a Subcontractor to the Contractor is: _____%

- Included in this percentage is the applicable compensation to cover all of Contractor's supervision, overhead, profit and all other costs.

4.5 **SUBCONTRACTOR'S MARK-UPS**

The percentage mark-ups, used by Contractor's Subcontractor shall not exceed Contractor's markup rates specified in 4.1 above, unless prior written authorization has been given by Owner and any such additional authorization shall be for burden adjustments only.

5 Project Staff And Labour Agreements

.1 The Contractor shall provide full time supervision throughout the duration of the project to the satisfaction of the Owner, for which the Contractor proposes the following persons:

Project Manager _____

General Superintendent _____

Site Safety Coordinator _____

.2 Contractor is signatory to agreements with the following crafts to be utilized for this Work:

Organization/Craft	Local No.	Location	Expiry Date
.1			
.2			
.3			
.4			
.5			
.6			

.3 Contractor's **Subcontractors** are signatories to agreements with the following crafts to be utilized for this Work:

Organization/Craft	Local No.	Location	Expiry Date
.1			
.2			
.3			
.4			
.5			
.6			

6 Schedule

The Contractor submits that he has carefully examined the Drawings and Specifications and the site of the proposed Work and has satisfied himself as to his ability and the ability of his Subcontractors and suppliers to meet the requirements for timely progress and completion set out below and to execute the Work in full accordance with Contract Documents.

It is understood and agreed that the Quotation Price stated herein includes all costs on account of premium time or overtime work required in order to meet the completion date (and Owner's partial occupancy requirements, if any), whether or not such work is done by the Contractor's own forces or by his Subcontractors.

The undersigned confirms that the Quotation Price includes working a minimum 40 hour week, based on a minimum of 5 days, 8 hours per day.

	EVENTS	DATES SPECIFIED BY OWNER	DATES SPECIFIED BY CONTRACTOR
.1	Award of Contract	August 29, 2014	
.2	Design completed		_____
.3	Start Work on Site		_____
.4	Delivery of New Power Transformer T2 Unit to Site	February 13, 2015	
.5	Substantial Performance on Site		_____
.6	New Power Transformer T2 Unit energized	May 08, 2015	
.7	No. of weeks to complete from date of award		_____

7 Bidders Understanding

The Contractor represents that he has had a sufficient opportunity to examine and has carefully examined the Site of the Work and the local conditions and all Drawings and Specifications and Reference Documents which relate to the Work; that he has made all investigations essential to a full understanding of the difficulties which may be encountered, and that he has sufficient equipment, experience and forces to perform the Work in accordance with the Drawings and Specifications and the terms of this Contract within the Time specified.

No allowances or extra consideration on behalf of the Contractor will be allowed by the Owner by reason of additional costs, damages or other difficulties incurred by the Contractor for failure to have fully investigated and determined conditions affecting the Work.

8 Execute Contract

The Contractor agrees that if this Quotation is acceptable to the Owner, he will:

- Accept a Letter of Award or Purchase Order as authority to commence work before executing a formal Contract with the Owner.

- Execute a formal Contract with the General Contractor, in accordance with the conditions of the quotation documents.
- Submit immediately, a complete list of subcontractors and suppliers of all major equipment and products intended for use on the Contract.
- If required by Owner, furnish within 7 days, a Performance Bond and Labour and Material Bond issued by a Surety acceptable to the Owner in accordance with the requirements of the Contract, indicating the Owner as "Obligee".
- Furnish within 7 days, certified copies of insurance policies as required by the Conditions of the Contract, naming the Owner and Consultant as additionally named insured.
- Furnish within 7 days, a Certificate of Clearance from the Workplace Safety & Insurance Board.
- Furnish within 7 days, a detailed schedule of Work, showing dates for preparation and submission of shop drawings, fabrication and erection, and a breakdown of items and tags of the Work.
- Furnish within 7 days, a breakdown of the Contract Price in such form and detail as required by the Owner, for progress payments, taxation and internal accounting purposes.
- Submit one month prior to the first application for payment, a cash flow schedule by month for the duration of the Contract, based on net payments. Identify holdback releases.

9 Address, Legal Status And Signature Of Bidder

.1 The Contractor does hereby designate the address, given below as the legal address to which all notices, directions or other communications may be served or mailed:

Street _____

City _____ Province _____

Postal Code _____ Tel _____ Fax _____

.2 Contact for questions relating to this Quotation

Name _____ Title _____

Email Address _____

.3 The undersigned does hereby declare that the Bidder has legal status checked below:

_____ Individual

_____ Partnership

_____ Corporation incorporated under the laws of

_____ Date _____

.4 This Quotation is submitted under seal in the name:

_____
(Company Name - Typed)

SEAL

By _____
(Signature)

Name _____ Title _____
(Typed)

Signed and sealed this _____ day of _____, 2011.

End Of Section

/dd/

1 Contract Documents

.1 Standard Construction Document for Stipulated Contract CCDC2-2008 (pages 1 thru 30) consisting of Agreement Between Owner and Contractor, Definitions, and The General Conditions of the Stipulated Price Contract, Articles GC-1.1 to GC-12.3 inclusive, governing same, including the Supplementary Conditions, is hereby made a part of these Contract Documents.

.2 CCDC2-2008 is a common document in the Canadian construction industry, and Contractor is required to have a copy. For copyright reasons, a copy of CCDC2-2008 is not bound into the Project Manual.

End Of Section

The Standard Construction Document for Stipulated Price Contract, 2008 English version, consisting of the Agreement Between Owner and Contractor, Definitions, and General Conditions of the Stipulated Price Contract, Parts 1 to 12 inclusive, governing same is hereby made part of these Contract Documents, with the following amendments, additions and modifications. Where these amendments, additions, and modifications specifically reference a change to the Agreement, Definitions, or General Conditions, these amendments, additions and modifications shall govern.

Agreement

ARTICLE A-5 – PAYMENT

In paragraph 5.1, holdback percentage shall be ten percent (10%).

ARTICLE A-6 – RECEIPT AND ADDRESSES FOR NOTICES IN WRITING

Delete Article A-6.1 and substitute new article 6.1:

6.1 Notices in Writing between the parties or between them and the Consultant shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier or if sent during normal business hours by fax and addressed as set out below. Such Notices in Writing will be deemed to be received by the addressee on the next business day if sent by fax after normal business hours or if sent by overnight commercial courier. Such Notices in Writing will be deemed to be received by the addressee on the fifth Working Day following the date of mailing, if sent by pre-paid registered post, when addressed as set out below. An address for a party may be changed by Notice in Writing to the other party setting out the new address in accordance with this Article.

DEFINITIONS

Delete definition 16. “Provide” and replace with the following:

16. Provide - This term means to Furnish and Install, complete and in place, including accessories, finishes, tests, and services required to render item so specified complete ready for use.

Add the following definitions:

28. Furnish - This term means fabrication or procurement of materials, equipment, or components, or performance of services to the extent specified and shown. Where used with respect to materials, equipment, or components, the term includes crating and delivery to Project Site but is not intended to include installation of item, either temporary or final.

29. Install - This term means placement of materials, equipment, or components, including receiving, unloading, transporting, storage, uncrating and installing, and performance of such testing and finish work as is compatible with degree of installation specified.

30. Commission - The procedure which includes checking, testing, adjusting and measuring performed by the Contractor to demonstrate and verify the installation, operation and performance of all components and the entire system.

1 GENERAL

1.1 Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

GC 1.1 CONTRACT DOCUMENTS

.1 Add to the end of subparagraph 1.1.2.2

Except where the Consultant shall be indemnified as a third party beneficiary as provided in subparagraphs 9.2.7.4, 9.5.3.4 and in 12.1.3.

.2 Add new subparagraph 1.1.7.5:

1.1.7.5 In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the Contract Documents.

GC 2.2 ROLE OF THE CONSULTANT

.1 Add at the end of paragraph 2.2.9. “The Owner and the Contractor shall waive any claims against the Consultant arising out of the making of such interpretations and findings made in accordance with paragraphs 2.2.7, 2.2.8 and 2.2.9”.

.2 Delete the comma after the word “submittals” and add the words “which are provided” before the words “in accordance” in paragraph 2.2.14.

GC 2.4 DEFECTIVE WORK

.1 Add new subparagraphs 2.4.1.1 and 2.4.1.2:

2.4.1.1 The Contractor shall rectify, in a manner acceptable to the Owner and the Consultant, all defective work and deficiencies throughout the Work, whether or not they are specifically identified by the Consultant.

2.4.1.2 The Contractor shall prioritize the correction of any defective work which, in the sole discretion of the Owner, adversely affects the day to day operation of the Owner.

GC 3.1 CONTROL OF THE WORK

.1 Add new paragraph 3.1.3:

3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the Contractor shall verify, at the Place of the Work, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the Work and shall further carefully compare such field measurements and conditions with the requirements of the Contract Documents. Where dimensions are not included or contradictions exist, or exact locations are not apparent, the Contractor shall immediately notify the Consultant in writing and obtain written instructions from the Consultant before proceeding with any part of the affected work.

GC 3.4 DOCUMENT REVIEW

.1 Delete paragraph 3.4.1 in its entirety and substitute new paragraph 3.4.1:

3.4.1 The Contractor shall review the Contract Documents and shall report promptly to the Consultant any error, inconsistency or omission the Contractor may discover. Such review by the Contractor shall comply with the standard of care described in paragraph 3.14.1 of the Contract. Except for its obligation to make such review and report the result, the Contractor does not assume any responsibility to the Owner or to the Consultant for the accuracy of the Contract Documents. The Contractor shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the Contract Documents, which the Contractor could not reasonably have discovered. If the Contractor does discover any error, inconsistency or omission in the Contract Documents, the Contractor shall not proceed with the work affected until the Contractor has received corrected or missing information from the Consultant.

GC 3.8 LABOUR AND PRODUCTS

.1 Add new paragraph 3.8.4:

3.8.4 The Contractor is responsible for the safe on-site storage of Products and their protection (including Products supplied by the Owner and other contractors to be installed under the Contract) in such ways as to avoid dangerous conditions or contamination to the Products or other persons or property and in locations at the Place of the Work to the satisfaction of the Owner and the Consultant. The Owner shall provide all relevant information on the Products to be supplied by the Owner.

GC 3.10 SHOP DRAWINGS

.1 Add the words “AND OTHER SUBMITTALS” to the Title after SHOP DRAWINGS.

.2 Add “and Submittals” after the words “Shop Drawings” in paragraphs 3.10.1, 3.10.2, 3.10.4, 3.10.7, 3.10.8, 3.10.8.2, 3.10.9, 3.10.10, 3.10.11, and 3.10.12.

.3 Delete 3.10.3 in its entirety and substitute new paragraph 3.10.3

GC.3.10.3 Prior to the first application for payment, the Contractor and the Consultant shall jointly prepare a schedule of the dates for submission and return of Shop Drawings and any Submittals.

.4 Delete the words “with reasonable promptness so as to cause no delay in the performance of the Work” and replace with “within 10 working days or such longer period as may be reasonably required” in paragraph 3.10.12.

GC 3.14 PERFORMANCE BY CONTRACTOR

.1 Add new General Condition 3.14.1

3.14.1 In performing its services and obligations under the Contract, the Contractor shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The Contractor acknowledges and agrees that throughout the Contract, the Contractor’s obligations, duties and responsibilities shall be interpreted in accordance with this standard. The Contractor shall exercise the same standard of due care and diligence in respect of any Products, personnel, or procedures which it may recommend to the Owner.

.2 Add new General Condition 3.14.2

3.14.2 The Contractor further represents, covenants and warrants to the Owner that:

.1 The personnel it assigns to the Project are appropriately experienced.

.2 It has a sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the Owner's approval, in the event of death, incapacity, removal or resignation.

GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Add: "Progress payments made prior to January 2015 shall not exceed 20% of the full Contract Price."

.2 Add new subparagraph 5.2.8:

5.2.8 Keep detailed supporting evidence for applications for payment for Work completed prior to January 2015 such that the *Consultant* may reasonably require to establish the value of the Work completed.

GC 5.7 FINAL PAYMENT

.1 In the second (2nd) line of paragraph 5.7.4, change "5 calendar days" to read "20 calendar days".

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

.2 Add new subparagraph 6.4.5:

6.4.5 The Contractor confirms that, prior to bidding the Project, it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.14.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor is not entitled to compensation or to an extension of the Contract Time for conditions which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.

GC 6.5 DELAYS

.1 Delete the period at the end of paragraph 6.5.1, and substitute the following words:

", but excluding any consequential, indirect or special damages."

.2 Add new subparagraph 6.5.6.

6.5.6 If the Contractor is delayed in the performance of the Work by an act or omission of the Contractor or anyone employed or engaged by the Contractor directly or indirectly, or by any cause within the Contractor's control, then the Contract Time shall be extended for such reasonable time as the Consultant may decide in consultation with the Contractor. The Owner shall be reimbursed by the Contractor for all reasonable costs incurred by the Owner as the result of such delay, including all services required by the Owner from the Consultant as a result of such delay by the Contractor and, in particular, the cost of the Consultant's services during the period between the date of Substantial Performance of the Work stated in Article A-1 herein as the same may be extended through the provisions of these General Conditions and any later, actual date of Substantial Performance of the Work achieved by the Contractor.

GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

.1 Add the words “as noted in paragraph 6.6.3” after the words “of the claim” in paragraph 6.6.5 and add the words “and the Consultant”, at the end of paragraph 6.6.5.

GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION

.1 Add the following new paragraphs 8.2.9, 8.2.10, 8.2.11, 8.2.12, 8.2.13, and 8.2.14.

8.2.9 Within five days of receipt of the notice of arbitration by the responding party under paragraph 8.2.6, the Owner and the Contractor shall give the Consultant a written notice containing:

a) a copy of the notice of arbitration

b) a copy of supplementary conditions 8.2.9 to 8.2.14 of this Contract, and;

c) any claims or issues which the Contractor or the Owner, as the case may be, wishes to raise in relation to the Consultant arising out of the issues in dispute in the arbitration

8.2.10 The Owner and the Contractor agree that the Consultant may elect, within ten days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

a) has a vested or contingent financial interest in the outcome of the arbitration;

b) gives the notice of election to the Owner and the Contractor before the arbitrator is appointed;

c) agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.2.6, and,

d) agrees to be bound by the arbitral award made in the arbitration.

8.2.11 If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the respondent receives a copy of the notice of arbitration.

8.2.12 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

a) on application of the Owner or the Contractor, determine whether the Consultant has satisfied the requirements of paragraph 8.2.10, and; b) make any procedural order considered necessary to facilitate the addition of the Consultant as a party to the arbitration.

8.2.13 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant;

8.2.14 In the event of notice of arbitration given by the Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding.

GC 9.1 PROTECTION OF WORK AND PROPERTY

.1 Delete subparagraph 9.1.1.1 in its entirety and substitute new subparagraph 9.1.1.1:

9.1.1.1 errors in the Contract Documents which the Contractor could not have discovered applying the standard of care described in paragraph 3.14.1;

.2 Delete paragraph 9.1.2 in its entirety and substitute the following new paragraph 9.1.2:

9.1.2 Before commencing any Work, the Contractor shall determine the locations of all underground utilities and structures indicated in the Contract Documents, or that are discoverable by applying to an inspection of the Place of the Work the degree of care and skill described in paragraph 3.14.1.

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

.1 Add to paragraph 9.2.6 after the word "responsible", the following new words:

or whether any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner or others,

.2 Add "and the Consultant" after the word "Contractor" in subparagraph 9.2.7.4.

.3 Add to paragraph 9.2.8 after the word "responsible", the following new words:

or that any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner or others,

GC 9.5 MOULD

.1 Add "and the Consultant" after "Contractor" in subparagraph 9.5.3.4.

GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

.2 Delete from the first line of paragraph 10.2.5 the word, "The" and substitute the words:

"Subject to paragraph 3.14.1, the".

GC 12.1 INDEMNIFICATION

.1 Add new clause 12.1.1.3.

12.1.1. 3. The Contractor shall indemnify and hold harmless the Consultant, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings by third parties that arise out of, or are attributable to, the Contractor's performance of the Contract, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable, and made in writing within a period of 6 years from the date of Substantial Performance of the Work as set out in the certificate of Substantial Performance of the Work, or within such shorter such period as may be prescribed by any limitation statute or the province or territory of the Place of Work.

GC 12.3 WARRANTY

.1 Delete from the first line of paragraph 12.3.2 the word, "The" and substitute the words:

"Subject to paragraph 3.14.1, the…".

GC 13 ADMINISTRATIVE PROCEDURES AND DOCUMENTS (NEW ARTICLE)

.1 The Contractor shall comply with the following documents and procedures, and instructions relating to the Work which will be given to the Contractor by the Consultant by the following means:

13.1 Contemplated Change Notice (CCN)

A CCN represents a notice of proposed change to the Work requiring the submission of quotations in accordance with Article 13.4 herein. A CCN is not an authorization to proceed with changes in the work. A CCN will indicate the items of work to be added, deleted, or revised and will relate to revised drawings issued or referenced in the CCN.

A CCN may provide clarifications or additional details consistent with the work included in the Contract and not requiring a change in price. A CCN may also be used for transmittal of information such as colour schedules, detail sketches, etc., not requiring a change in price.

It is recognized that on many tightly scheduled projects, work detailed on CCNs must be proceeded with immediately, pending settlement of the price change. In such instances, the Owner through the Consultant may authorize the work or part of the work covered in the CCN to proceed by the Consultant issuing a Change Directive to the Contractor.

13.2 Supplemental Instruction (SI)

As defined under "DEFINITIONS" in CCDC2-2008

Should the Contractor hold that these instructions involve a change in the contract rice or contract time, Contractor shall notify the Consultant in writing and not proceed with any work until directed by a change order or change directive.

13.4 Quotations

Quotations shall be submitted to the Consultant promptly after receipt of each CCN and Change Directive addressed as follows:

Niagara-on-the-Lake Hydro Inc.
c/o IBI Group (Canada) Inc.
30 International Boulevard
Rexdale, Ontario
M9W 5P3

and identified as follows:

IBI Project No. 24RX14.0062
Power Transformer

A separate quotation is required for each CCN and Change Directive. Quotations shall be complete and account for each item in the CCN or Change Directive.

The Contractor's fees for changes to the work are to be based on the net additional cost of each CCN or Change Directive but not applied to unit price items.

Quotations shall provide a complete breakdown of prices for all items, including quantities and unit material and labour costs. Copies of each subcontractor's breakdown submissions shall accompany all quotations.

Where unit costs are established for items of work in the Contract, quotations shall be based on such unit costs, showing quotations each item.

Three copies of quotations, and 3 copies of subcontractor's quotations and breakdowns, are required.

Quotations shall be submitted within 10 working days of receipt of each CCN or Change Directive or sooner if requested by the Consultant.

13.5 Change Order

As defined under “DEFINITIONS” in CCDC2-2008.

After satisfying himself as to the correctness of the Contractor's quotation, the Consultant will prepare a Change Order for the Owner's approval. When the Change Order is signed by the Owner, the original and 1 copy of the Change Order will be forwarded to the Contractor who will indicate his acknowledgement and receipt of the Change Order on the copy, and return it to the Consultant for record purposes. The Contractor will retain the original for its records.

13.6 Change Directive

As defined under “DEFINITIONS” in CCDC2-2008.

Unless otherwise stated all materials and workmanship shall be in accordance with the requirements of the Contract. The basis of calculation of the adjustment in contract price and contract time for the work described in the Change Directive shall be determined in the manner described in the contract documents. The actual adjustment in contract price for the work described in the Change Directive shall be on a lump sum basis unless noted otherwise.

GC 14 CONFIDENTIALITY (NEW ARTICLE)

Contractor shall treat as confidential and secret all data, drawings and specifications related to the Project and shall not lend out to others such information or documents.

Data or design provided by or developed under this Contract shall be for the strict use and benefit of the Owner and not to be used for any other purpose.

End Of Section

/dd/

1.0 CIVIL

1.1 Sitework

1. Locate the Power Transformer Foundations and the Oil Containment Systems.

2. Dispose of all unsuitable materials and supply & install appropriate fill material as required. Dispose of any contaminated material in accordance with MOE regulation.

1.2 Excavating, Trenching And Backfilling

1. Furnish all labour, materials and equipment necessary to clear and prepare the site and to excavate, backfill and grade as required for placing foundations, footing, slabs, oil containment systems and underground services. Work in accordance with all applicable laws and standards.

2. Prior to commencing any excavation work, notify the Owner and applicable authorities, and establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.

3. All excavations to be properly backfilled with materials per the design..

4. If required, excavate and remove any contaminated fill and replace with appropriate “engineered fill” in accordance with the geotechnical report..

6. Protect existing structures and surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.

8. Comply with Safety Requirements and applicable local regulations to protect existing features.

9. Granular fill materials shall conform to the specifications of the authority having jurisdiction in the Province of Ontario.

11. Granular fill type shall, as a minimum, conform to recommendations listed in the geotechnical report.

1.3 Geotechnical Investigation and Study

1. Perform a geotechnical investigation and study complete with report.

2. Require to visit the site prior to tender submission and ascertaining the nature of all conditions at the site affecting the work.

END OF SECTION

1.0 CONCRETE AND STRUCTURAL REQUIREMENTS

1.1 General

1. Structural Design

    1. The selection, analysis and design of the structural foundations for the Power Transformers. The structural design in accordance and as defined in the PEO Guideline for Professional Engineers Providing Structural Engineering Services.

    2. Insured against professional liability in accordance with section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.

2. Standards, Codes and Acts

    1. Conform with the Ontario Building Code, any applicable acts of any authority having jurisdiction, and the following:

        1. Concrete in accordance with CAN/CSA-A23.1-09/A23.2-09 and A23.3-04 latest update.

        2. Concrete formwork: CAN/CSA S269.3-M92 (R2008)

        3. Reinforcing Steel: CAN/CSA G30.18-M1992 (R2007)

        4. Steel Fibres for reinforced concrete: ASTM A820

        5. Welding Materials: CSA W59-03 (R2008)

3. Structural Design Services

    1. In accordance with PEO Guideline for Professional Engineers Providing Structural Engineering Services, the structural system shall be selected, analyzed and designed in accordance with relevant codes and standards. Drawings and specifications shall be prepared in accordance with standard requirements and owner requirements.

    2. Structural engineering services shall include the preparation of complete calculations (appropriately indexed), coordination with other disciplines and construction. Structural calculations shall be submitted to the Owner for Record.

4. Protection

    1. Use of calcium chloride is not permitted in the design of the concrete mixes.

2. Where exposed to the environment and susceptible to corrosion the concrete elements and reinforcing steel shall be in accordance with CAN/CSA S413-07.

3. Exposed concrete elements shall conform to CAN/CSA-A23.1-04 for strengths, slumps, water/cement ratios, air entrainment.

4. Any non-structural service, conduits, etc. embedded in concrete to have a 125 mm concrete cover. Make allowance for this thickness in the design of relevant elements.

1.2 Foundations

1. The structural design and construction shall respond to the site characteristics of the soil and/or rock, the potential effects of settlement and the recommendations resulting from the Geotechnical investigation of the site.

2. The foundations shall be designed to limit settlement of the structure and differential settlement of components of the structure to within acceptable structural design limitations.

4. Foundations shall be constructed of reinforced concrete

5. Footings shall be placed below the level at which frost is anticipated to occur given the characteristics of the soil material and the environment adjacent to the foundation. The bearing material shall be protected against freezing, disturbance by construction activity and the loss of bearing capacity.

6. Appropriately sized footings shall be provided for all structural elements and also for any and all equipment.

7. Trench and pit walls shall be designed to safely sustain lateral pressure of the retained soil.

8. Exposed corners of foundation walls shall be chamfered 19 mm x 19 mm.

9. Equipment foundations shall be designed and detailed to accommodate equipment loading and specifications.

1.3 Slab-on-Grade

1. Construct slab on grade to support all loads, and requires to satisfy the Ontario Building Code.

2. The ground level slab on grade shall be constructed in accordance with the recommendations of the geotechnical report.

3. Reinforce slab on grade as necessary.

4. Cure concrete slabs with the method that prevents loss of mixing water from the concrete, and keep continuously wet for the entire curing period.

12. Provide full time inspection on pour days. nspect and record the quantity and source for all materials being used (fibers, sealers, plasticizer, hardeners, concrete, etc.).

END OF SECTION

1 General

1.1 **SUMMARY**

.1 Section Includes

.1 Design, Labour, Products, equipment and services necessary to complete the work of this section.

1.2 **RELATED SECTIONS**

.1 Section 03 20 00: Concrete Reinforcing

.2 Section 03 30 00: Cast-in-Place Concrete

1.3 **REFERENCES**

.1 Conform to the latest edition of the following:

.1 CSA-A23.1 - Concrete Materials and Methods of Concrete Construction

.2 CSA O121-M - Douglas Fir Plywood

.3 CSA S269.1 - Falsework for Construction Purposes

1.4 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Store materials on site in a manner to prevent damage thereto. Protect from the weather. Comply with CSA-A23.1, Clause 9.

.2 Protect work of this section from damage. Protect other work from damage resulting from this work. Replace damaged work which cannot be satisfactorily repaired at no cost to Owner.

1.5 **TOLERANCES**

.1 Construct forms to produce plumb and level concrete, and true to linear building lines. Maximum variations (not accumulative) shall conform to CSA-A23.1, Clause 10.

.2 A permitted variation in one part of the construction or in one Section of the Specification shall not be construed as permitting violation of more stringent requirements for any other part of the construction, or in any other Specification Section.

2 Products

2.1 **MATERIALS**

.1 Forms

.1 Plywood: CSA O121-M, G1S; Douglas Fir plywood, sheets as large as practical, exterior grade, waterproof glue, edges sealed with oil based sealer.

.2 Prefabricated steel forms: CAN/CSA S136-M; Free of irregularities, dents, sags, rust, and materials that can discolour concrete finish.

.3 Used formwork may be used for surfaces which will be concealed.

.4 The use of premanufactured commercial "system formwork" is not permitted.

.2 Plywood Form Liner (for interior face of basement walls - designated as Architectural Concrete): Medium density overlaid plywood marked "COFI Form Plus"

.1 "Pourform 107" by Ainsworth Lumber Company Ltd.

.2 "Ultraform" by Richmond Plywood Corporation

.3 Or approved alternate

.3 Form Ties: Adjustable snap ties, formed to break 25 mm from surface of concrete after form removal, with a minimum working strength of 13 kN. Do not use wire ties.

.4 Falsework Materials: CSA S269.1. Where patented accessories, fabricated forms, shoring or scaffolding units are to be used, follow manufacturer's instructions for load carrying capacity and bracing.

.5 Bar Type Waterstops

.1 Preformed bentonite and butyl rubber-based waterstop

.1 "Waterstop RX 101" for concrete 200 mm thick and greater

.2 Waterstop RX 102" for concrete 125 mm to 200 mm thick by DRE Industries Inc.

.3 or approved alternative

.2 Adhesive for concrete, steel, or PVC

.1 Water based "WB-Adhesive" by DRE Industries Inc.

.2 Or approved alternative.

.6 Tubular Forms: Sonoco Products Ltd. "Sonotube" spirally wound fibre forms free of dents and other irregularities, treated internally with release material.

.7 Chamfer Strips: 20 x 20 mm triangular fillets milled from clear, straight grain pine, surfaced each side, or extruded vinyl type.

.8 Formwork Release Agent

.1 Imperial Oil "Filmo No 40"

.2 Goodco "Noxcrete"

.3 W.R. Meadows "Duogard"

.4 Euclid "Super Slip"

.5 CPD Chemical Form Release Agent

.6 Dayton Superior "Clean-Strip (J-1)"

.7 Or approved alternate

3 Execution

3.1 **FORMWORK**

.1 Construct formwork in accordance with CSA-A23.1, Clause 11, except where shown otherwise. Do not leave lumber in concrete.

.2 Construct falsework in accordance with CSA S269.1.

.3 Obtain approval in writing for use of earth cuts as forms for vertical sides of footings and other work not exposed to view. If approved, hand trim sides and bottoms and remove loose earth before placing concrete.

.4 Assume full responsibility for the complete design and engineering of formwork including shoring and bracing to resist loads due to wet concrete, forms, wind, etc. and other forces arising from use of equipment to place concrete.

.5 Do not set shoring and scaffolding on frozen subgrade. Continuously monitor safety of scaffolding.

.6 Apply release agent by spray in accordance with manufacturer's recommendations. Ensure surfaces of form receive a uniform coating.

.7 Align form joints and make watertight. Keep form joints to minimum.

.8 Form for depressions, recesses, chases, reglets, anchorages and keys required in concrete.

.9 Set floor screeds with true and straight top edge to proper elevation.

.10 Form 20 mm x 20 mm minimum chamfered edges on exposed concrete corners unless shown otherwise. Set chamfer strips to achieve a smooth finish and consistent chamfer size throughout length of concrete.

.11 Construct forms for concrete exposed in the finished work to achieve the following:

.1 Grout-tight forms at corners, panel joints, recesses, arises and at construction joints to prevent cement paste from leaking.

.2 Accurate alignment of concrete surfaces.

.3 Surfaces without indentations other than those shown.

.4 Sharp and straight corners.

.12 Use full size contact form sheeting panels wherever possible. Carefully install contact surfaces of formwork to produce neat and symmetrical joint patterns. Joints shall be either vertical or horizontal and, where possible, stagger so as to maintain structural continuity. Back vertical joints solidly and nail edges of abutting sheets to same stud. Likewise solidly back horizontal joints. Take care to ensure adjacent form panels fit accurately, tight and flush. Use straight lumber.

.13 Align forms to ensure no visible defects appear on finished work.

.14 Take particular care in forming corners and openings. Ensure formwork is tight and braced so no movement occurs.

.15 Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.2 CONSTRUCTION JOINTS

.1 Form construction joints where required and where shown. Construction joints shall conform to CSA-A23.1, Clause 20.

.2 Form 50 mm x 100 mm bevelled shear keys full length on construction joints, unless detailed otherwise.

3.3 **INSTALLATION OF BAR TYPE BENTONITE WATERSTOPS**

.1 Brush clean debris, dirt, and rocks from dry concrete surface. Verify surfaces are dry.

.2 Ensure proper waterstop placement for sufficient concrete coverage. Install waterstop along interior side of the outer row of steel reinforcement to allow for minimum concrete cover.

.3 Apply adhesive by roller or brush to 125 microns (5 mils) thick x width of waterstop to prepared concrete surfaces.

.4 Allow adhesive to dry 10 - 15 minutes or until adhesive appears black in colour.

.5 Remove release paper from waterstop and press firmly into dried adhesive. Apply uniform pressure for minimum 15 seconds to ensure adhesion.

.6 Butt coil ends of waterstop together to form continuous installation. Do not overlap ends.

3.4 **STRIPPING FORMWORK**

.1 Strip formwork in accordance with CSA-A23.1. Forms may be removed any time after 3 days from date of placing concrete.

.2 Be responsible for the safety of structure, both before and after removal of forms until concrete has reached its specified 28-day compressive strength.

.3 Take particular care when removing forms to ensure no damage occurs at corners, arises and the like.

.1 Promptly make good any damage occurring from removal of forms, at no cost to Owner.

.4 To help avoid colour variations in architectural concrete, ensure length of time between concrete pouring and form removal is approximately the same for each portion of work.

.5 In hot weather, wood forms remaining in place are not adequate for curing purposes. Instead, loosen forms as soon as practical without damage to the concrete, and run a water sprayer such as a soil soaker hose on the inside face of forms so as to keep concrete moist. In any case, loosen forms only following time frames specified for stripping.

.6 In cold weather, defer removal of formwork or replace formwork with insulation blankets, to avoid thermal shock and consequent cracking of concrete surface.

.7 When concrete is dry, install temporary polyethylene rope in reglets to prevent contamination of same.

End Of Section

1 General

1.1 **SUMMARY**

.1 Section Includes

.1 Design, Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 **RELATED SECTIONS**

.1 Section 03 11 00: Concrete Forming

.2 Section 03 30 00: Cast-in-Place Concrete

1.3 **REFERENCES**

.1 Conform to the latest edition of the following:

.1	CSA-A23.1	-	Concrete Materials and Methods of Concrete Construction
.2	CAN/CSA G30.18-M	-	Carbon-Steel Bars for Concrete Reinforcement

1.4 **SUBMITTALS**

.1 Test Reports

.1 Submit certification from reinforcing steel manufacturer confirming compliance of supplied products to specified CSA Standard.

1.5 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Store materials on site in a manner to prevent damage thereto. Protect from the weather. Comply with CSA-A23.1, Clause 9.

.2 Protect work of this section from damage. Protect other work from damage resulting from this work. Replace damaged work which cannot be satisfactorily repaired at no cost to Owner.

.3 Handle, transport and install epoxy coated reinforcing steel bars carefully to avoid damage thereto. Use nylon lifting slings, padded slings, separators or any other means recommended by epoxy coated reinforcing steel supplier.

1.6 **TESTS OF REINFORCING**

.1 Provide an independent inspection and testing company to conduct mill tests - physical and chemical analysis, of reinforcing steel supplied.

.2 Remove defective materials and completed work which fails tests and replace as directed. Contract shall pay for subsequent inspections and tests of such work, as required after work is complete at no cost to Owner.

2 Products

2.1 **MATERIALS**

.1 Reinforcing Steel: Conforming to CAN/CSA G30.18-M, Grade 400.

.2 Chairs and Spacers: Of sufficient strength to rigidly support weight of reinforcement and construction loads. As manufactured by:

.1 Drummond and Reeves Ltd.

.2 Acrow Richmond

.3 Superior Concrete Accessories Ltd.

.4 Max Frank GmbH & Co.

.1 Use chairs with flat plate base for reinforcing over rigid insulation.

.3 Epoxy Grout for Dowels/Rebars: Conforming to ASTM C-881, 100% solids high modulus high strength epoxy gel adhesive; acceptable products:

.1 J-51 by Dayton Superior

.2 Anchor Fix 3/Sikadur 35 by Sika Canada Inc.

.3 Or approved alternate

2.2 **FABRICATION OF REINFORCING STEEL**

.1 Fabricate reinforcing steel in accordance with reviewed shop drawings.

.2 Bend steel cold; no heating will be permitted. Fabricate reinforcement conforming to CSA-A23.1, Clause 12.

.3 Ship bundles of reinforcing steel, clearly identified in accordance with reviewed bar lists.

3 Execution

3.1 **EXAMINATION**

.1 Inspect formwork to ensure it has been completed and adequately braced in place before commencing to place reinforcement.

3.2 **PLACING OF REINFORCING STEEL**

.1 Place reinforcing in accordance with CSA-A23.1 Clause 12 and reviewed placing drawings. Support with chairs or spacers in as close a spacing as possible to prevent displacement of reinforcement from intended bar position, before and during pouring of concrete. Pieces of block, wood, etc. are not acceptable as chairs and spacers.

.2 Before placing, remove all loose scale, dirt, concrete residue from previous pours, oil or other coatings, which would reduce bond.

.3 Turn the ends of tie wire towards the interior of the concrete.

.4 Do not eliminate or displace reinforcement to accommodate hardware to be embedded in concrete.

.5 Straighten kinks and bends not called for on Drawings.

.6 Bars shall be in lengths as long as possible. Where bars are joined, lap at least the distance required by CSA-A23.1 unless shown otherwise.

.7 Lap wire mesh sections at least 150 mm and wire together securely.

.8 Unless shown otherwise on Drawings, provide reinforcing to housekeeping pads as follows:

.1 100 mm thick pad: 10M at 300 mm o.c. each way middle layer.

.2 150 mm thick pad: 15M at 300 mm o.c. each way middle layer.

3.3 **ANCHORING OF DOWELS OR REINFORCING BARS**

.1 Drill holes to provide 4mm space around the dowel or reinforcing bar. Drill to a depth approximately 9 to 15 times the bolt diameter.

.2 Blow out dust and debris from holes with compressed air.

.3 Dispense grout cartridges with a dispensing gun, filling anchoring holes.

.4 Insert dowel or reinforcing bar, turning slowly during insertion. After insertion, holes should be full of epoxy.

End Of Section

1 General

1.1 **SUMMARY**

.1 Section Includes

.1 Design, Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 **RELATED SECTIONS**

.1 Section 03 11 00: Concrete Formwork.

.2 Section 03 20 00: Concrete Reinforcement.

1.3 **REFERENCES**

.1 Conform to the latest edition of the following:

.1	ASTM A307	-	Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
.2	ASTM A563M	-	Standard Specification for Carbon and Alloy Steel Nuts [Metric]
.3	ASTM C260	-	Standard Specification for Air-Entraining Admixtures for Concrete
.4	ASTM C494	-	Standard Specification for Chemical Admixtures for Concrete
.5	ASTM C881	-	Standard Specification for Epoxy-Resin-Base Bonding System for Concrete
.6	ASTM C920	-	Standard Specification for Elastomeric Joint Sealants
.7	CAN/CSA-A3001	-	Cementitious Materials for Use in Concrete
.8	CAN/CSA G164-M	-	Hot Dip Galvanizing of Irregularly Shaped Articles
.9	CISC/CPMA 2.75	-	Canadian Institute of Steel Construction Standard 2.75 - A Quick Drying Primer for Use on Structural Steel
.10	CSA-A23.1	-	Concrete Materials and Methods of Concrete Construction
.11	CSA-A23.2	-	Methods of Test for Concrete

1.4 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Ensure delivered materials for membrane panels are packaged and protected from damage until required for installation.

.2 Store materials on site in a manner to prevent damage thereto. Protect from weather. Comply with CSA-A23.1, Clause 5.1.

.3 Protect work of this Section from damage. Protect other work from damage resulting from this work. Replace damaged work which cannot be satisfactorily repaired, at no cost to Owner.

1.5 **ENVIRONMENTAL CONDITIONS**

.1 Conform to CSA-A23.1 Clause 7.4.

.2 During cold weather, provide temporary heating and enclosures required. Mix, place and protect concrete in accordance with CSA-A23.1, Clause 7.4.

.3 Protect installation of membrane from wind uplift until backfill placement.

1.6 **TOLERANCES**

.1 Concrete in place shall be plumb, level and true to linear building lines. Maximum variations (not accumulative) shall conform to CSA-A23.1, Clause 6.4.

.2 A permitted variation in one part of the construction or in one Section of the Specification shall not be construed as permitting violation of the more stringent requirements for any other part of the construction, or in any other Specification Section.

1.7 **INSPECTION AND TESTS**

.1 Provide an independent inspection and testing company to inspect and test the materials and concrete work for conformance to CSA-A23.1 and to specifications.

.2 Tests include the following:

.1 Obtaining certification of cement.

.2 Tests of aggregates.

.3 Test for setting mixes of concrete and design of mix.

.4 Concrete cylinder test. Three cylinders from each day's pour for each 75 cu.m. of concrete, or for each 30 cu.m. of concrete poured in small amounts on successive days.

.5 Air entrainment test and slump test which will be made on same batch of concrete from which test cylinders are made.

.6 Field Seams: by non-destructive means, for membrane liner. Test along entire length using air pressure test or vacuum test.

.3 Tests will be made in accordance with CSA-A23.2.

.4 Independent Inspection and Testing Company reports of tests will be forwarded with an opinion or reason for any abnormalities noted thereon.

.5 Independent Inspection and Testing Company will inspect and review placement of reinforcing steel bars and verify size of reinforcing in accordance with shop and placing drawings prior to concrete placement. Any and all irregularities may deem installation to be unacceptable and must be rectified prior to concrete placement. Reports of inspection will be forwarded to Owner.

.6 Remove defective materials and completed work which fails tests and replace as directed at no cost to owner.

.7 Where work or materials fail to meet strength requirements as indicated by test results, pay costs of additional inspection and testing required for new replacement work or materials.

1.8 **SUBMITTALS [FOR RECORD]**

.1 Product Catalogues: up-to-date catalogue of products proposed for use under this Section. Include the following:

.1 Specified admixtures

.2 Sealant

.3 Bonding agent

.2 Concrete Mix Design: Submit concrete supplier's latest statistical analysis of all concrete mixes to be used on this project.

.3 Concrete Producer's Certification: Certification that plant, equipment and materials to be used in concrete comply with requirements of CSA A23.1.

.4 Contractor's Quality Control: Proposed quality control procedures for hot or cold weather conditions, for ensuring correlation of concrete mix with strength or exposure classification for area of placement, and for finishing and curing methods.

.5 Anchor Bolt Setting Diagrams: Submit detailed drawings for anchor bolt setting.

.6 Manufacturer's certification of quality control testing of membrane environmental liner.

1.9 **RECORDS**

.1 Keep a written record of the following:

.1 Concrete pours, showing location of pour, date of pour and cubic yards or metres of concrete.

.2 Signed trip ticket for each truck.

.3 Ambient air temperature, and unusual occurrences during placement of each pour.

2 Products

2.1 **MATERIALS**

.1 Select one product from that specified under each material listing.

.2 Portland Cement: Normal, Type GU Portland cement conforming to CAN/CSA-A3001.

.3 Cementitious Hydraulic Slag: Conforming to CAN/CSA-A3001.

.4 Coarse Aggregate: Conforming to CSA-A23.1, Clause 4.2.3.4 and Table 11, Group I, 20-5 mm. Coarse aggregate to be 100% crushed, in cubular size.

.5 Fine Aggregate: Conforming to CSA-A23.1, Clause 4.2.3.3 and Table 10.

.6 Water: Conforming to CSA-A23.1, Clause 4.2.2.

.7 Water Reducing Admixture: Conforming to ASTM C494 Type A:

.1 Master Builders "Pozzolith 200N"

.2 Euclid "WR 75"

.3 Grace "WRDA" series or "Zyla" series

.4 Axim "Catexol 1000N"

.8 Air Entraining Admixture: Conforming to ASTM C260:

.1 Master Builders "Micro-Air"

.2 Euclid "Airextra"

.3 Grace "Darex AEA EH" or "Darex AEA ED"

.4 Axim "Catexol AE260"/"Catexol AE360" (for low slump concrete)

.9 Flowable Construction Grade Grout: Pre-mixed, without aggregate fillers, non shrink, flowable type; complete with forms for flowing in place:

.1 Euclid "Euco NS"

.2 W.R. Meadows "CG-86"

.3 Sika "M-Bed Standard" or "Sika Grout 212"

.4 Master Builders "Construction Grout"

.5 CPD "Non-Shrink Construction Grout"

.6 Dayton Superior "1107 Advantage Grout"

.7 Five Star Products “FSP Construction Grout”

.10 Flowable Premium Grout: Pre-mixed, without aggregate fillers, non-shrink, flowable type; complete with forms for flowing in place:

.1 Master Builders "Masterflow 713"

.2 W.R. Meadows "V3 Grout"

.3 Sika "M-Bed Standard OH"

.4 Euclid "Euco Hi-Flow Grout"

.5 Dayton Superior "Sure-Grip HP Grout"

.6 CPD "Non-Shrink (Hi-Flo)"

.7 Five Star Products “Five Star Grout”

.11 Epoxy Grout: Premixed, non-shrink, consisting of thermosetting resin base, with inert fillers, with minimum 7 day compressive strength of 10,000 psi, suitable for use on dry or damp surfaces:

.1 Dayton Superior "J-54 Sure-Grip Epoxy Grout"

.2 Euclid Chemical Company "E3-G"

.3 Sika Chemical Company "Sikadur 42 Grout Pak"

.4 W.R. Meadows, Inc. "EG-96 Plus"

.5 Five Star Products “DP Epoxy Grout”

.12 Bonding Agent: Conforming to ASTM C881:

.1 Sika Chemical "Sika-Dur Hi-Mod"

.2 Euclid "452LV or MV"

.3 W.R. Meadows "Resi-Weld 1000"

.4 Master Builders "Concresive Liquid LPL"

.5 CPD "Epoxcrete (Hi-Mod)"

.6 Dayton Superior "Resi-Bond (J-58)"

.7 Master Builders "Concresive Liquid LPL"

.8 Five Star Products “Bonding Adhesive”

.13 Sealant for Exposed V-Joints: Grey in colour.

.1 Sika "RC-1"

.2 Euclid "Eucolastic I"

.3 Tremco "Vulkem 116"

.4 Sonneborn "NP-1"

.14 Asphalt Coating: Bakor "110-14", including primers recommended by coating manufacturer.

.15 Bond Breaker Coating: 2-coat application, brush applied

.1 Dayton Superior "Sure-Lift WB (J5)

.2 Cresset "Crete-Lease 20-VOC" by Form and Build

.16 High Density Insulation

.1 Dow Styrofoam "HI-40"

.2 Celfortec "Foamular 400"

.17 Environmental Liner: Smooth HDPE, synthetic polymeric membrane sheet; minimum 1.5mm (60mils) thick, minimum tensile strength 23.1KN:

.1 Solmax “Solmax 460”

.2 Layfield Plastics

.3 Terrafix

.4 Or approved alternate

2.2 CONCRETE MIX PROPORTIONS

.1 Ready-mixed concrete and concrete proportions to be in accordance with CSA-A23.1, Clause 4.3.1, and as follows:

.1 Minimum allowable compressive strengths at 28 days are as follows unless otherwise noted or shown.

.1 15 MPa: for lean concrete fill

.2 25 MPa: for control building slab on grade

.3 30 MPa: for footings, exterior pads, containment pits

.4 30 MPa: for piers and walls

.5 30 MPa: for retaining walls

.6 30 MPa: for control building first floor slab

.2 Minimum cement content: 30 MPa-260 kg/m^3; 30 MPa-265 kg/m^3; 30 MPa-285 kg/m^3. If blended normal Portland cement/cementitious hydraulic slag is used, slag content to be not more than 25% of total volume of cement.

.3 Slump at point of deposit: 80 mm with a maximum tolerance of plus or minus 20 mm.

.4 Keep water-cement ratio to a minimum to increase strength and durability of concrete. Keep water-cement ratio to 0.55.

.5 Exposure classification: F-2, as defined in Table 2 of CSA A23.1.

.6 Air content for exterior concrete: conforming to CSA A23.1, Clause 4.3.3, Table 4.

2.3 **ADMIXTURES**

.1 Add admixtures to concrete mix in accordance with manufacturer's recommendations. Have admixture manufacturer make available, at no cost, upon 72 hours notice, the services of a qualified, full-time field representative to assure proper use of admixtures.

.2 Except where specified otherwise herein, comply with CSA A23.1.

.3 The use of calcium chloride or additional admixtures, other than that specified, is not acceptable.

3 Execution

3.1 **EXAMINATION**

.1 Confirm surfaces on which concrete is to be placed are free of frost, water, and debris before placing concrete.

.2 Confirm that reinforcement, inserts and other built-in work are in place and secured before pouring concrete.

.3 Prior to placement of concrete, confirm that reinforcement is secured in correct location.

.4 Replace incorrectly fabricated reinforcement, relocate misplaced reinforcement and install omitted reinforcement before concrete is placed.

.1 Incorrectly fabricated, misplaced or omitted reinforcement will be considered defective Work performed by this Section.

3.2 **SETTING AND BUILDING-IN**

.1 Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached. Refer to A23.1 “Fabrication and Placement of Hardware and Other Embedded Items” for acceptable tolerances.

.2 Advise trades well in advance of scheduled pours to allow adequate time for supply of items to be built in. Have respective trades verify location of items supplied by them.

.3 Set column anchor bolts to comply with the following tolerances:

.1 Tolerance of anchor bolt location: conform to CSA-A23.1, Clause 6.7.

.2 Allowable anchor bolt height tolerance: to within plus or minus 12 mm maximum

.3 Tolerance for placing embedded items: conform to CSA-A23.1, Clause 6.7.

.4 Set bumper posts in concrete footings and fill with ram packed 20 MPa concrete. Form top of fill to a crown, smooth finish.

3.3 **PLACING OF CONCRETE**

.1 Place concrete in accordance with CSA-A23.1, Clause 6.8.5.4.

.2 Install sluices to limit height of free fall of concrete to 1200 mm maximum. Place concrete to prevent layering and segregation and vibrate sufficiently to ensure thorough compaction, maximum density and according to CSA-A23.1, Clause 6.8.5.4. Hand spade concrete adjacent to forms.

.3 Before placing fresh concrete against set or partially set concrete, clean surfaces to remove dirt, scum, shavings, debris, laitance, etc. On set surfaces, brush generously with a bonding mixture.

.4 Check work frequently with accurate instruments during placing of concrete.

.5 Systematically and thoroughly vibrate concrete around waterstops to avoid honeycombing and voids, to ensure complete contact between waterstop and concrete.

3.4 **TREATMENT OF FORMED CONCRETE**

.1 Treat and finish exposed formed surfaces in accordance with CSA-A23.1, Clause 7.7.

.2 Where top of grade beams or foundation walls will be exposed to view in the finished work, steel trowel same to a level, smooth finish.

.3 Treat and prepare surfaces to be waterproofed to a smooth and even finish free from projecting mortar, concrete fins, honeycombing and other irregularities and with juncture of wall and footing coved with masonry mortar. Patch as required in accordance with CSA-A23.1, Clause 7.7.2.

3.5 **ARCHITECTURAL CONCRETE**

.1 All concrete surfaces designated to be smooth be in accordance with CSA A23.1/A23.2, Clause 8.3 - Architectural Concrete.

3.6 **FINISHING OF PITS**

.1 Tanks Bottom (Floors) and Rooftop: Screed, float and trowel surface to smooth level and dense condition free from trowel marks, ridges and depressions except where otherwise specified. Water cure as specified herein.

.2 Inside Surfaces of Perimeter Walls: Treat and prepare wall surfaces in accordance with "Treatment of Formed Concrete" article herein.

.3 Outside Surfaces of Perimeter Walls: Treat and prepare wall surfaces in accordance with "Treatment of Formed Concrete" article herein.

3.7 **GROUTING**

.1 Place grout in accordance with the grout manufacturer's printed directions. Form around bases, place grout in a manner which will ensure positive bearing of the full area of the steel plate on top of the supporting surface. Thoroughly compact, leaving no voids.

3.8 **SEALANT APPLICATION**

.1 Sealant at V-Joints: Prime, prepare substrate and apply sealant full joint depth in accordance with manufacturer's printed directions. Tool to a smooth semi-concave finish. Exclude joints in surfaces to receive waterproofing treatment.

3.9 **ENVIRONMENTAL LINER**

.1 Fabricate membrane sheets into panels by manufacturer's approved methods, in shop into maximum sized panels to eliminate excess joint seaming.

.2 Install membrane panels in accordance with manufacturer's instructions, with approved, qualified, experienced installer.

.3 Supply and install accessories for complete and operational liner system.

.4 Repair or replace any damaged work under this Section, or work damaged by work of this Section, promptly, and at no cost to Owner.

3.10 **SITE CLEAN UP**

.1 Remove excess materials including waste hardened concrete and other debris resulting from Work of this Section from site and leave premises in a condition acceptable to Owner.

End Of Section

1 General

1.1 **SUMMARY**

.1 Section Includes

.1 Design, Labour, Products, equipment and services necessary to complete the work of this section

1.2 **GROUNDING**

.1 Provide outdoor station (main) ground grid, connection to structures, equipment and fencing.

2 Products

2.1 **GROUND CONDUCTORS**

.1 Copper conductors, soft drawn, ASTM Class B stranded as sized in Drawings.

.2 Copperweld conductors for fence bonding and down conductors as noted and as sized in Drawings.

.3 Insulated conductors, insulation color green.

2.2 **BURIED CONNECTORS - COMPRESSION TYPE**

.1 Cable to rod and cable to cable.

.2 Acceptable Manufacturer

.1 Burndy type YGHR and type YGLR (cable to rod) and type YGHP (cable to cable)

2.3 **CONNECTIONS TO HOLLOW SUPPORT STEEL STRUCTURE**

.1 Acceptable Manufacturers

.1 Burndy

.2 Sefcor

2.4 **CONNECTIONS TO FLANGED STEEL STRUCTURE**

.1 Compression ground connector.

.2 Acceptable Manufacturer

.1 Burndy Groundlink type YGIB and cable connector

2.5 **MISCELLANEOUS HARDWARE**

.1 Silicon bronze ground studs, bolts, washers, nuts and accessories necessary for grounding system, including but not limited to:

.1 Grounding and bonding bushings

.2 Bolt type conductor connectors

.3 Bonding jumpers, straps

.4 Pressure type wire connectors

.2 Acceptable Manufacturers

.1 Burndy

.2 T & B Blackburn

2.6 **GROUND RODS**

.1 Copper-clad steel, 19 mm diameter, 3 m long.

.2 At manholes provide ground wire connection on ground rods.

.3 Acceptable Manufacturers

.1 Hydel

.2 T & B Blackburn

2.7 **ALUMINUM STRUCTURES AND EQUIPMENT**

.1 Use tin or silver plated connectors for grounding connections to aluminum structures and equipment.

.2 Acceptable Manufacturers

.1 Burndy

.2 Thomas & Betts

2.8 **ELECTRICAL INSULATING CRUSHED STONE**

.1 Use clean, washed, crushed limestone. No fines.

.2 Crushed stone shall be able to pass through a 35mm x 35mm mesh screen but shall stopped by a 22 mm x 22 mm mesh screen.

.3 Electrical insulating crushed stone obtained from Nelson Aggregates Co. labelled as 40 mm cleared, crushed, washed limestone is acceptable. Other types from other sources require a detailed Shop Drawing review by the Consultant.

3 Execution

3.1 **GENERAL**

.1 Clean all paint, rust and dirt from all surfaces to which ground lugs are bolted.

.2 Protect exposed grounding conductors from mechanical damage.

.3 At junction and terminal boxes, bond grounding conductors to ground stud.

.4 Bond the main substation ground grid to the building grounding system.

3.2 **BURIED GROUNDING**

.1 For buried grounding use compression connection types.

3.3 **OUTDOOR MAIN STATION GROUNDING**

.1 Install station ground grid conductors and rods to meet code and design requirements. In case of interference between concrete foundations and rods or grid conductors, relocate rods or reroute conductors as required.

.2 Connect all steel or metal structures, equipment enclosures and equipment ground buses to the station ground grid.

.3 Connect neutral point of transformers to station main neutral bus.

3.4 **CABLES**

.1 Bond single conductor cable armour to equipment enclosure at supply end and load end.

.2 Bond multiconductor cable armour to equipment enclosures

.3 Bond grounding conductor of multiconductor armoured and non-armoured cable to ground bus or lug in equipment enclosures.

3.5 **ELECTRICAL INSULATING CRUSHED STONE**

.1 The electrical insulating crushed stone must always be the surface layer

.2 Depth of the electrical insulating crushed stone layer should not be less than 150 mm.

.3 The fire quenching stone used as part of the oil containment system (around the transformers) is the same electrical insulating crushed stone as used over the surface of the station.

End Of Section

1 General

1.1 **SUMMARY**

.1 Work of this section includes the design, supply and installation of equipment, devices, items and systems and associated supplementary ancillaries, the Power Transformer - Supply and Installation Contractor and their associated supplementary ancillaries to form a complete and functional transformer station.

1.2 **WORK INCLUDED**

.1 Contractor to coordinate all design work and site work with the following:

.1 Hydro One Networks Inc. (Hydro One)

.2 Independent Electricity System Operator (IESO)

.3 Metering Service Provider (MSP)

.4 Power Transformers: Supply and Installation Contractor

.5 Transformer Station: Integrated Automation System contractor

.6 Niagara-on-the-Lake Hydro (NOTL Hydro)

.2 Work includes;

.1 Power Transformers: Supply and Installation Contractor

.3 The work includes but is not limited to the following connections to the Power Transformer;

.1 Design, Supply, Installation and termination of primary power conductors and associated connectors

.2 Design, Supply, Installation and termination of secondary power conductors and associated connectors

.3 Design, Supply, Installation and termination of Medium Voltage Rigid Tubular Bus System (from Power Transformer secondary)

.4 Design. supply, installation and termination of Protection & Control system cables

.5 Design, supply, installation and termination of Telecommunication cables

.6 Design, supply, installation and termination of auxiliary system cables

.7 Design, supply, installation and termination of service system cables

.8 Design, supply, installation and termination of grounding and bonding cables and conductors

.9 Installation of connections in accordance with design, and in accordance with manufacturer’s requirements and instructions

.10 Underground raceway systems from Protection/Control Shed to Power Transformer Unit

.11 Grounding and Bonding Systems

.4 Work includes;

.1 Electrical Insulating Crushed Stone

.5 Work includes the supply and installation of all associated hardware.

.6 Work includes the supply and installation of all required buswork and hardware.

.7 Work includes the design, supply and installation of the ground grid system and connection to the equipment in accordance with section 25 05 26 and to the satisfaction of the Electrical Safety Authority.

.8 Work includes the supply and execution of the crushed stone in accordance with section 25 05 26.

1.3 **REFERENCES**

.1 Design, fabricate and test equipment and provide the completed installation in accordance with the latest revisions of the applicable standards, codes and regulations shown below.

.1	CSA	-	Canadian Standards Association
.2	NEMA	-	National Electrical Manufacturer's Association
.3	IEEE	-	Institute of Electrical and Electronic Engineers
.4	ANSI	-	American National Standards Institute
.5		-	Ministry of Consumer and Commercial Relations
.6		-	Industrial Safety Act of Ontario
.7		-	Ontario Electrical Safety Code including Hydro inspection bulletins
.8		-	Applicable codes and regulations
.9	AISC	-	American Institute of Steel Construction
.10	ASTM	-	American Society of Testing Materials (ASTM)
.11	CSA 080-M1983	-	Specification for Wood Preservation
.12	NEMA SG6-1974	-	Electrical Structures

1.4 **SUBMITTALS [FOR RECORD]**

.1 Submit details of all equipment which the supply is in the scope of this Contract with Tender.

.2 Prepare erection and detail drawing.

2 Products

2.1 **HIGH VOLTAGE LINE AND RIGID BUS CONNECTORS**

.1 Provide swaged connectors for high voltage lines and high voltage rigid buses.

.2 Approved manufacturer:

.1 DMC Power: Swaged Connectors

2.2 **MEDIUM VOLTAGE RIGID BUS**

.1 Rigid aluminum IPS tubular bus.

.2 Rigid aluminum IPS tubular bus per ASTM B317 (GR6101 T6).

2.3 **MEDIUM VOLTAGE RIGID BUS CONNECTORS**

.1 Provide swaged connectors for medium voltage rigid buses.

.2 Approved manufacturer:

.1 DMC Power: Swaged Connectors

2.4 **HARDWARE**

.1 Provide all hardware.

.2 Provide hardware as required and specified by equipment and device manufacturers.

.3 In general, provide steel galvanized, grade 5 hardware.

2.5 **ELECTRICAL INSULATING CRUSHED STONE**

.1 As per section 25 05 26.

3 Execution

3.1 **ELECTRICAL INSULATING CRUSHED STONE**

.1 Lay the electrical insulating crushed stone layer in accordance with the section 26 05 26.

.2 The application of electrical insulating crushed stone shall occur after the completion of the installation of all electrical equipment in the substation.

.3 Prior to laying the electrical insulating crushed stone treat the soil at the subgrade level with sterilant to inhibit vegetation growth.

End Of Section

1 General

1.1 **SUMMARY**

.1 Section Includes

.1 Design, Labour, Products, equipment and services necessary to complete the work of this section.

1.2 **OIL CONTAINMENT SYSTEM**

.1 Passive, engineered, geo-composite, secondary oil containment system which contains hydrocarbons (transformer insulating oil) from escaping the containment area and allows water to move freely through it without accumulating.

.2 Approved by the Ontario Ministry of the Environment as a Secondary Oil Containment System.

.3 Each oil containment system designed to contain the following total volume of liquids:

.1 total power transformer volume of oil

.2 plus an additional 10% of the power transformer volume of oil

.3 plus an additional rainfall event of 150 mm

1.3 **SUBMITTALS [FOR RECORD]**

.1 Design calculations, documentation and drawings.

.2 Shop Drawings, product data, performance and other criteria data.

.3 Shop Drawings of assemblies. Draw to a scale not smaller than 1:50 and include plans, sections and details.

.4 Approval Documentation by the Ontario Ministry of the Environment, as a Secondary Oil Containment System

1.4 **QUALITY ASSURANCE**

.1 Provide manufacturer’s field technician on site during the installation of Oil Containment System.

.2 Manufacturer’s field technician to provide technical guidance and inspection of the installation of the Oil Containment System.

1.5 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Store materials on site in a manner to prevent damage. Protect from the weather.

.2 Protect the materials and Work of this section from damage. Protect other Work from damage resulting from this Work. Replace damaged Work which cannot be satisfactorily repaired at no cost to Owner.

2 Products

2.1 **OIL CONTAINMENT SYSTEM**

.1 Passive, engineered, geo-composite, secondary oil containment system which contains hydrocarbons (transformer insulating oil) from escaping the containment area and allows water to move freely through it without accumulating.

.2 Acceptable manufacturers;

.1 Sorbweb Plus [Albarrie Canada Ltd.]

.2 C.I. Agent Solutions

3 Execution

3.1 **EXAMINATION**

.1 Confirm that surfaces are free of frost, water and debris before placing material.

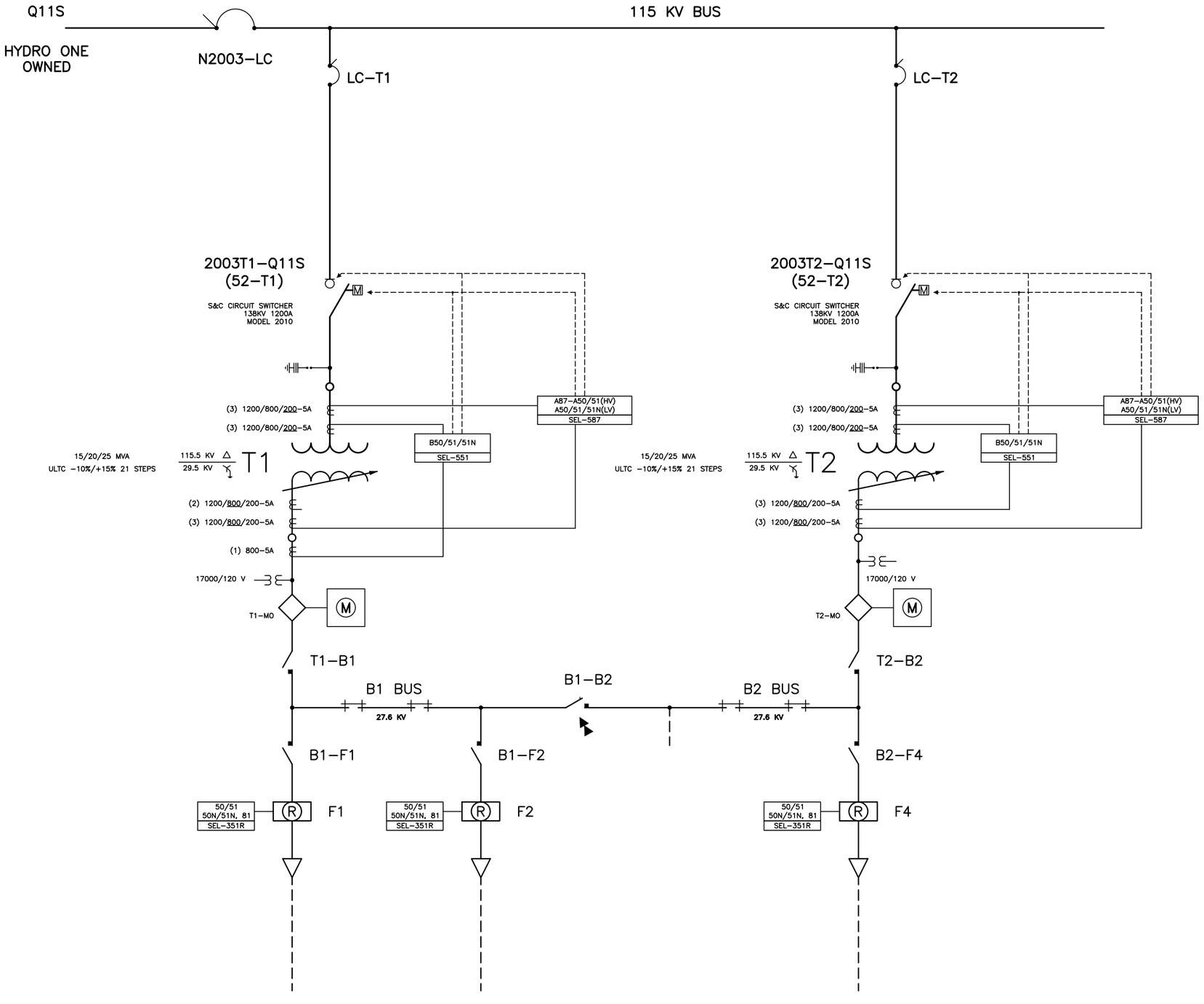
.2 Ensure that substrates are compacted and acceptable, and that all other built-in work are in place and secured before placing material.

3.2 **OIL CONTAINMENT SYSTEM**

.1 Installation of the oil containment system per the manufacturers design drawings, documentation and instructions.

.2 Manufacturer's field technician to provide technical guidance during the installation of the oil containment system.

End Of Section



REFERENCE DRAWING – 3–LINE DIAGRAM (S3)

RAVEN
Engineering Inc.

Niagara Falls, ON.

NOTES

1.

(S1)

#	REVISIONS	DATE
4	INSTALLED T1 NEUTRAL CT	10/15/10
3	AS BUILT	6/2/08
2	REPLACED TITLE BLOCK	8/28/07
1	REMOVED FUSES, ADDED CIRC SWITCH'S, PROT'N	1/10/06

NIAGARA–ON–THE–LAKE HYDRO INC.

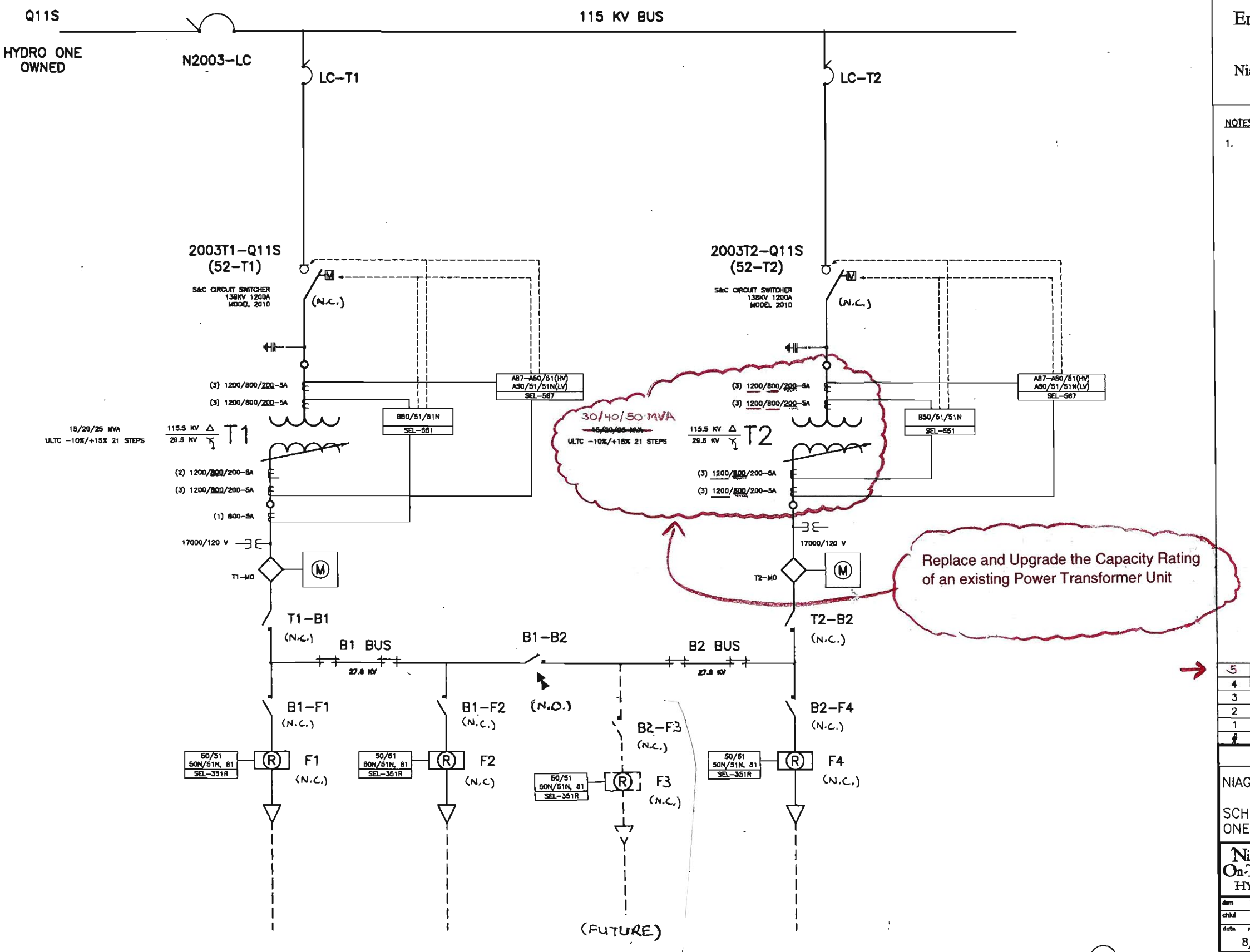
NIAGARA ON THE LAKE D.S. (MTS#2)

SCHEMATIC
ONE LINE DIAGRAM

Niagara On-The-Lake HYDRO
PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
L0S 1T0
PHONE: 905–468–4235
FAX: 905–468–3861

dwn	designed by ADD	cad use	
chkd			
date month/day/yr 8/7/07	design approved ADD		plot scale
scale Not To Scale	authorized		dist. code
w.o.			electronic filename NOTLDS_S1_R4.DWG

dwg no NOTLDS_S1 rev 4



RAVEN
Engineering Inc.

Niagara Falls, ON.

NOTES
1.

S1

#	REVISIONS	DATE
5	HYDRO ONE STUDY AGREEMENT	JUL 13, 2013
4	INSTALLED T1 NEUTRAL CT	10/15/10
3	AS BUILT	6/2/08
2	REPLACED TITLE BLOCK	8/28/07
1	REMOVED FUSES, ADDED CIRC SWITCH'S, PROT'N	1/10/06

NIAGARA-ON-THE-LAKE HYDRO INC.

NIAGARA ON THE LAKE D.S. (MTS#2)

SCHEMATIC
ONE LINE DIAGRAM

Niagara On-The-Lake HYDRO
PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
L0S 1T0
PHONE: 905-468-4235
FAX: 905-468-3861

dsn	designed by ADD	cad use	
chkd		plot scale	
date month/day/yr 8/7/07	design approved ADD	dist. code	
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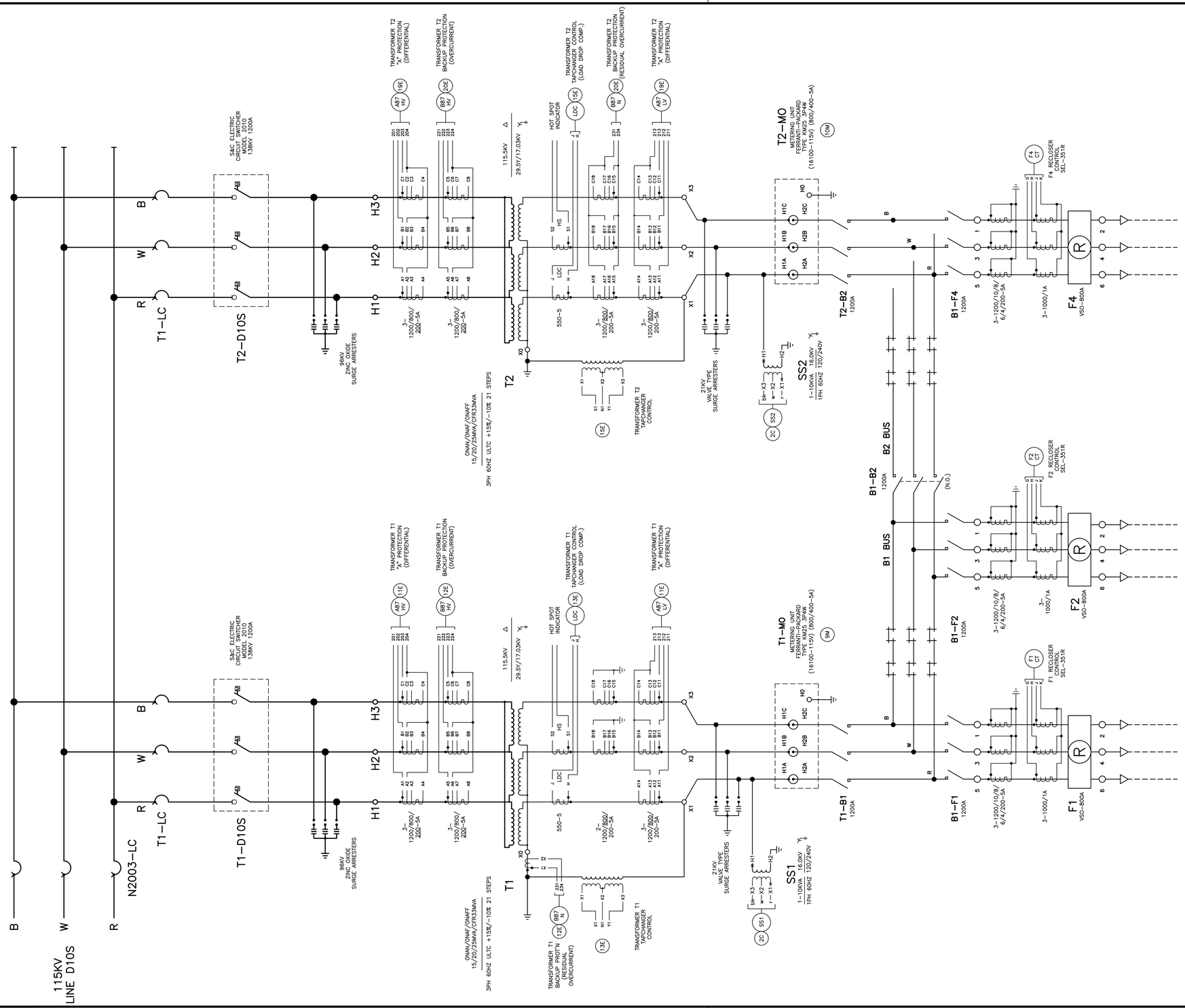

RAVEN
Engineering Inc.

Niagara Falls, ON.

DRAWING NOTES

1.

#	REVISIONS	DATE
2	T1 NEUTRAL CT INSTALLED	10/15/10
1	AS BUILT	16/10/09
4	AS BUILT, NOTL HYDRO TITLE BLOCK	16/8/07

NIAGARA-ON-THE-LAKE HYDRO INC.

NIAGARA ON THE LAKE D.S.

SCHEMATIC
3-LINE WIRING DIAGRAM

Niagara On-The-Lake HYDRO
PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
L0S 1T0
PHONE: 905-468-4235
FAX: 905-468-3861

dwn	designed by D. HUGHES	cad dwn	
chkd			
date month/day/yr 8/28/07	design approved D. HUGHES	plot scale	
		dist. code	
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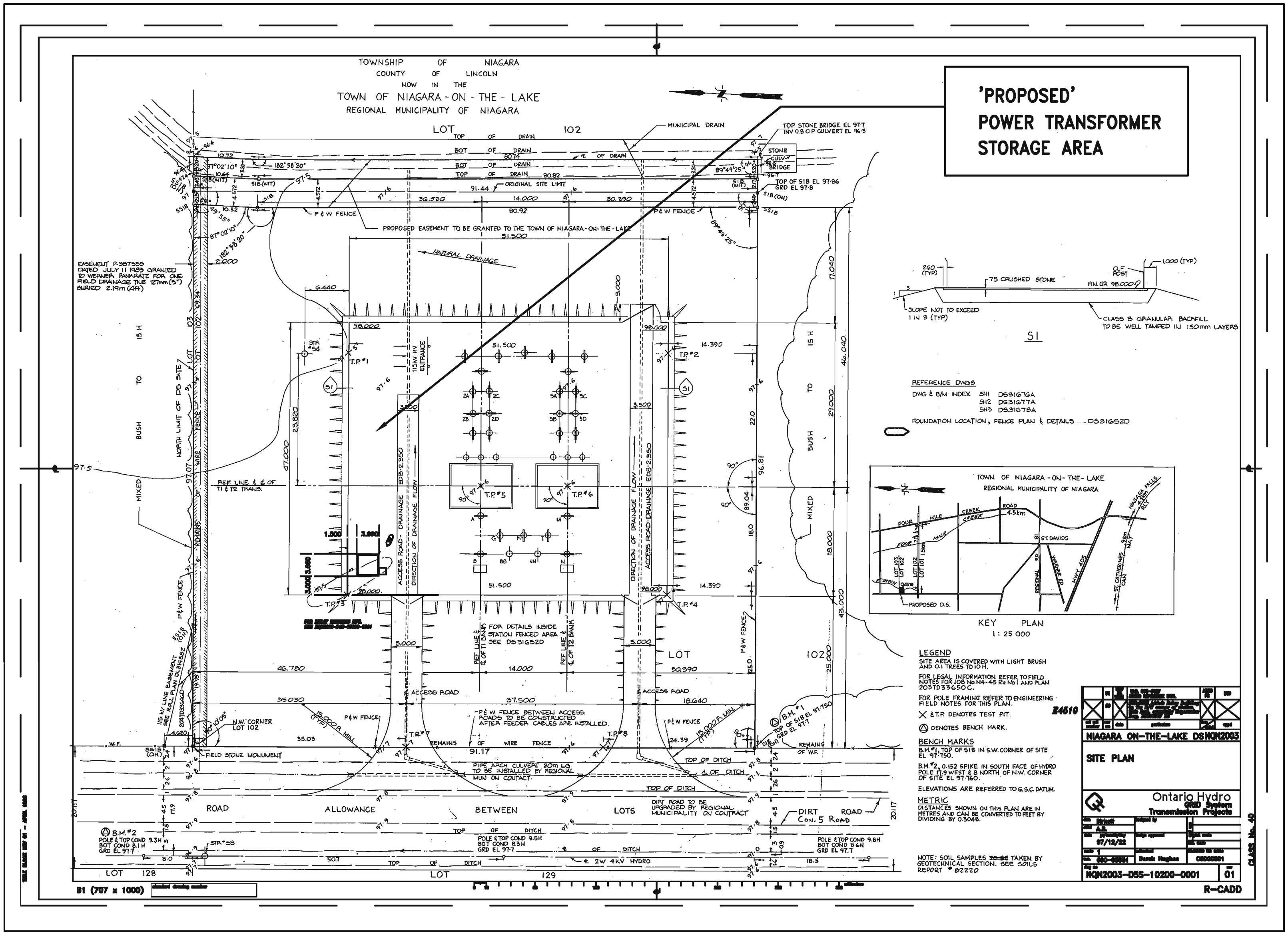
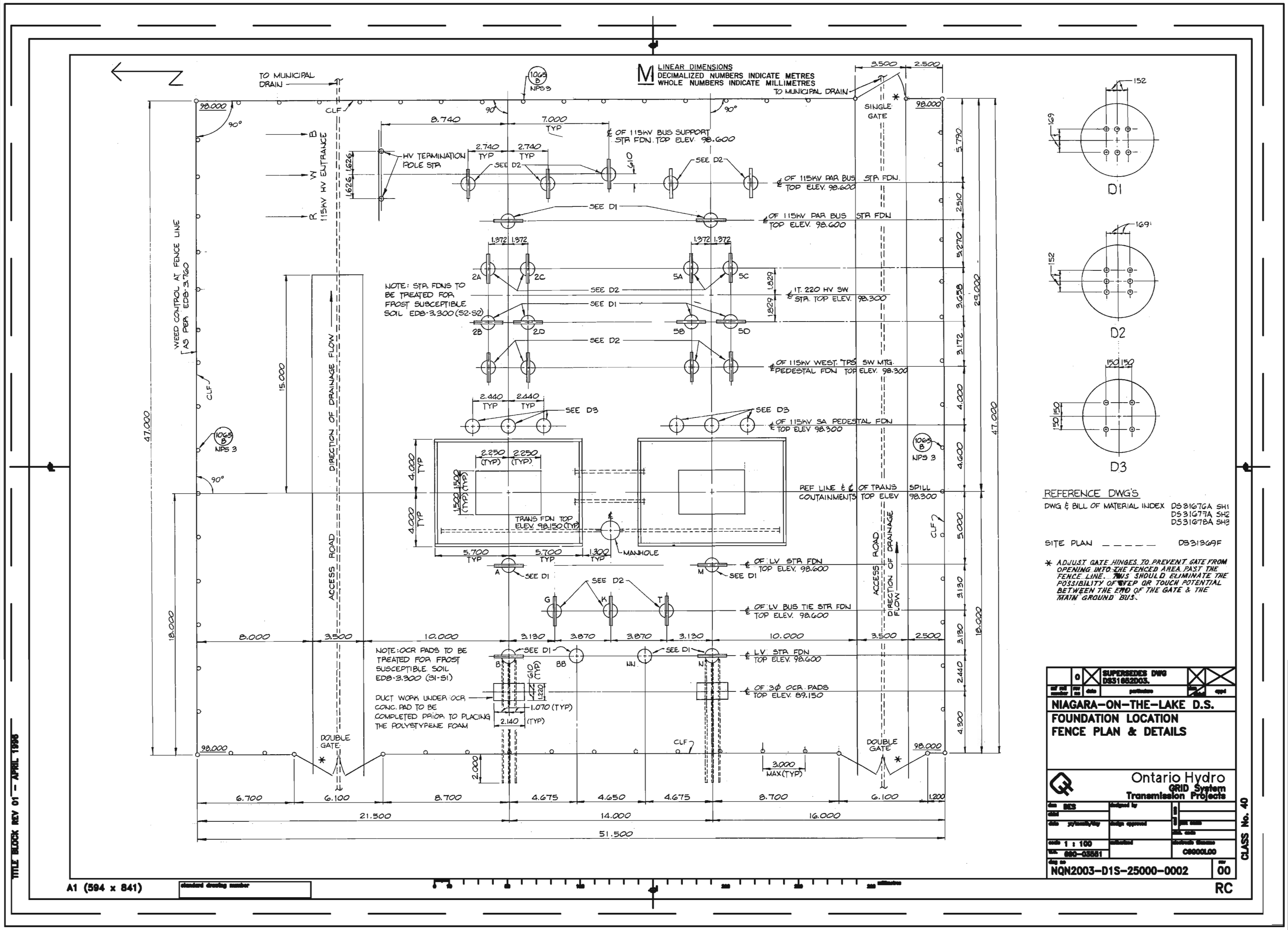
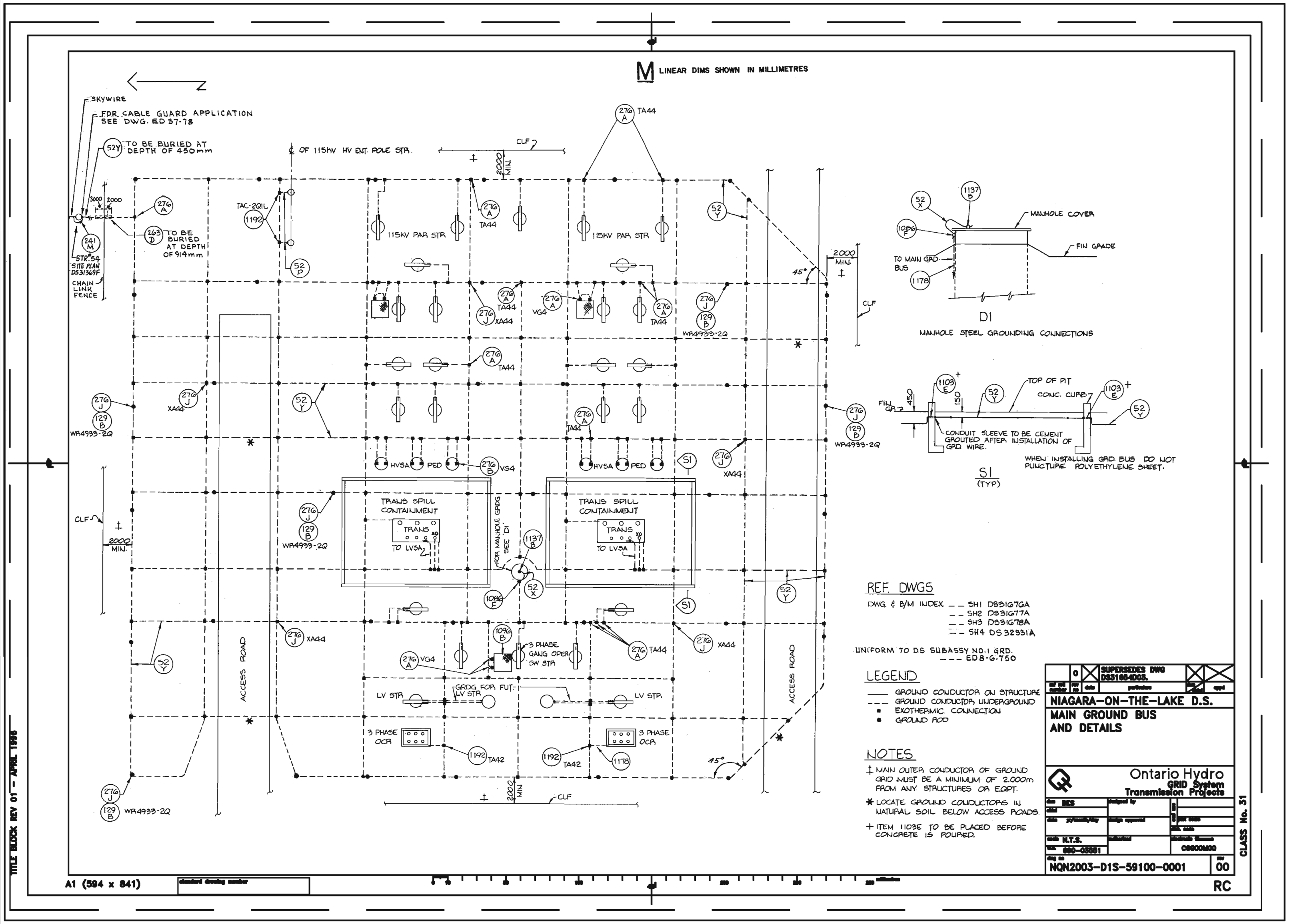
w.o.			
dwg no NOTLDS_S2		rev 2	

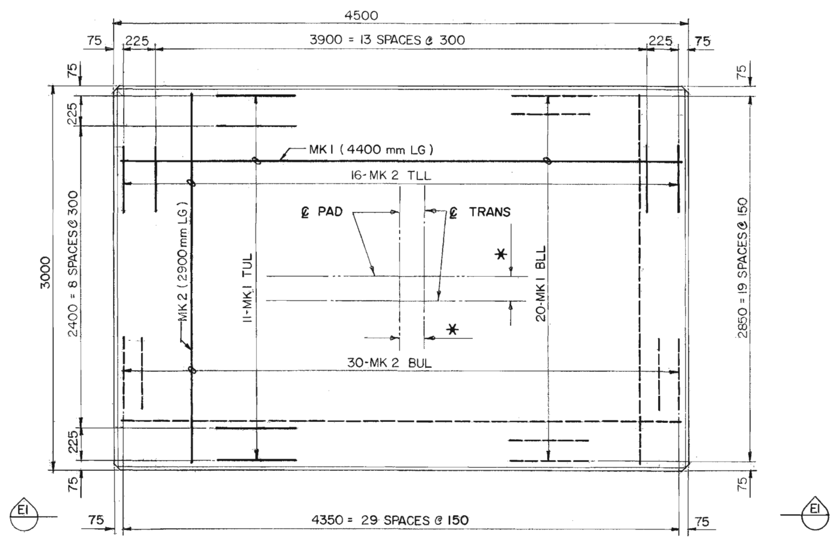


TOWNSHIP OF NIAGARA
COUNTY OF LINCOLN
NOW IN THE
TOWN OF NIAGARA-ON-THE-LAKE
REGIONAL MUNICIPALITY OF NIAGARA
'PROPOSED'
POWER TRANSFORMER
STORAGE AREA
LOT 102
MUNICIPAL DRAIN
PROPOSED EASEMENT TO BE GRANTED TO THE TOWN OF NIAGARA-ON-THE-LAKE
NATURAL DRAINAGE
T.P.#5
T.P.#6
FOR DETAILS INSIDE STATION FENCED AREA SEE DS31G52D
ACCESS ROAD
ROAD ALLOWANCE BETWEEN LOTS
DIRT ROAD CON. 5 ROAD
LOT 128
LOT 129
REFERENCE DWGS
DWG & B/M INDEX SH1 DS31G76A
SH2 DS31G77A
SH3 DS31G78A
FOUNDATION LOCATION, FENCE PLAN & DETAILS ... DS31G52D
KEY PLAN
1: 25 000
LEGEND
SITE AREA IS COVERED WITH LIGHT BRUSH AND O.I. TREES TO 10 H.
FOR LEGAL INFORMATION REFER TO FIELD NOTES FOR JOB No. N4-45 Re No1 AND PLAN 203TD33650C.
FOR POLE FRAMING REFER TO ENGINEERING FIELD NOTES FOR THIS PLAN.
& T.P. DENOTES TEST PIT.
DENOTES BENCH MARK.
BENCH MARKS
B.M.#1, TOP OF 518 IN S.W. CORNER OF SITE EL 97.750.
B.M.#2, 0.152 SPIKE IN SOUTH FACE OF HYDRO POLE 17.9 WEST & 8 NORTH OF N.W. CORNER OF SITE EL 97.760.
ELEVATIONS ARE REFERRED TO G.S.C. DATUM.
METRIC
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.
NOTE: SOIL SAMPLES TAKEN BY GEOTECHNICAL SECTION. SEE SOILS REPORT #82220
NIAGARA ON-THE-LAKE DS NQN2003
SITE PLAN
Ontario Hydro
NQN2003-D5S-10200-0001
01
R-CADD
B1 (707 x 1000)

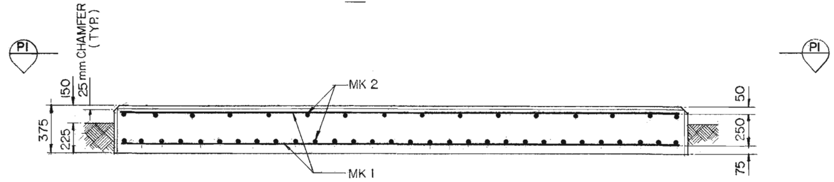
 LINEAR DIMENSIONS
DECIMALIZED NUMBERS INDICATE METRES
WHOLE NUMBERS INDICATE MILLIMETRES
TO MUNICIPAL DRAIN
HV TERMINATION POLE STR
115kV HV ENTRANCE
℄ OF 115kV BUS SUPPORT STR FDN. TOP ELEV. 98.600
℄ OF 115kV PAR BUS STR FDN. TOP ELEV. 98.600
℄ OF 115kV PAR BUS STR FDN TOP ELEV. 98.600
1T. 220 HV SW STR. TOP ELEV. 98.300
℄ OF 115kV WEST. TPS SW MTG. PEDESTAL FDN TOP ELEV. 98.300
℄ OF 115kV SA PEDESTAL FDN TOP ELEV 98.300
REF LINE ℄ ℄ OF TRANS SPILL CONTAINMENTS TOP ELEV 98.300
TRANS FDN TOP ELEV 98.150 (TYP)
MANHOLE
℄ OF LV STR FDN TOP ELEV. 98.600
℄ OF LV BUS TIE STR FDN TOP ELEV. 98.600
℄ LV STR FDN TOP ELEV. 98.600
℄ OF 3Ø OCR PADS TOP ELEV. 89.150
NOTE: STR. FDNS TO BE TREATED FOR FROST SUSCEPTIBLE SOIL EDB-3.300 (S2-S2)
NOTE: OCR PADS TO BE TREATED FOR FROST SUSCEPTIBLE SOIL EDB-3.300 (S1-S1)
DUCT WORK UNDER OCR CONC. PAD TO BE COMPLETED PRIOR TO PLACING THE POLYSTYRENE FOAM
WEED CONTROL AT FENCE LINE AS PER EDB-3.760
DIRECTION OF DRAINAGE FLOW
ACCESS ROAD
SINGLE GATE
DOUBLE GATE
D1
D2
D3
REFERENCE DWG'S
DWG & BILL OF MATERIAL INDEX D53167GA SH1 D53167?A SH2 D53167?A SH3
SITE PLAN D53130AF
* ADJUST GATE HINGES TO PREVENT GATE FROM OPENING INTO THE FENCED AREA PAST THE FENCE LINE. THIS SHOULD ELIMINATE THE POSSIBILITY OF STEP OR TOUCH POTENTIAL BETWEEN THE END OF THE GATE & THE MAIN GROUND BUS.
SUPERSEDES DWG D531682D03.
NIAGARA-ON-THE-LAKE D.S.
FOUNDATION LOCATION
FENCE PLAN & DETAILS
Ontario Hydro
GRID System
Transmission Projects
scale 1 : 100
NQN2003-D1S-25000-0002
00
CLASS No. 40
A1 (594 x 841)
standard drawing number
TITLE BLOCK REV 01 - APRIL 1996
RC


M LINEAR DIMS SHOWN IN MILLIMETRES
SKYWIRE
FOR CABLE GUARD APPLICATION SEE DWG. ED 37-78
TO BE BURIED AT DEPTH OF 450mm
TO BE BURIED AT DEPTH OF 914mm
STR 54 SITE PLAN DS31369F
CHAIN LINK FENCE
℄ OF 115kV HV ENT. POLE STR.
TAC-2Q1L
115kV PAR STR
HVSA
PED
TRANS SPILL CONTAINMENT
TRANS
TO LVSA
FOR MANHOLE GRDG SEE 'D1'
3 PHASE GANG OPER SW STR
GRDG FOR FUT LV STR
LV STR
3 PHASE OCR
ACCESS ROAD
CLF
2000 MIN.
MANHOLE COVER
FIN GRADE
TO MAIN GRD BUS
D1
MANHOLE STEEL GROUNDING CONNECTIONS
TOP OF PIT
CONC. CURB
FIN GR
CONDUIT SLEEVE TO BE CEMENT GROUTED AFTER INSTALLATION OF GRD WIRE.
WHEN INSTALLING GRD BUS DO NOT PUNCTURE POLYETHYLENE SHEET.
S1 (TYP)
REF. DWGS
DWG. & B/M INDEX — SH1 DS31676A
— SH2 DS31677A
— SH3 DS31678A
— SH4 DS32331A
UNIFORM 70 DS SUBASSY NO.1 GRD. — ED8-6-750
LEGEND
GROUND CONDUCTOR ON STRUCTURE
GROUND CONDUCTOR UNDERGROUND
EXOTHERMIC CONNECTION
GROUND ROD
NOTES
‡ MAIN OUTER CONDUCTOR OF GROUND GRID MUST BE A MINIMUM OF 2.000m FROM ANY STRUCTURES OR EQPT.
* LOCATE GROUND CONDUCTORS IN NATURAL SOIL BELOW ACCESS ROADS.
+ ITEM 1103E TO BE PLACED BEFORE CONCRETE IS POURED.
0 SUPERSEDES DWG DS31654D03.
NIAGARA-ON-THE-LAKE D.S.
MAIN GROUND BUS AND DETAILS
Ontario Hydro
GRID System
Transmission Projects
BES
scale N.T.S.
690-03551
C9900M00
NQN2003-D1S-59100-0001
rev 00
CLASS No. 31
RC
A1 (594 x 841)
standard drawing number
TITLE BLOCK REV 01 - APRIL 1998

M LINEAR DIMS SHOWN IN MILLIMETRES



P1



E1

BILL OF REINFORCING					
MARK	TYPE	QTY.	SIZE	LENGTH	MASS kg
1	ST	31	20M	4400	321.22
2	ST	46	20M	2900	314.16
				TOTAL MASS	635.38

DESIGNATION & BENDS———— ED4-3.606

BEND & HOOK DETAILS———— ED4-3.607

NOTES

1. MAXIMUM TRANSFORMER WEIGHT 59 Mg
2. MINIMUM SOIL BEARING STRENGTH -
   - A - 144 kPa - PROVIDED THE TRANS. CENTRE OF GRAVITY LIES MAX. 450 mm FROM PAD CENTRE LINE.
   - B - 72 kPa PROVIDED THE TRANS. CENTRE OF GRAVITY LIES MAX. 50 mm FROM PAD CENTRE LINE.
3. VOLUME OF CONCRETE... 5.1 m^3
4. SEE ALSO NOTES A B D F G & N DWG ED8 - 3.300
5. * TRANSFORMER / PAD OFFSET IS NOTED ON THE SITE PLAN AS DETERMINED BY THE PROJECT ENGINEER.

REF DWG

CONC TRANS PAD INSTALLATION DETAILS IN SOIL ————————ED8-3.302

TRANS PAD TREATMENT IN FROST SUSCEPTIBLE SOIL————ED8-3.300

0 SUPERSEDES DWG DS32027C02.

NIAGARA-ON-THE-LAKE D.S.

CONCRETE TRANS PAD

Ontario Hydro
GRID System
Transmission Projects

drn MGB

scale 1 : 20

690-03551

C6900J00

NQN2003-D2S-25104-0001 00

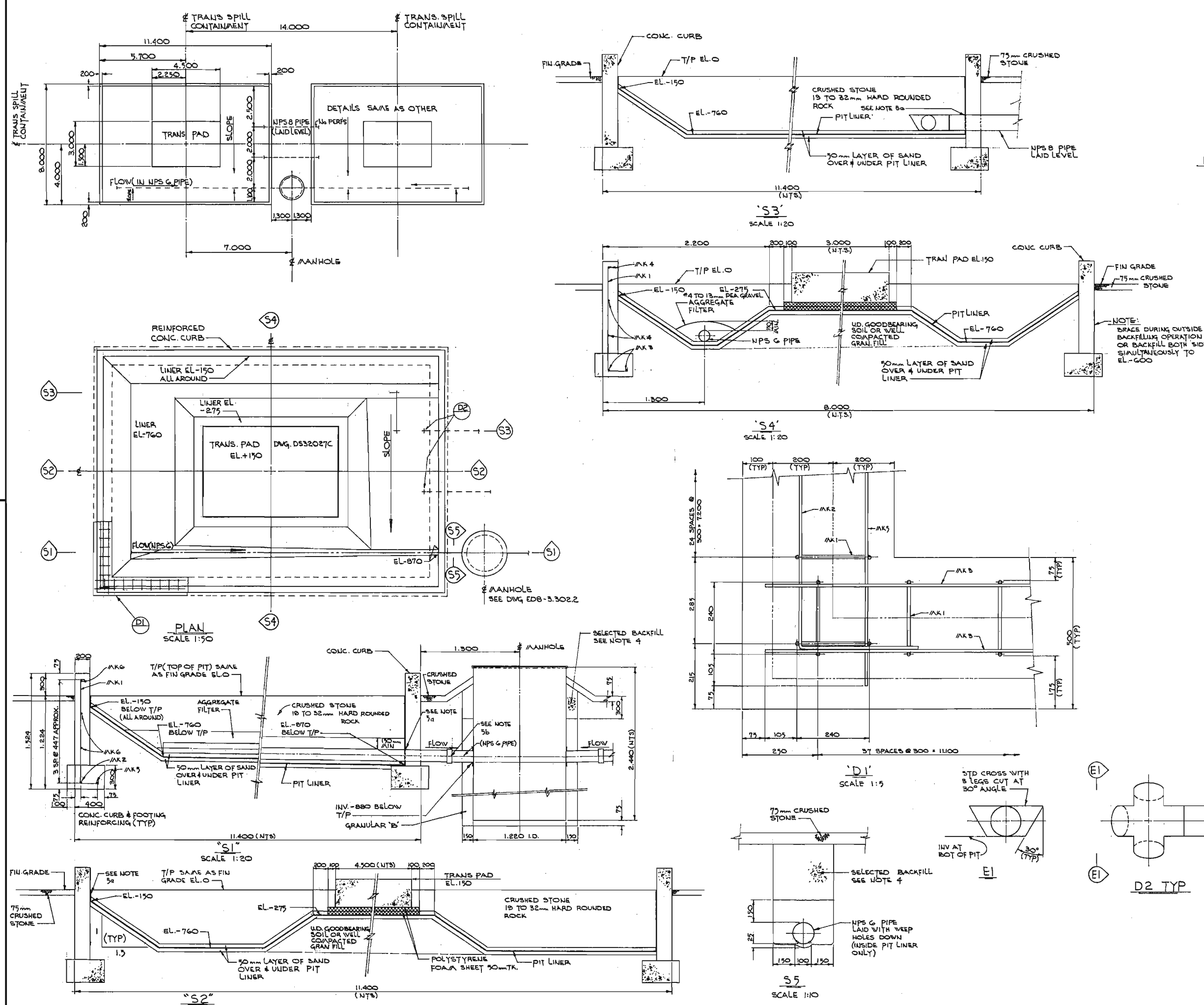
CLASS No. 41

TITLE BLOCK REV 01 - FEB 1996

standard drawing number

A2 (420 x 594)

RC



BILL OF REINFORCING FOR TWO CONTAINMENTS

DESIGNATIONS & BENDS ED4-3.606
BEND & HOOK DETAILS ED4-3.607

MARK	QTY	SIZE	LENGTH	TYPE	DIMENSIONS A	B	C	D	G		MASS Kg
1	260	10M	1.705	S6	50	1.365	240	50	–		348.00
2	4	10M	8.510	S10	–	400	7.710	400	–		26.72
3	8	10M	11.450	ST							71.90
4	12	10M	11.250	ST							105.98
5	4	10M	8.070	ST							25.33
6	12	10M	7.850	ST							73.95
TOTAL MASS											651.88

NOTES:

1. VOLUME OF CONCRETE FOR TWO CONTAINMENTS = 29.5 m^3
2. VOID VOLUME OF STONE FOR EACH CONTAINMENT = 9000 ℓ APPROX @ 25% VOIDS.
3. VOLUME WITHIN CONCRETE CURBS ABOVE STONE FOR EACH CONTAINMENT = 21.0 m^3
4. SELECTED BACKFILL-EXCAVATED SOIL FREE OF FROZEN LUMPS, VEGETABLE MATTER & STONES OR ROCK FRAGMENTS EXCEEDING 65 mm IN ANY DIMENSION.

5a. THE PIT LINER SHALL BE INSTALLED AND SEALED PER ONTARIO HYDRO SPEC. L981M-83.

5b. MAKE WATERTIGHT WITH APPLICATION OF FLINTSTIK #200-32 RUBBERIZED ASPHALT EMULSION ANY PIPE COUPLINGS & JOINTS AND WEEP HOLES OUTSIDE THE LINED PIT.

6. NO CONTRACTION JOINTS ARE REQUIRED IN WALL POURS.
7. TAKE CARE NOT TO PUNCTURE THE LINER DURING FORMING & POURING OF THE TRANSFORMER PAD.
8. SEE ALSO NOTES A,B,F & G ON DWG. ED8-3.299.

M LINEAR DIMENSIONS
DECIMALIZED NUMBERS INDICATE METRES
WHOLE NUMBERS INDICATE MILLIMETRES

SUPERSEDES DWG

NIAGARA-ON-THE-LAKE D.S.

TWO INTERCONNECTED TRANS SPILL CONTAINMENTS WITH CONC CURBS AND PIT LINING

Ontario Hydro
GRID System
Transmission Projects

P. BUNN

AS SHOWN

NQN2003-D5S-79310-0001 | rev 00

CLASS No. 51

B1 (707 x 1000)

RC

Westinghouse

INSULATION **INSULDUR** SYSTEM

15/20/25 MVA

55°C RISE

115 500 HV

29 500 LV

THREE PHASE

60 HERTZ

TRANSFORMER

TYPE ONAN/ONAF/ONAF

SEALEDAIRE

LTC POS	% IMP AT 15 MVA
1	8.56
9	8.56
21	8.90

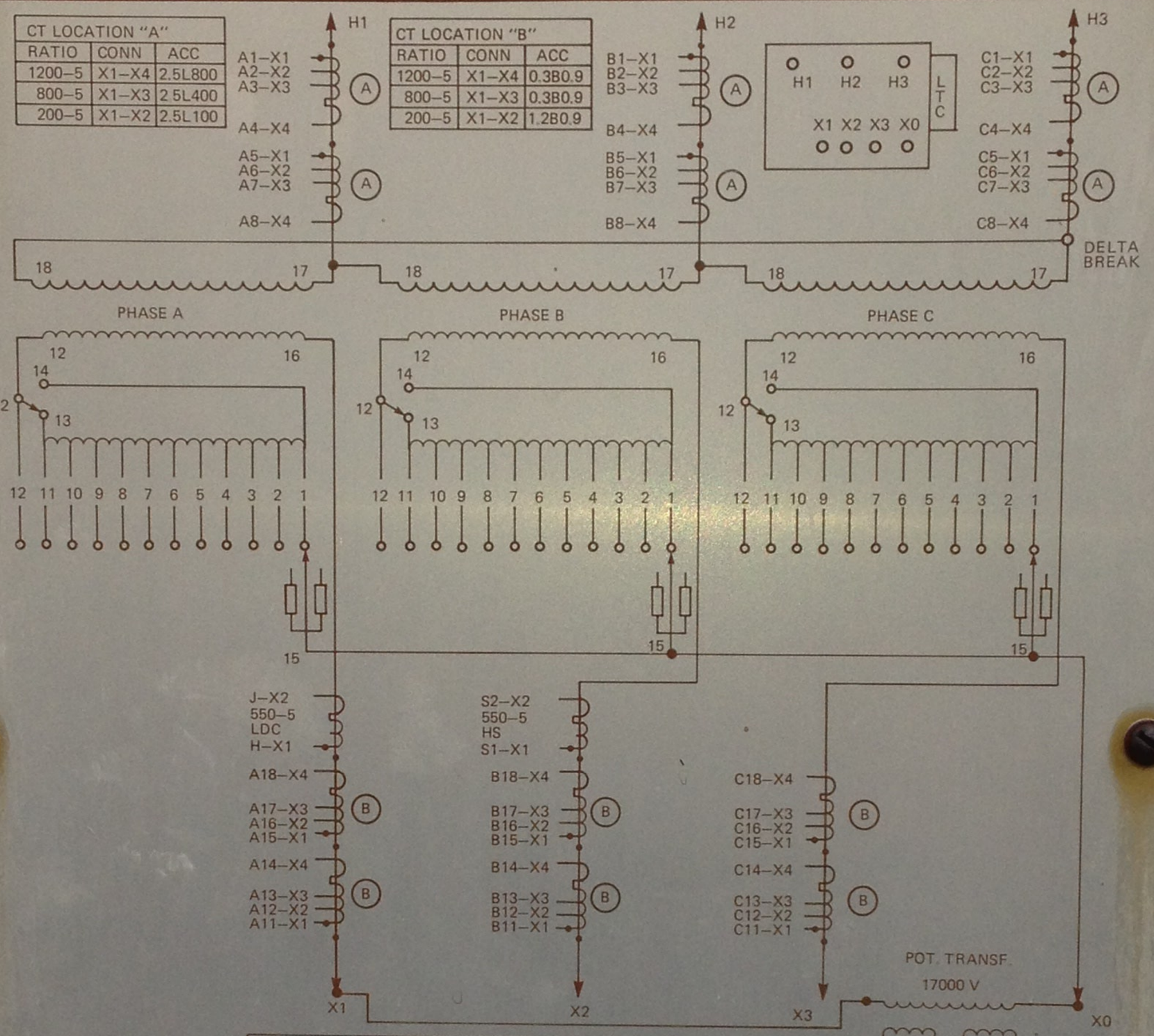
OIL 20473 LITRES

CUST SERIAL

MFG SERIAL A 385671

INST BOOK CT 507

LIGHTNING IMPULSE LEVEL (LIL): HV 550 KV, LV LINE 150 KV, X0 110 KV



HIGH VOLTAGE DELTA ON LEADS H1, H2, H3			
VOLTS	AMPERES		
	15 MVA	20 MVA	25 MVA
115 500	75.0	100.0	125.0

LOW VOLTAGE STAR ON LEADS X1, X2, X3

VOLTS	AMPERES			LTC		
	15 MVA	20 MVA	25 MVA	POS	15 to	12 to
26550	293.6	391.4	489.3	1	1	13
26918				2	2	
27288				3	3	
27656				4	4	
28025				5	5	
28394				6	6	
28763				7	7	
29131				8	8	
29500	293.6	391.4	489.3	9	9	
29869	289.9	386.6	483.2	10	10	
30238	286.4	381.9	477.3	11	12	

VOLTS	AMPERES			LTC		
	15 MVA	20 MVA	25 MVA	POS	15 to	12 to
30238	286.4	381.9	477.3	11	12	13
30606	283.0	377.3	471.6	12	2	14
30975	279.6	372.8	466.0	13	3	
31344	276.3	368.4	460.5	14	4	
31713	273.1	364.1	455.1	15	5	
32081	269.9	359.9	449.9	16	6	
32450	266.9	355.8	444.8	17	7	
32819	263.9	351.8	439.8	18	8	
33188	260.9	347.9	434.9	19	9	
33556	258.1	344.1	430.1	20	10	
33925	255.3	340.4	425.5	21	11	

COOLING LIQUID MUST BE MAINTAINED AT THE PROPER LEVEL.
AMPERE RATING GIVEN IS CURRENT IN OUTLET LEADS.
DO NOT ENERGIZE TRANSFORMER WITH COOLING VALVES CLOSED
TANK WITHSTAND PRESSURE 70 kPa POSITIVE OR 101 kPa NEGATIVE (FULL VACUUM).
LOAD TAPCHANGER ASEA TYPE UZERN 200/600
INSULDUR INSULATION PERMITS CONTINUOUS OPERATION AT 28 MVA WITH A WINDING RISE OF APPROXIMATELY 65°C.
CAPACITY AT 0°C AMBIENT: 29.7 MVA (55° RATING) OR 33.2 MVA (65° RATING)
TRANSFORMER IS BUILT TO ONTARIO HYDRO STANDARD SPECIFICATION M 111SM-80.
THIS TRANSFORMER IS SUITABLE FOR CONTINUOUS OPERATION AT VOLTAGES AS HIGH AS 126 KV.
THE ON LOAD TAPCHANGER IS EQUIPPED WITH A RANGE LIMITING FEATURE.
PRE-SELECT SUITABLE RANGE FROM FULL RANGE AVAILABLE.
POWER SUPPLY FOR AUXILIARY EQUIPMENT IS 120/240 V, 1 PHASE, 60 HZ.

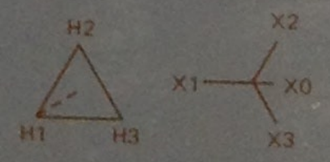
CORE AND WINDINGS 27215 kg

TANK AND FITTINGS 12648 kg

INSULATING LIQUID 17772 kg

TOTAL 57635 kg

MADE IN CANADA
Westinghouse Canada Inc.
Hamilton, Ontario, Canada



BUILT 1985

237P498–2

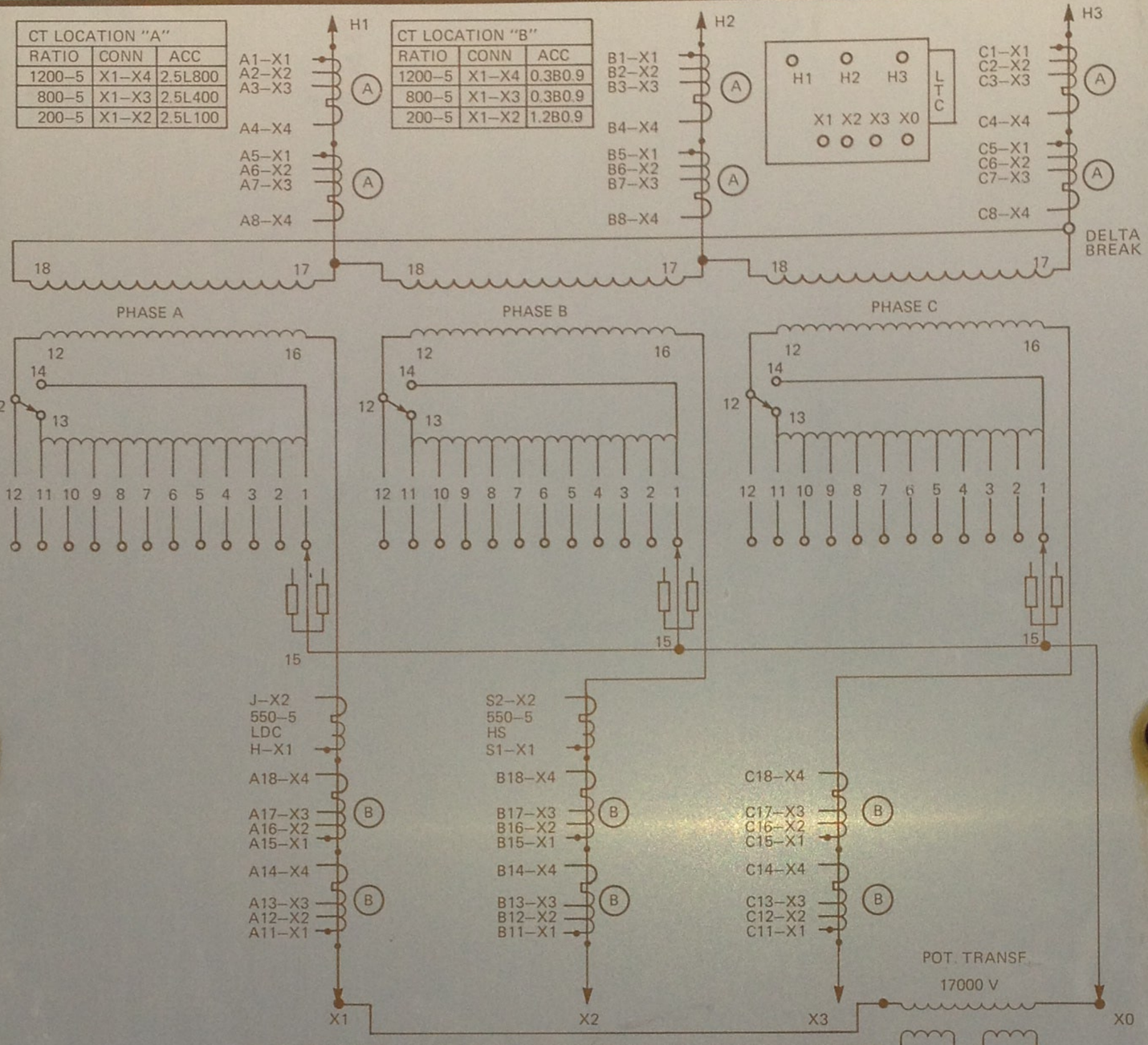
Westinghouse

INSULATION **INSULDUR** SYSTEM

15/20/25 MVA 55°C RISE 115 500 HV 29 500 LV	THREE PHASE 60 HERTZ **TRANSFORMER** TYPE ONAN/ONAF/ONAF SEALEDAIRE	OIL 20475 LITRES CUST SERIAL A MFG SERIAL A 3S 5672 INST BOOK CT 507

LTC POS	% IMP AT 15 MVA
1	8.50
9	8.46
21	8.83

LIGHTNING IMPULSE LEVEL (LIL): HV 550 KV, LV LINE 150 KV, X0 110 KV



HIGH VOLTAGE DELTA ON LEADS H1, H2, H3			
VOLTS	AMPERES		
	15 MVA	20 MVA	25 MVA
115 500	75.0	100.0	125.0

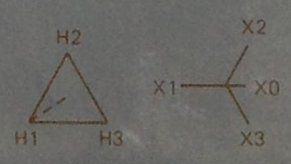
LOW VOLTAGE STAR ON LEADS X1, X2, X3

VOLTS	AMPERES			LTC		
	15 MVA	20 MVA	25 MVA	POS	15 to	12 to
26550	293.6	391.4	489.3	1	1	13
26918				2	2	
27288				3	3	
27656				4	4	
28025				5	5	
28394				6	6	
28763				7	7	
29131				8	8	
29500	293.6	391.4	489.3	9	9	
29869	289.9	386.6	483.2	10	10	
30238	286.4	381.9	477.3	11	12	

VOLTS	AMPERES			LTC		
	15 MVA	20 MVA	25 MVA	POS	15 to	12 to
30238	286.4	381.9	477.3	11	12	13
30606	283.0	377.3	471.6	12	2	14
30975	279.6	372.8	466.0	13	3	
31344	276.3	368.4	460.5	14	4	
31713	273.1	364.1	455.1	15	5	
32081	269.9	359.9	449.9	16	6	
32450	266.9	355.8	444.8	17	7	
32819	263.9	351.8	439.8	18	8	
33188	260.9	347.9	434.9	19	9	
33556	258.1	344.1	430.1	20	10	
33925	255.3	340.4	425.5	21	11	

COOLING LIQUID MUST BE MAINTAINED AT THE PROPER LEVEL.
AMPERE RATING GIVEN IS CURRENT IN OUTLET LEADS.
DO NOT ENERGIZE TRANSFORMER WITH COOLING VALVES CLOSED
TANK WITHSTAND PRESSURE: 70 kPa POSITIVE OR 101 kPa NEGATIVE (FULL VACUUM).
LOAD TAPCHANGER ASEA TYPE UZERN 200/600.
INSULDUR INSULATION PERMITS CONTINUOUS OPERATION AT 28 MVA WITH A WINDING RISE OF APPROXIMATELY 65°C.
CAPACITY AT 0°C AMBIENT: 29.7 MVA (55° RATING) OR 33.2 MVA (65° RATING).
TRANSFORMER IS BUILT TO ONTARIO HYDRO STANDARD SPECIFICATION M-111SM-80.
THIS TRANSFORMER IS SUITABLE FOR CONTINUOUS OPERATION AT VOLTAGES AS HIGH AS 126 KV.
THE ON LOAD TAPCHANGER IS EQUIPPED WITH A RANGE LIMITING FEATURE.
PRE-SELECT SUITABLE RANGE FROM FULL RANGE AVAILABLE.
POWER SUPPLY FOR AUXILIARY EQUIPMENT IS 120/240 V, 1 PHASE, 60 HZ.

CORE AND WINDINGS 27215 kg
TANK AND FITTINGS 12843 kg
INSULATING LIQUID 17772 kg
TOTAL 57830 kg

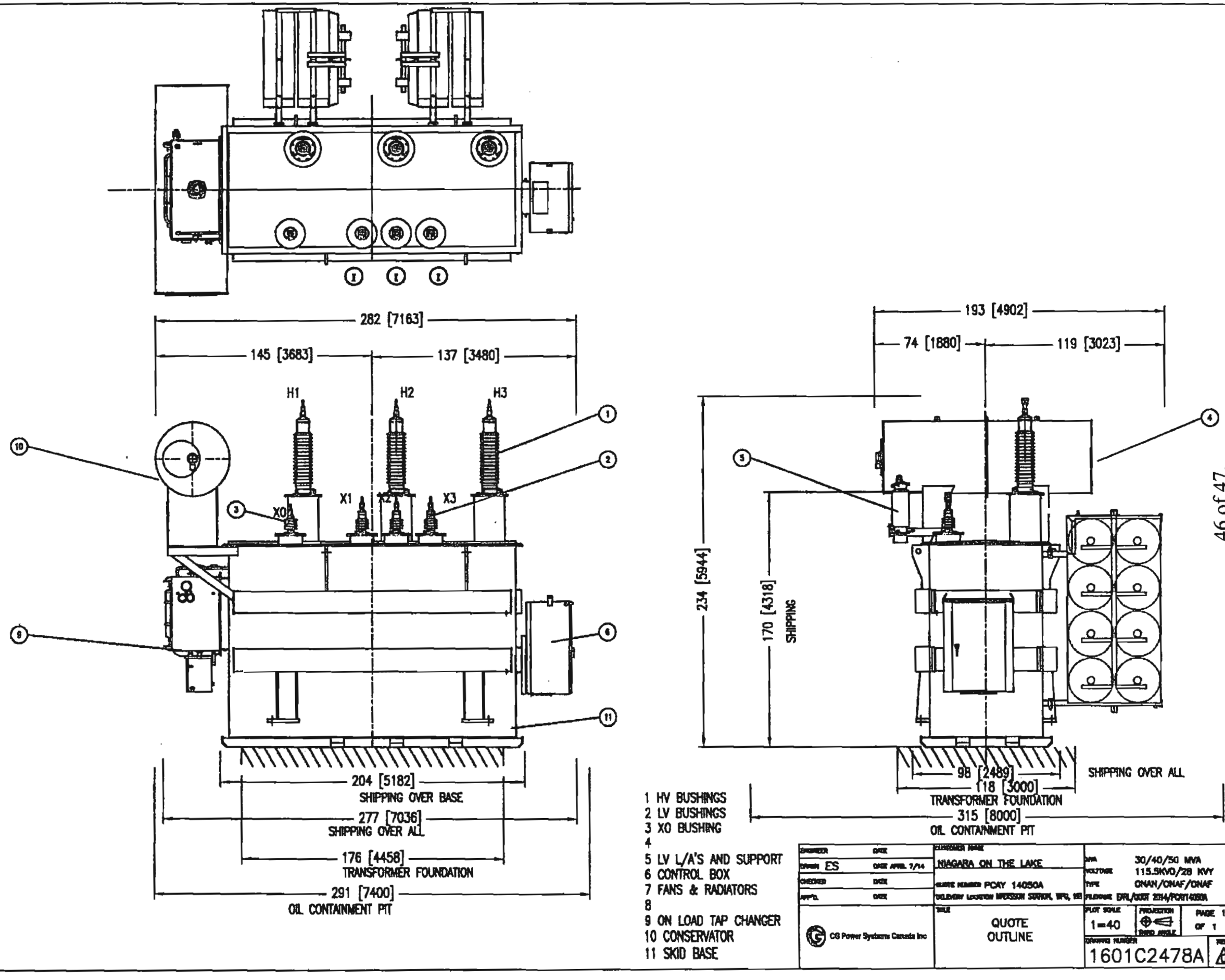


MADE IN CANADA
Westinghouse Canada Inc.
Hamilton, Ontario, Canada

BUILT 1983

237P498–2

PASSED QUALITY CONTROL
RELEASED FOR SHIPMENT
FR. _____ SER. # _____
emarks: _____



1 HV BUSHINGS
2 LV BUSHINGS
3 XO BUSHING
4
5 LV L/A'S AND SUPPORT
6 CONTROL BOX
7 FANS & RADIATORS
8
9 ON LOAD TAP CHANGER
10 CONSERVATOR
11 SKID BASE

ENGINEER / DATE	CUSTOMER NAME: NIAGARA ON THE LAKE	MVA: 30/40/50 MVA	
DRWN: ES / DATE: APRIL 7/14	QUOTE NUMBER: PQAY 14050A	VOLTAGE: 115.5KVD/28 KVY	
CHECKED / DATE	DELIVERY LOCATION: [illegible]	TYPE: ONAN/ONAF/ONAF	
APP'D. / DATE		FILENAME: DRL/QUOT 2014/PQAY14050A	
CG Power Systems Canada Inc	TITLE: QUOTE OUTLINE	PLOT SCALE: 1=40	PROJECTION: THIRD ANGLE; PAGE 1 OF 1
		DRAWING NUMBER: 1601C2478A	REV. A

CG POWER SYSTEMS CANADA INC Power Transformer Specification

For:	Niagara on the lake			Date:	4/23/2014
Proposal No.	PCAY14050	Spec No.	0	Item No.	PCAY14050

RATING

		Class	H Winding		X Winding		Y Winding	
Type:	POWER							
Phase:	3		116	kV	28	kV	0	kV
Hertz:	60	ONAN	30.00	MVA	30.00	MVA	0	MVA
Temp. Rise:	65	ONAF	40.00	MVA	40.00	MVA		
Insul Liquid:	Oil	ONAF	50.00	MVA	50.00	MVA		
Service:	Outdoor							

ADDITIONAL TAP VOLTAGES

H Winding		+/- 0 %	+/- 0	Steps
X Winding	+/- 20	+/- 16 %		
	+/- 0	+/- 0 %		

CONNECTIONS FOR OPERATION

Transformers In Bank	To Transformer From	Phase	Connected	To Transformer To	Phase	Connected
	HV		Delta			
	LV		Delta			

PERFORMANCE BASED ON A LOADING OF

Winding	Voltage	MVA
H Winding	116	30
X Winding	28	30
Y Winding	0	0

DIELECTRIC TESTS

Test	Winding	Voltage
Applied Voltage	H Winding	per CSA
	X Winding	per CSA
	Y Winding	per CSA
Induced Voltage	Line-Line	per CSA
	Line-Ground	per CSA

INSULATION LEVELS

Item	BIL
H Line	550
X Line	200

PERFORMANCE DATA, Based on 85 °C Reference Temperature

Losses and Exciting Current at 30.00 MVA

Excitation	%Iex		No Load KW Guaranteed	Load KW Approximate	Total Loss KW Guaranteed
100%	0.07	approx.	26.00	96.50	122.50
110%	0.27	approx.			

REGULATION (approximate)

Power Factor	% Regulation
1.0	#NUM!
0.8	#NUM!
0.8 P.F Lead	#NUM!

AUXILIARY LOSSES (cooling losses only)

Transformer MVA	Class	KW Aux. Loss
30	ONAN	0.00
40	ONAF	3.00
50	ONAF	5.00

PERCENT IMPEDANCE VOLTS

% IZ	Connection	at MVA
0.085	H-X	30
	H-Y	
	Y-X	

AVERAGE SOUND LEVEL

75/77/78 dBA per CSA standard test methods

EFFICIENCIES (approximate)

MVA Rating	1 1/4 Load	Full Load	3/4 Load	1/2 Load	1/4 Load
30	99.53 %	99.59 %	99.64 %	99.67 %	99.57 %
50.00	99.29 %	99.41 %	99.53 %	99.63 %	99.66 %

MECHANICAL DATA
Not For Construction Purposes

For dimensions please refer to attached drawing

Net Weight In	kg
Core and Coils:	28,623
Tank and Fittings:	10,878
Liquid: 2,2659 Litres	1,9,444
Total Weight:	68,045
Shipping Weight:	42,639

(i) The Customer is responsible for designing and installing adequately rated equipment to protect the Customer's facilities.

(ii) The Customer is responsible, at its cost, to obtain all applicable regulatory approvals and permits such as municipal, provincial, Federal, Independent Electricity System Operator (IESO), Ontario Energy Board (OEB), Electrical Safety Authority (ESA), etc and meeting all regulatory requirements for its facilities.

(iii) the Customer completing the work as described in this Agreement, including, but not limited to the work the customer is responsible for as described in Schedule "A"

Notes:

i) Customer has provided the following data for the transformer that will replace the existing T2 transformer :

- Voltage rating -High Voltage(HV)/ Low Voltage(LV): 115.5kV / 28kV
- Winding Connection (HV/LV): Delta/Wye
- Thermal rating:30/40/50 MVA
- LV neutral grounding: solidly grounded.
- Impedance (HV-LV): 8.5%
- Number of ULTC steps: -10%/+20%, 32 steps

Customer will confirm to Hydro One if there are any changes in the above transformer data.

ii) Customer confirms that:

- There is no change in the operating philosophy for the NOTL MTS No 2 with the proposed replacement and upgrade of an existing transformer (T2).
- The 10/15/25 MVA rating of the T1 transformer remains unchanged.The Customer is required to submit a separate application to Hydro One for the scope of work and associated costs if the Customer plans to modify ratings of T1 transformer.
- The T1 and T2 transformers bus tie disconnect switch will be operated normally open.
- There is no change to the existing protection and control system to the NOTL MTS No 2 with the proposed replacement/upgrade of an existing transformer (T2).
- There is no generation in feed to the Hydro One system at NOTL MTS No. 2.

iii) The Customer will install station class surge arrestors at the HV and LV terminals of the 115- 27.6 kV transformer

iv) Customer will provide Hydro One with a copy of the IESO System Impact Assessment for the proposed modifications to NOTL MTS No. 2 within 2 weeks of signing this CCRA.

v) Customer will provide four sets of single line diagrams for the proposed revisions at the NOTL MTS No.2 within 2 weeks of signing this CCRA.

vi) Customer will provide four sets of technical descriptions of the operating philosophy of the electrical equipment, and the protection and control philosophy of the Customer's Facilities that could affect Hydro One's transmission system within 2 weeks of signing this CCRA.

vii) The Customer is responsible for designing and installing adequately rated protection, control,

telecommunication equipment to protect its facilities.

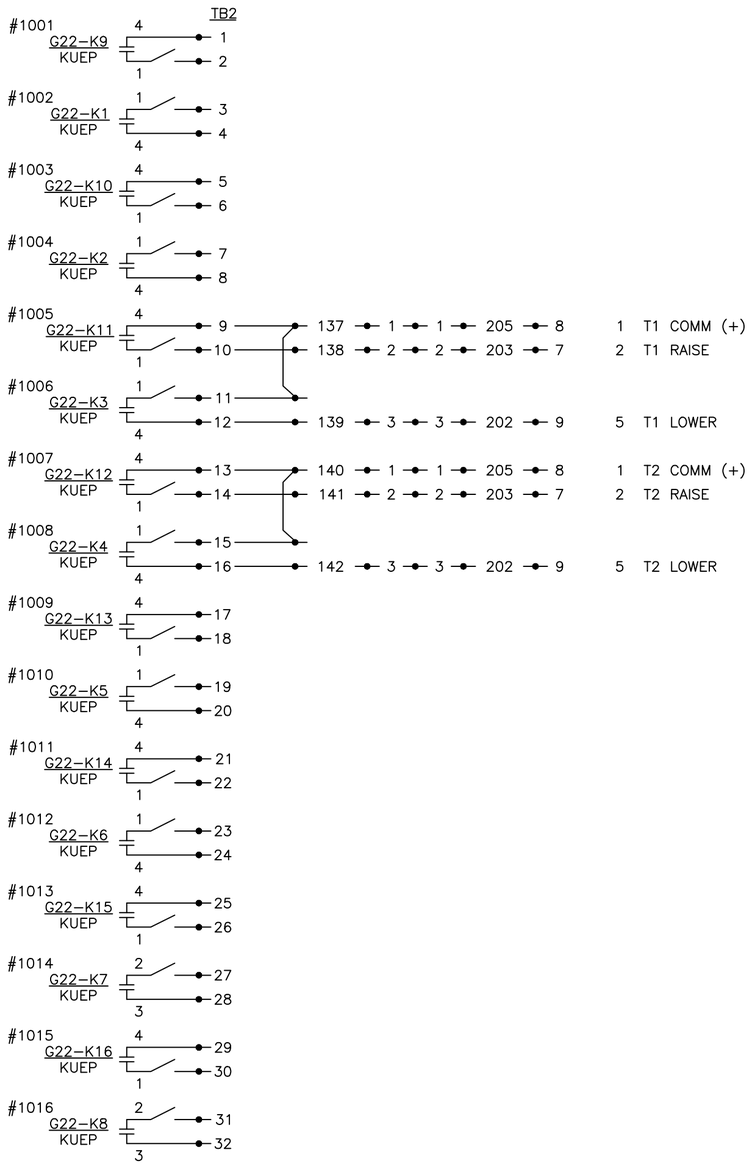
viii) The Customer is responsible for providing the SCADA remote end functionality and providing real-time telemetry to Hydro One in accordance with the Transmission System Code and Hydro One requirements.

ix) To meet operations requirements, the Customer will:

- Provide SCADA telemetry quantities to the OGCC, as required.
- Provide SCADA telemetry quantities to the IESO, as required.
- Meet the requirements for 3% and 5% Voltage Reductions as required by the IESO.
- Provide Under Frequency Load Shedding relay as required by IESO.
- Provide adequate Underload Tap changer control, as required.

The following data will be required by Hydro One and be made available by the Customer's ready for service date.

- Status of the high tension (HT) interrupter or transformer HT disconnect switches.
- Status of the transformer secondary breaker(s) or applicable transformer secondary isolating device(s). Status of the bus-tie breaker, if applicable
- Status of the capacitor breaker(s) if applicable.
- The ULTC tap position for the transformer.
- Common trip annunciation for any trips that open the HT interrupter, or HT disconnect switches or send a Transfer Trip (TT) if applicable.
- Breaker Fail annunciation for HT interrupter(s) or for the transformer secondary breakers if HT interrupters are installed.
- MW quantity & direction for the transformer.
- MVAR quantity & direction for the transformer.
- HT voltage if available.
- Three phase low tension (LT) bus voltage.



RAVEN
Engineering Inc.

Niagara Falls, ON.

DRAWING NOTES

1. REFERENCE DRAWING HARRIS CONTROLS DWG. # 573-1125-SC REV. 0.

3E

#	REVISIONS	DATE
X	x	X

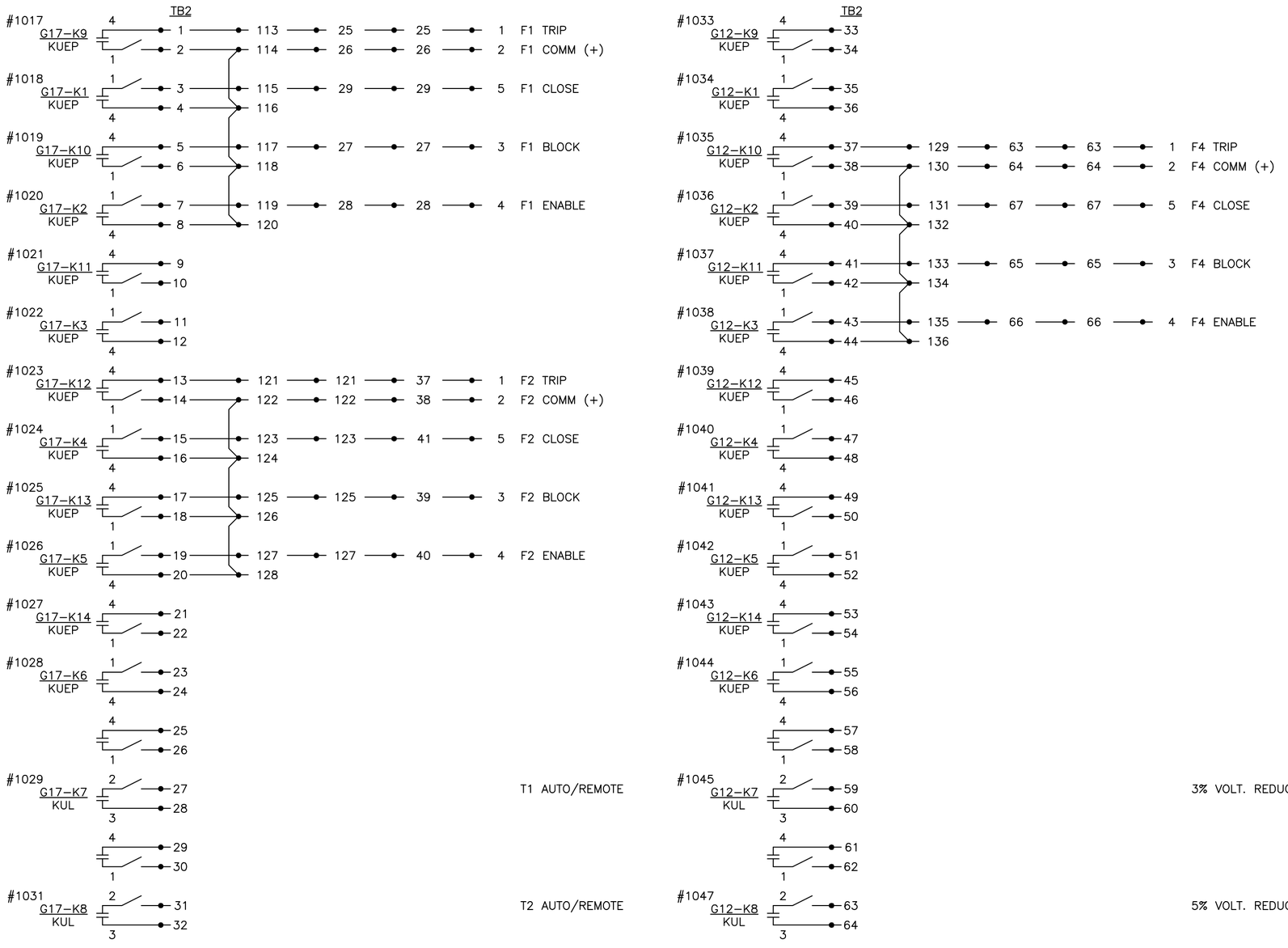
NIAGARA-ON-THE-LAKE HYDRO INC.

NIAGARA ON THE LAKE D.S.
SCADA DTU (HARRIS D20)
CONTROL OUTPUTS #1001-1016
ELEMENTARY WIRING DIAGRAM

Niagara On-The-Lake HYDRO
PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
L0S 1T0
PHONE: 905-468-4235
FAX: 905-468-3861

dwn	designed by ADD	cad use	
chkd			plot scale
date month/day/yr 15/8/07	design approved		dist. code
scale Not To Scale	authorized		electronic filename NOTLDS_3E_R0.DWG
w.o.			

dwg no	rev
NOTLDS_3E	0



RAVEN
Engineering Inc.

Niagara Falls, ON.

DRAWING NOTES

1. REFERENCE DRAWING HARRIS CONTROLS DWG. # 573-1125-SC REV. 0.

4E

#	REVISIONS	DATE
X	x	X

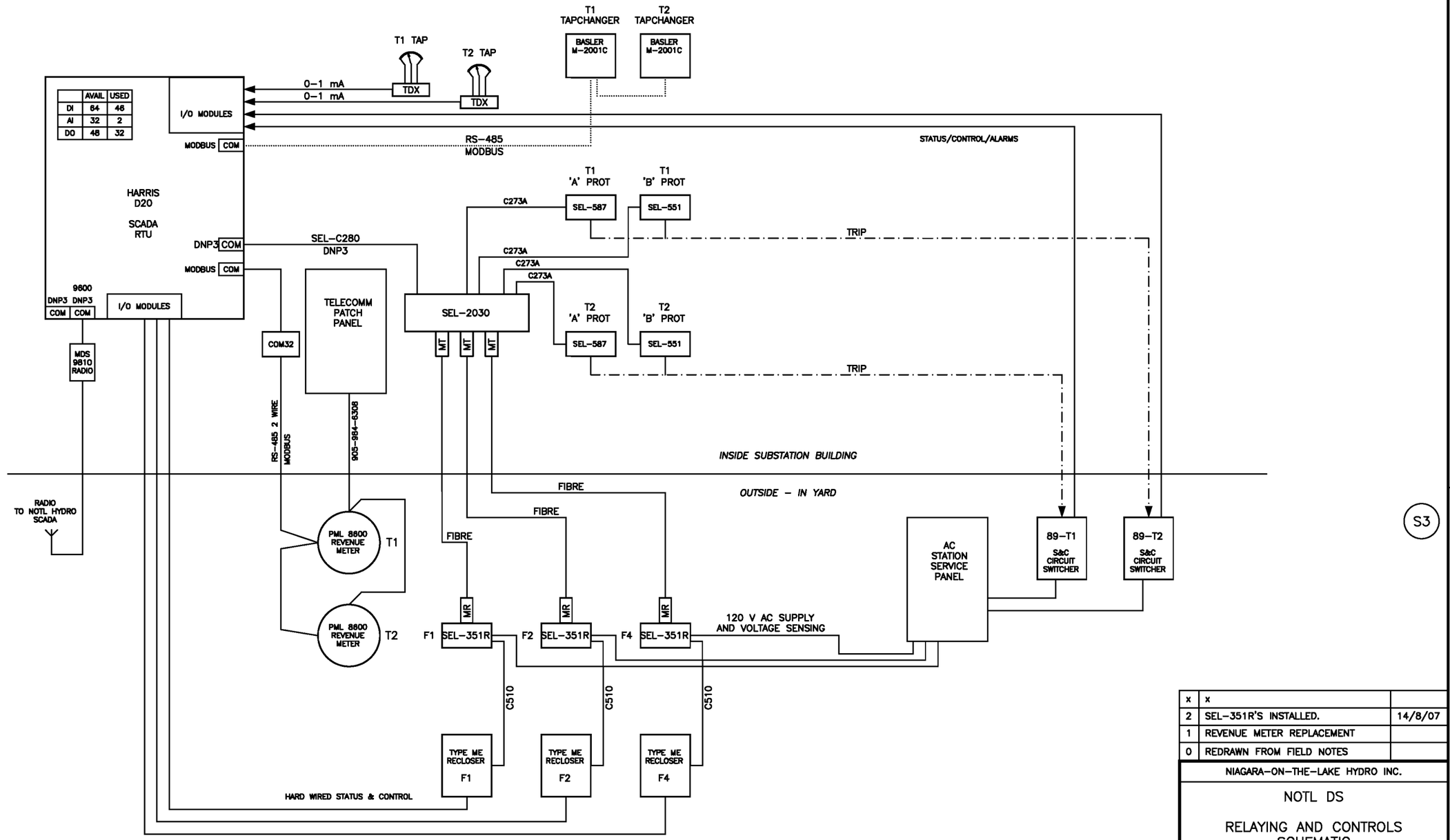
NIAGARA-ON-THE-LAKE HYDRO INC.

NIAGARA ON THE LAKE D.S.
SCADA DTU (HARRIS D20)
CONTROL OUTPUTS #1017-1048
ELEMENTARY WIRING DIAGRAM

Niagara On-The-Lake HYDRO
PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
LOS 1T0
PHONE: 905-468-4235
FAX: 905-468-3861

dwn	designed by ADD	cad use	
chkd			plot scale
date month/day/yr 15/8/07	design approved		dist. code
scale Not To Scale	authorized		electronic filename NOTLDS_4E_R0.DWG
w.o.			

dwg no NOTLDS_4E | rev 0



x	x	
2	SEL-351R'S INSTALLED.	14/8/07
1	REVENUE METER REPLACEMENT	
0	REDRAWN FROM FIELD NOTES	

NIAGARA-ON-THE-LAKE HYDRO INC.

NOTL DS

RELAYING AND CONTROLS SCHEMATIC

PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
L0S 1T0

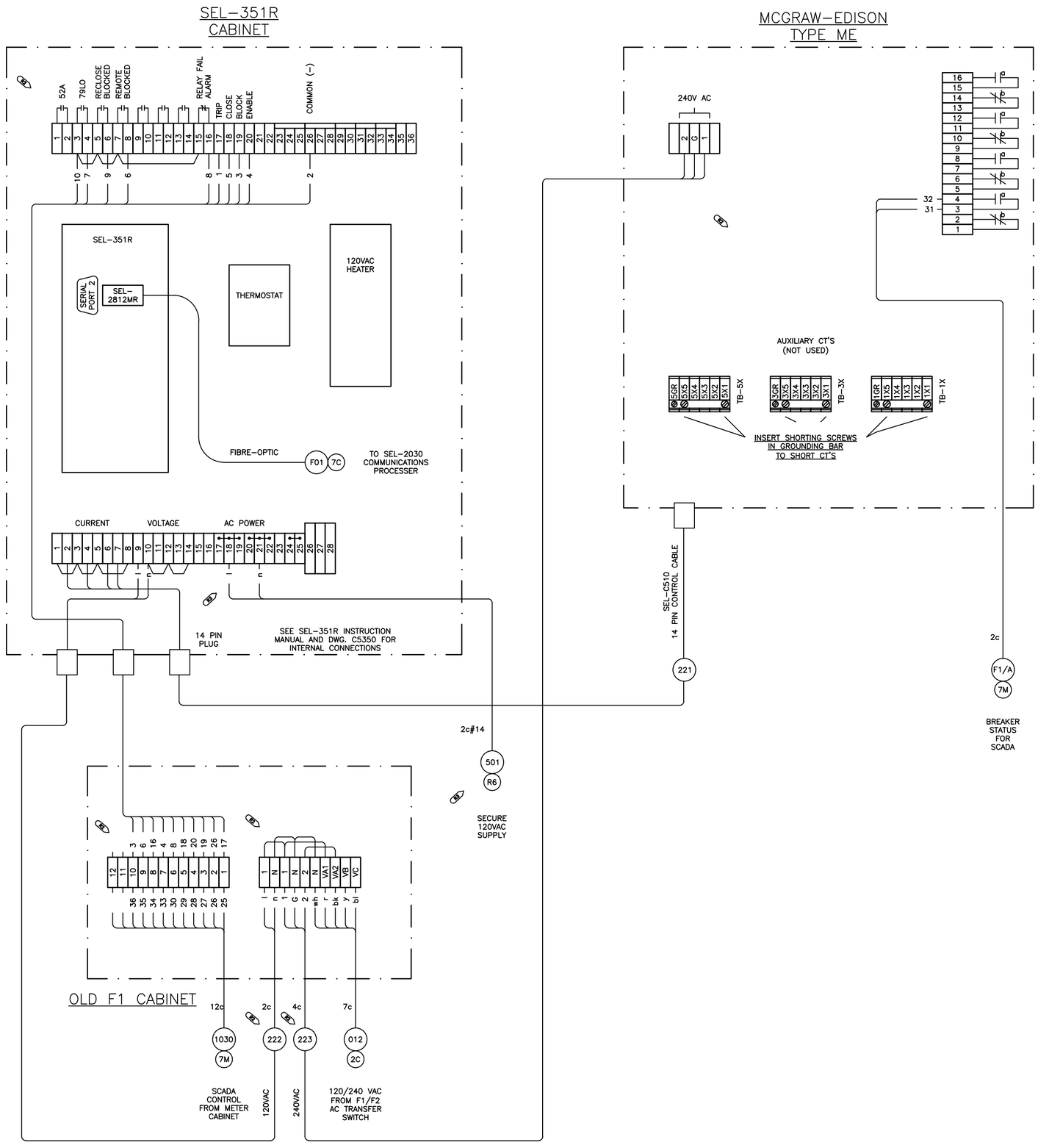
PHONE: 905-468-4235
FAX: 905-468-3861

dwn	designed by ADD	cad data	
chkd			
date month/day/yr 03/06/07	design approved		plot scale
			dist. code
scale Not To Scale	authorized		electronic filename NOTLDS_S3_R2.DWG
w.o.			
dwg no NOTLDS_S3			rev 2

Scada Point	AI	MASTER Point	RTU Scada Point	DNP Point	Description / Function	Scaling Comments	Master SCADA Mult.	Comments	Ratio	Scale	Offset	ICCP Object ID - H1	ICCP Object ID - IESO
AI001	1	NOTL_7001	01AI001	0	T1 Tap Position			Physical Pt.		0.000641	0	NOTL_7001	NOTL_7001
AI002	2	NOTL_7002	01AI002	1	T2 Tap Position			Physical Pt.		0.000641	0	NOTL_7002	NOTL_7002
AI003	3	NOTL_7003	01AI003	2				Physical Pt.					
AI004	4	NOTL_7004	01AI004	3				Physical Pt.					
AI005	5	NOTL_7005	01AI005	4				Physical Pt.					
AI006	6	NOTL_7006	01AI006	5				Physical Pt.					
AI007	7	NOTL_7007	01AI007	6				Physical Pt.					
AI008	8	NOTL_7008	01AI008	7				Physical Pt.					
AI009	9	NOTL_7009	01AI009	8				Physical Pt.					
AI010	10	NOTL_7010	01AI010	9				Physical Pt.					
AI011	11	NOTL_7011	01AI011	10				Physical Pt.					
AI012	12	NOTL_7012	01AI012	11				Physical Pt.					
AI013	13	NOTL_7013	01AI013	12				Physical Pt.					
AI014	14	NOTL_7014	01AI014	13				Physical Pt.					
AI015	15	NOTL_7015	01AI015	14				Physical Pt.					
AI016	16	NOTL_7016	01AI016	15				Physical Pt.					
AI017	17	NOTL_7017	01AI017	16				Physical Pt.					
AI018	18	NOTL_7018	01AI018	17				Physical Pt.					
AI019	19	NOTL_7019	01AI019	18				Physical Pt.					
AI020	20	NOTL_7020	01AI020	19				Physical Pt.					
AI021	21	NOTL_7021	01AI021	20				Physical Pt.					
AI022	22	NOTL_7022	01AI022	21				Physical Pt.					
AI023	23	NOTL_7023	01AI023	22				Physical Pt.					
AI024	24	NOTL_7024	01AI024	23				Physical Pt.					
AI025	25	NOTL_7025	01AI025	24				Physical Pt.					
AI026	26	NOTL_7026	01AI026	25				Physical Pt.					
AI027	27	NOTL_7027	01AI027	26				Physical Pt.					
AI028	28	NOTL_7028	01AI028	27				Physical Pt.					
AI029	29	NOTL_7029	01AI029	28				Physical Pt.					
AI030	30	NOTL_7030	01AI030	29				Physical Pt.					
AI031	31	NOTL_7031	01AI031	30				Physical Pt.					
AI032	32	NOTL_7032	01AI032	31				Physical Pt.					
AI033	33	NOTL_7033		32	T1 Voltage - R	2047=0V, 4095=150V		Modbus/Bitronics	16100/115	0.022106	-36.37307	NOTL_7033	NOTL_7033
AI034	34	NOTL_7034		33	T1 Voltage - W			Modbus/Bitronics	16100/115	0.022106	-36.37307	NOTL_7034	
AI035	35	NOTL_7035		34	T1 Voltage - B			Modbus/Bitronics	16100/115	0.022106	-36.37307	NOTL_7035	
AI036	36	NOTL_7036		35	T1 Current - R	2047=0A, 4095=10A		Modbus/Bitronics	400/5	0.048852	-800		
AI037	37	NOTL_7037		36	T1 Current - W			Modbus/Bitronics	400/5	0.048852	-800		
AI038	38	NOTL_7038		37	T1 Current - B			Modbus/Bitronics	400/5	0.048852	-800		
AI039	39	NOTL_7039		38	T1 Watts	0=-3kW, 2047=0W,		Modbus/Bitronics		0.002052	-33.6	NOTL_7039	NOTL_7039
AI040	40	NOTL_7040		39	T1 VARs	4095=+3kW		Modbus/Bitronics		0.002052	-33.6	NOTL_7040	NOTL_7040
AI041	41	NOTL_7041		40	T2 Voltage - R	2047=0V, 4095=150V		Modbus/Bitronics	16100/115	0.022106	-36.37307	NOTL_7041	NOTL_7041
AI042	42	NOTL_7042		41	T2 Voltage - W			Modbus/Bitronics	16100/115	0.022106	-36.37307	NOTL_7042	
AI043	43	NOTL_7043		42	T2 Voltage - B			Modbus/Bitronics	16100/115	0.022106	-36.37307	NOTL_7043	
AI044	44	NOTL_7044		43	T2 Current - R	2047=0A, 4095=10A		Modbus/Bitronics	400/5	0.048852	-800		
AI045	45	NOTL_7045		44	T2 Current - W			Modbus/Bitronics	400/5	0.048852	-800		
AI046	46	NOTL_7046		45	T2 Current - B			Modbus/Bitronics	400/5	0.048852	-800		
AI047	47	NOTL_7047		46	T2 Watts	0=-3kW, 2047=0W,		Modbus/Bitronics		0.002052	-33.6	NOTL_7047	NOTL_7047
AI048	48	NOTL_7048		47	T2 VARs	4095=+3kW		Modbus/Bitronics		0.002052	-33.6	NOTL_7048	NOTL_7048
						Device	Scaling	Protocol	Port	Region	Address	Data Type	Notes

Scada Point	AI	MASTER Point	RTU Scada Point	DNP Point	Description / Function	Scaling Comments	Master SCADA Mult.	Comments	Ratio	Scale	Offset	ICCP Object ID - H1	ICCP Object ID - IESO
AI049	49	NOTL_7049		48	F1 Amps - R	SEL-2030	1	DNP 3.0	16	User	F800h	16 bit signed Integer	re-use old Modbus point
AI050	50	NOTL_7050		49	F1 Amps - W	SEL-2030	1	DNP 3.0	16	User	F801h	16 bit signed Integer	re-use old Modbus point
AI051	51	NOTL_7051		50	F1 Amps - B	SEL-2030	1	DNP 3.0	16	User	F802h	16 bit signed Integer	re-use old Modbus point
AI052	52	NOTL_7052		51	F1 Relay Voltage	SEL-2030	volts/100	DNP 3.0	16	User	F803h	16 bit signed Integer	re-use old Modbus point
AI053	53	NOTL_7053		52	F2 Amps - R	SEL-2030	1	DNP 3.0	16	User	F805h	16 bit signed Integer	re-use old Modbus point
AI054	54	NOTL_7054		53	F2 Amps - W	SEL-2030	1	DNP 3.0	16	User	F806h	16 bit signed Integer	re-use old Modbus point
AI055	55	NOTL_7055		54	F2 Amps - B	SEL-2030	1	DNP 3.0	16	User	F807h	16 bit signed Integer	re-use old Modbus point
AI056	56	NOTL_7056		55	F2 Relay Voltage	SEL-2030	volts/100	DNP 3.0	16	User	F808h	16 bit signed Integer	re-use old Modbus point
AI057	57	NOTL_7057		56	F4 Amps - R	SEL-2030	1	DNP 3.0	16	User	F80Ah	16 bit signed Integer	re-use old Modbus point
AI058	58	NOTL_7058		57	F4 Amps - W	SEL-2030	1	DNP 3.0	16	User	F80Bh	16 bit signed Integer	re-use old Modbus point
AI059	59	NOTL_7059		58	F4 Amps - B	SEL-2030	1	DNP 3.0	16	User	F80Ch	16 bit signed Integer	re-use old Modbus point
AI060	60	NOTL_7060		59	F4 Relay Voltage	SEL-2030	volts/100	DNP 3.0	16	User	F80Dh	16 bit signed Integer	re-use old Modbus point
AI061	61	NOTL_7061		60									
AI062	62	NOTL_7062		61									
AI063	63	NOTL_7063		62									
AI064	64	NOTL_7064		63									
AI065									IED	Object	Point	ScanTag	
AI066	65	NOTL_7065		64	T1 Tapchanger Secondary Voltage			DNP3.0	1	30	0	304	
AI067	66	NOTL_7066		65	T1 Tapchanger Primary Voltage			DNP3.0	1	30	1	305	
AI068	67	NOTL_7067		66	T1 Tapchanger Load Amps			DNP3.0	1	30	2	306	
AI069	68	NOTL_7068		67	T1 Min Voltage Volts			DNP3.0	1	30	3	352	
AI070	69	NOTL_7069		68	T1 Min Voltage Sec			DNP3.0	1	30	4	353	
AI071	70	NOTL_7070		69	T1 Min Voltage Min			DNP3.0	1	30	5	354	
AI072	71	NOTL_7071		70	T1 Min Voltage Hour			DNP3.0	1	30	6	355	
AI073	72	NOTL_7072		71	T1 Min Voltage Day			DNP3.0	1	30	7	356	
AI074	73	NOTL_7073		72	T1 Min Voltage Month			DNP3.0	1	30	8	357	
AI075	74	NOTL_7074		73	T1 Min Voltage Year			DNP3.0	1	30	9	358	
AI076	75	NOTL_7075		74	T1 Max Voltage Volts			DNP3.0	1	30	10	359	
AI077	76	NOTL_7076		75	T1 Max Voltage Sec			DNP3.0	1	30	11	360	
AI078	77	NOTL_7077		76	T1 Max Voltage Min			DNP3.0	1	30	12	361	
AI079	78	NOTL_7078		77	T1 Max Voltage Hour			DNP3.0	1	30	13	362	
AI080	79	NOTL_7079		78	T1 Max Voltage Day			DNP3.0	1	30	14	363	
AI081	80	NOTL_7080		79	T1 Max Voltage Month			DNP3.0	1	30	15	364	
AI082	81	NOTL_7081		80	T1 Max Voltage Year			DNP3.0	1	30	16	365	
AI083	82	NOTL_7082		81									
AI084	83	NOTL_7083		82									
AI085	84	NOTL_7084		83									
AI086	85	NOTL_7085		84	T1 Tapchanger Secondary Voltage			DNP3.0	2	30	0	304	
AI087	86	NOTL_7086		85	T1 Tapchanger Primary Voltage			DNP3.0	2	30	1	305	
AI088	87	NOTL_7087		86	T1 Tapchanger Load Amps			DNP3.0	2	30	2	306	
AI089	88	NOTL_7088		87	T1 Min Voltage Volts			DNP3.0	2	30	3	352	
AI090	89	NOTL_7089		88	T1 Min Voltage Sec			DNP3.0	2	30	4	353	
AI091	90	NOTL_7090		89	T1 Min Voltage Min			DNP3.0	2	30	5	354	
AI092	91	NOTL_7091		90	T1 Min Voltage Hour			DNP3.0	2	30	6	355	
AI093	92	NOTL_7092		91	T1 Min Voltage Day			DNP3.0	2	30	7	356	
AI094	93	NOTL_7093		92	T1 Min Voltage Month			DNP3.0	2	30	8	357	
AI095	94	NOTL_7094		93	T1 Min Voltage Year			DNP3.0	2	30	9	358	
AI096	95	NOTL_7095		94	T1 Max Voltage Volts			DNP3.0	2	30	10	359	
AI097	96	NOTL_7096		95	T1 Max Voltage Sec			DNP3.0	2	30	11	360	

Scada Point	AI	MASTER Point	RTU Scada Point	DNP Point	Description / Function	Scaling Comments	Master SCADA Mult.	Comments	Ratio	Scale	Offset	ICCP Object ID - H1	ICCP Object ID - IESO
AI098	97	NOTL_7097		96	T1 Max Voltage Min			DNP3.0	2	30	12	361	
AI099	98	NOTL_7098		97	T1 Max Voltage Hour			DNP3.0	2	30	13	362	
AI100	99	NOTL_7099		98	T1 Max Voltage Day			DNP3.0	2	30	14	363	
AI101	100	NOTL_7100		99	T1 Max Voltage Month			DNP3.0	2	30	15	364	
AI102	101	NOTL_7101		100	T1 Max Voltage Year			DNP3.0	2	30	16	365	
AI103	102	NOTL_7102		101									
AI104	103	NOTL_7103		102									
AI105	104	NOTL_7104		103									



DRAWING NOTES

1. SHORT CT'S IN ME CABINET BEFORE REMOVING CT CABLE "CTA" TO TRANSDUCERS AND DEMAND AMMETERS.
2. MOUNT SEL-2812xR FIBRE OPTIC TRANSCEIVER INSIDE SEL-351R CABINET AND CONNECT TO COMM PORT 2 OF SEL-351R.
3. MAINTAIN ADEQUATE BENDING RADIUS WHEN INSTALLING FIBRE-OPTIC CABLE.
4. "CAUTION" – DO NOT DISCONNECT RECLOSER CONTROL CABLES WITH RECLOSER IN-SERVICE. HAZARDOUS VOLTAGES MAY RESULT FROM OPEN CIRCUIT CURRENT TRANSFORMERS.
5. CONTROL IS AVAILABLE VIA SEL-2030 OVER COMMUNICATIONS CIRCUIT BUT IS NOT USED. CONTROLS AND SOME STATUS ARE HARD-WIRED.

RAVEN
Engineering Inc.

Niagara Falls, ON.

8C

#	REVISIONS	M/D/Y
3	ADDED SECURE AC SUPPLY TO RELAY	10/7/10
2	AS BUILT	8/14/07
1	ISSUED FOR CONSTRUCTION	06.06.07

NIAGARA-ON-THE-LAKE HYDRO INC.

NIAGARA ON THE LAKE D.S.
F1 RECLOSER
SEL-351R CONTROL
CONNECTION WIRING DIAGRAM

Niagara On-The-Lake HYDRO
PO BOX 460
8 HENEGAN RD
VIRGIL, ONTARIO
L0S 1T0
PHONE: 905-468-4235
FAX: 905-468-3861

dwn	designed by ADD	cad use	
chkd			
date month/day/yr 07/19/06	design approved		plot scale
			dist. code
scale Not To Scale	authorized		electronic filename NOTLDS_8C_R3.DWG
w.o.			

dwg no	rev
NOTLDS_8C	3

CLOSED

SPRINGS CHARGED

ELECTRONIC CONTROL
MUST USE
TYPE MDL-2.5 FUSE ONLY.

USE
FORM 3 OR 3A
ELECTRONIC CONTROL
ONLY

AUTOMATIC RECLOSER TYPE "VSO"
SERIAL NO. 313 DATE 1-74
MAX. VOLT. 38.0 KV B.I.L. 150 KV
MAX. CONT. CURRENT 560 AMP.
MAX. INTER. CURRENT 12,000 AMP.
McGRAW-EDISON
NON-PCB FLUID

SPRING CHARGING MOTOR

NO BATTERY CHARGER
IN THIS RECLOSER.
USE WITH FORM 3A,
OR CONTROL CONTAINING
POTENTIAL BATTERY CHARGER.

Specification for Soil Resistivity Test, the Ground Grid Resistance Test and the Driving-Point Impedance Test

Owner (Local Distribution Company):	Niagara-on-the-Lake Hydro Inc.
Station:	NOTL MTS No.2
Location:	Concession 5 Road, Niagara-on-the-Lake, Ontario Latitude: 43°11'1.00" N Longitude: 79° 7'19.82" W

Specifications for;

1. Soil Resistivity Test
2. Ground Grid Resistance Test
3. Driving-Point Impedance Test of the Distribution System Neutral

1. Soil Resistivity Test

Perform the Soil Resistivity Test at an adjacent area to the NOTL MTS No.2 were the soil conditions are expected to similar to the station.

Perform the Soil Resistivity Test using the Wenner method, as applicable for resistivity measurements for ground grid system design.

Perform the Wenner Soil Resistivity Test Method in accordance to ANSI, IEEE Standards.

The overall total Wenner test survey line length = 1000m [Wenner probe spacing a = 333m, which corresponds to a distance of 3·a = 3 · (333m) = 1000m between the two current probes]

The test probes located in a line, connected to Terminals C1 (Current Probe), C2 (Current Probe), P1 (Potential Probe) and P2 (Potential Probe) of a ground test meter and separated by equal distances. The overall total Wenner test survey line length = 1000m. Measurements repeated with the probe spacing increased through 1, 2, 5, 10, 20, 50, 100, 150, 200, 250, 300 and 333m.

The apparent resistivity value calculated and entered into a software model. The software establishes the best fitting curve to the measured data, to determine the multi-layer (two layer, three layer, four layer, etc.) soil resistivity model.

Determine the soil resistivity of each layer of the multi-layer (two layer, three layer, four layer, etc.) soil resistivity model.

Also, determine the soil resistivity of each layer for a ‘pseudo’ (simulated) two layer soil resistivity model.

Provide formal report, perform by, reviewed by and stamped & signed by a Profession Engineer of Ontario.

Provide a formal report including the following;

- Conclusions and Recommendations
- Description of Test Method
- Tabulated Test Results
- Graphed Modelled Results
- Soil Resistivity Values for each layer of the multi-layer soil resistivity model
- Soil Resistivity Values for each layer of the ‘pseudo’ (simulated) two layer soil resistivity model
- Test Survey Line and Location Diagram or Figure
- References

2. Ground Grid Resistance Test

Perform the Ground Grid Resistance Test in accordance with the NETA ATS, Section 7.13, Grounding System (attached);

Perform fall-of-potential test in accordance with ANSI/IEEE Standards.

Provide formal report, perform by, reviewed by and stamped & signed by a Profession Engineer of Ontario.

Provide a formal report including the following;

- Conclusions and Recommendations
- Description of Test Method
- Tabulated Test Results
- Graphed Results
- Ground Grid Resistance Value
- Test Survey Line and Location Diagram or Figure
- References

3. Driving-Point Impedance Test of the Distribution System Neutral

Driving-Point Impedance Test of the Distribution System Neutral (Current Injection Test Method)

Perform the Driving-Point Impedance Test of the Distribution System Neutral (Current Injection Test Method) using a modified fall-of-potential method, to measure the overall Distribution System Neutral impedance.

Perform a modified fall-of-potential test in accordance with ANSI/IEEE Standards applicable for Driving-Point Impedance Test (Current Injection Test Method).

The Testing Method and Testing System capable of injecting very low range currents, and capable of precise and accurate measurement of the very low range current magnitude and phase angles and the precise and accurate measurement of the resultant potential magnitude and phase angles.

Require to perform the Driving-Point Impedance Test (Current Injection Test Method) by injecting very low range currents with a frequency that is 'off' from the fundamental 60Hz power system frequency of the Electrical Power System, in order to avoid interference from the existing 60Hz noise. The injected current signals and resulting measured potentials require to be digitized at the 'off' test frequency and their magnitudes and phase angles determined using Fourier transformation.

Use arbitrary placement of a current probe (C2) and potential probe (P2) in opposite directions if possible.

Using the information obtained from the soil resistivity test, apply the appropriate proximity corrections (between P2 and C2) to the measurements.

Require to repeat the test at several P2 locations and the proximity corrected values averaged to find the neutral driving point impedance.

Provide formal report, perform by, reviewed by and stamped & signed by a Profession Engineer of Ontario.

Provide a formal report including the following;

- Conclusions and Recommendations
- Description of Test Method
- Tabulated Test Results
- Distribution System Neutral, Driving-Point Impedance Value
- Test Survey Line, Points and Location Diagram or Figure
- References

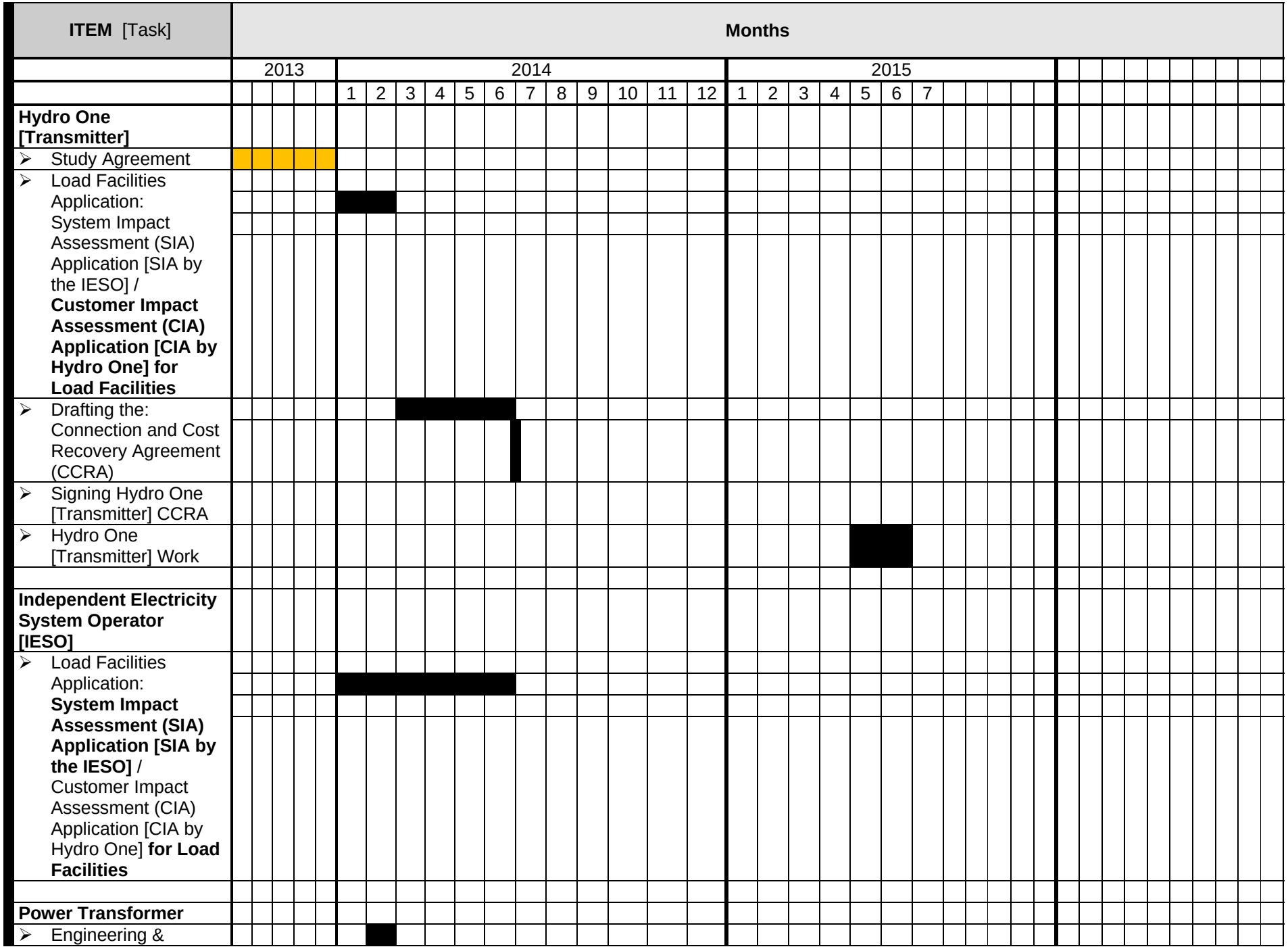
NIAGARA-ON-THE-LAKE HYDRO INC.

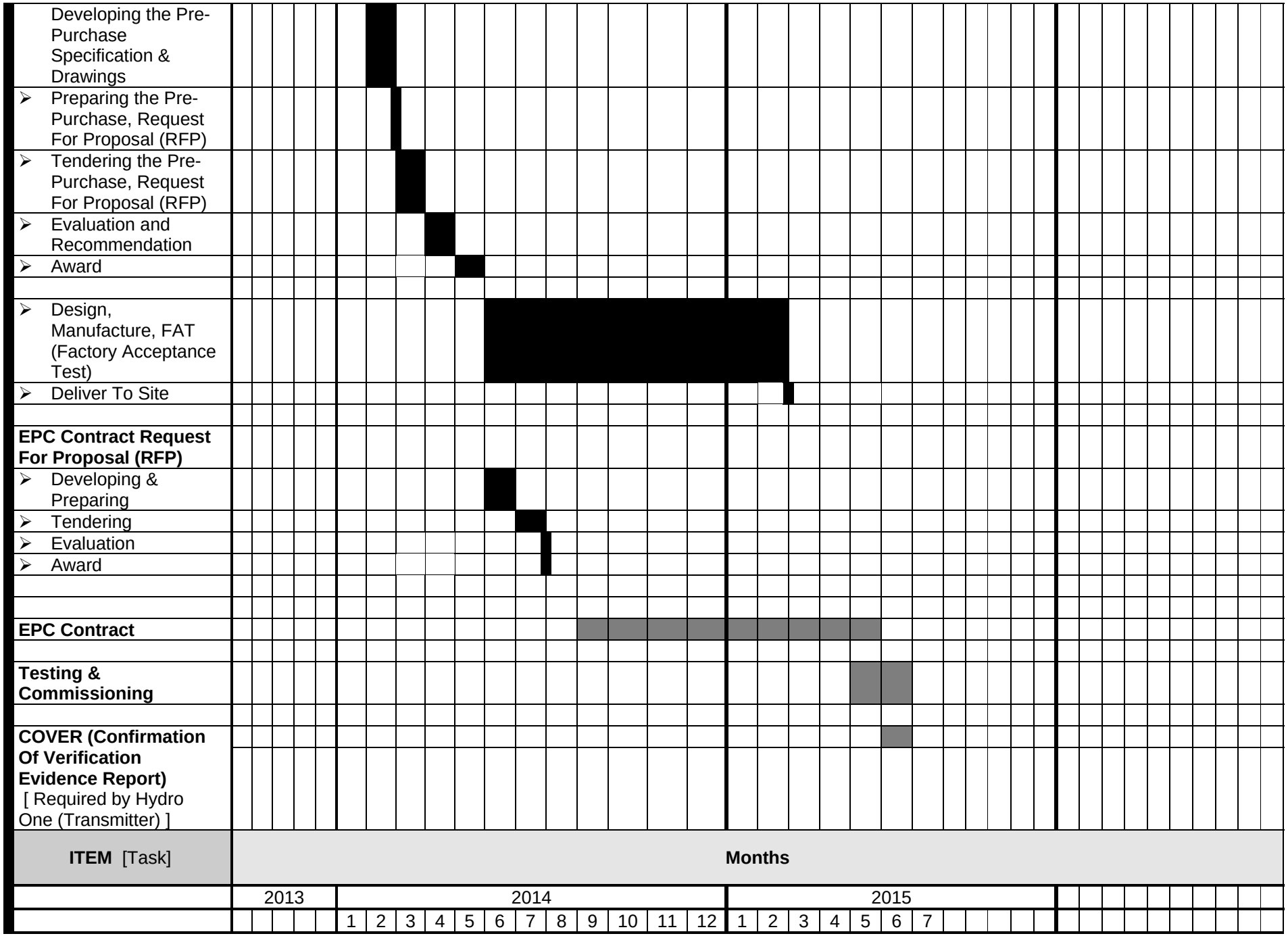
APPENDIX I

Project Schedule

Niagara-On-The-Lake Hydro [NOTL Hydro]

Power Transformer Replacement/Upgrade Project Schedule for Niagara-On-The-Lake MTS No.2 [NOTL MTS No.2] - '*Preliminary*'




Developing the Pre-Purchase Specification & Drawings
Preparing the Pre-Purchase, Request For Proposal (RFP)
Tendering the Pre-Purchase, Request For Proposal (RFP)
Evaluation and Recommendation
Award
Design, Manufacture, FAT (Factory Acceptance Test)
Deliver To Site
EPC Contract Request For Proposal (RFP)
Developing & Preparing
Tendering
Evaluation
Award
EPC Contract
Testing & Commissioning
COVER (Confirmation Of Verification Evidence Report) [Required by Hydro One (Transmitter)]
ITEM [Task]
Months
2013
2014
2015
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2014

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2013-0155

RESIDENTIAL SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less where the electricity is used exclusively in a separately metered living accommodation. Customers shall be residing in single-dwelling units that consist of a detached house or one unit of a semi-detached, duplex, triplex or quadruplex house, with a residential zoning. Separately metered dwellings within a town house complex or apartment building also qualify as residential customers. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES – Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	17.94
Rate Rider for Recovery of Stranded Meter Assets – effective until April 30, 2015	$	0.48
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0126
Rate Rider for Disposition of Deferral/Variance Accounts (2014) - effective until April 30, 2015	$/kWh	(0.0012)
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015		
Applicable only for Non-RPP Customers	$/kWh	(0.0021)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0072
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural and Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 1, 2014

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EB-2013-0155

GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION

This classification applies to a non-residential account taking electricity at 750 volts or less whose monthly average peak demand is less than, or is forecast to be less than, 50 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	37.28
Rate Rider for Recovery of Stranded Meter Assets– effective until April 30, 2015	$	3.34
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0112
Rate Rider for Disposition of Deferral/Variance Accounts (2014) - effective until April 30, 2015	$/kWh	(0.0027)
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015		
Applicable only for Non-RPP Customers	$/kWh	(0.0021)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0066
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural and Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 1, 2014

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EB-2013-0155

GENERAL SERVICE 50 TO 4,999 KW SERVICE CLASSIFICATION

This classification applies to a non-residential account whose monthly average peak demand is equal to or greater than, or is forecast to be equal to or greater than 50 kW but less than 5,000 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	266.42
Distribution Volumetric Rate	$/kW	2.1025
Rate Rider for Disposition of Deferral/Variance Accounts (2014) - effective until April 30, 2015	$/kW	(1.6736)
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015		
Applicable only for Non-RPP Customers	$/kW	(0.8249)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3801)
Retail Transmission Rate - Network Service Rate	$/kW	2.6853
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.4602
Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.9023
Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Metered	$/kW	1.1068

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural and Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 1, 2014

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EB-2013-0155

UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less whose average monthly maximum demand is less than, or is forecast to be less than, 50 kW and the consumption is unmetered. Such connections include cable TV power packs, bus shelters, telephone booths, traffic lights, railway crossings, etc. The level of the consumption will be agreed to by the distributor and the customer, based on detailed manufacturer information/ documentation with regard to electrical consumption of the unmetered load or periodic monitoring of actual consumption. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES – Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per customer)	$	20.05
Distribution Volumetric Rate	$/kWh	0.0060
Rate Rider for Disposition of Deferral/Variance Accounts (2014) - effective until April 30, 2015	$/kWh	(0.0013)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0066
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural and Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 1, 2014

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STREET LIGHTING SERVICE CLASSIFICATION

This classification applies to an account for roadway lighting with a Municipality, Regional Municipality, Ministry of Transportation and private roadway lighting operation, controlled by photo cells. The consumption for these customers will be based on the calculated connected load times the required lighting times established by an approved OEB process. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per connection)	$	7.42
Distribution Volumetric Rate	$/kW	29.0338
Rate Rider for Disposition of Deferral/Variance Accounts (2014) - effective until April 30, 2015	$/kW	(1.3699)
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015		
Applicable only for Non-RPP Customers	$/kW	(0.7620)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3511)
Retail Transmission Rate - Network Service Rate	$/kW	2.0249
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.3558

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural and Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 1, 2014

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EB-2013-0155

MICROFIT SERVICE CLASSIFICATION

This classification applies to an electricity generation facility contracted under the Ontario Power Authority's microFIT program and connected to the distributor's distribution system. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

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It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	5.40

ALLOWANCES

Transformer Allowance for Ownership - per kW of billing demand/month	$/kW	(0.56)
Primary Metering Allowance for transformer losses – applied to measured demand and energy	%	(1.00)

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 1, 2014

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EB-2013-0155

SPECIFIC SERVICE CHARGES

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, charges for the Ministry of Energy Conservation and Renewable Energy Program, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

Customer Administration

Arrears certificate	$	15.00
Statement of Account	$	15.00
Pulling Post Dated Cheques	$	15.00
Duplicate Invoices for previous billing	$	15.00
Request for other billing information	$	15.00
Easement Letter	$	15.00
Account History	$	15.00
Credit check (plus credit agency costs)	$	15.00
Returned cheque charge (plus bank charges)	$	15.00
Charge to certify cheque	$	15.00
Account set up charge/change of occupancy charge (plus credit agency costs if applicable)	$	30.00
Special meter reads	$	30.00
Meter dispute charge plus Measurement Canada fees (if meter found correct)	$	30.00

Non-Payment of Account

Late Payment – per month	%	1.50
Late Payment – per annum	%	19.56
Collection of account charge – no disconnection	$	30.00
Disconnect/Reconnect at meter – during regular hours	$	65.00
Disconnect/Reconnect at meter – after regular hours	$	185.00
Disconnect/Reconnect at pole – during regular hours	$	185.00
Disconnect/Reconnect at pole – after regular hours	$	415.00

Service Call – Customer-owned Equipment – During Regular Hours	$	30.00
Service Call – Customer-owned Equipment – After Regular Hours	$	165.00
Install/Remove load control device – during regular hours	$	65.00
Install/Remove load control device – after regular hours	$	185.00
Temporary service install & remove – overhead – no transformer	$	500.00
Temporary Service Install & Remove – Underground – No Transformer	$	300.00
Temporary Service Install & Remove – Overhead – With Transformer	$	1,000.00
Specific Charge for Bell Canada Access to the Power Poles – per pole/year	$	18.36
Specific Charge for Access to the Power Poles - per pole/year	$	22.35

Note: Specific Charge for Bell Canada Access to the Power Poles is valid only until the existing joint-use agreement is terminated

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 1, 2014

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EB-2013-0155

RETAIL SERVICE CHARGES (if applicable)

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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Retail Service Charges refer to services provided by a distributor to retailers or customers related to the supply of competitive electricity.

One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	100.00
Monthly Fixed Charge, per retailer	$	20.00
Monthly Variable Charge, per customer, per retailer	$/cust.	0.50
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.30
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.30)
Service Transaction Requests (STR)		
Request fee, per request, applied to the requesting party	$	0.25
Processing fee, per request, applied to the requesting party	$	0.50
Request for customer information as outlined in Section 10.6.3 and Chapter 11 of the Retail Settlement Code directly to retailers and customers, if not delivered electronically through the Electronic Business Transaction (EBT) system, applied to the requesting party		
Up to twice a year	$	no charge
More than twice a year, per request (plus incremental delivery costs)	$	2.00

LOSS FACTORS

If the distributor is not capable of prorating changed loss factors jointly with distribution rates, the revised loss factors will be implemented upon the first subsequent billing for each billing cycle.

Total Loss Factor – Secondary Metered Customer < 5,000 kW	1.0379
Total Loss Factor – Primary Metered Customer < 5,000 kW	1.0275

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

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EB-2014-0097

RESIDENTIAL SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less where the electricity is used exclusively in a separately metered living accommodation. Customers shall be residing in single-dwelling units that consist of a detached house or one unit of a semi-detached, duplex, triplex or quadruplex house, with a residential zoning. Separately metered dwellings within a town house complex or apartment building also qualify as residential customers. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	18.19
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0128
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kWh	0.0007
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kWh	0.0002
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kWh	(0.0065)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0076
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION

This classification applies to a non-residential account taking electricity at 750 volts or less whose monthly average peak demand is less than, or is forecast to be less than, 50 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	37.80
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0114
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kWh	0.0007
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kWh	0.0002
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kWh	(0.0065)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0070
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

GENERAL SERVICE 50 TO 4,999 KW SERVICE CLASSIFICATION

This classification applies to a non-residential account whose monthly average peak demand is equal to or greater than, or is forecast to be equal to or greater than 50 kW but less than 5,000 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	270.15
Distribution Volumetric Rate	$/kW	2.1319
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3801)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kW	0.4356
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kW	0.0619
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kW	(2.6463)
Retail Transmission Rate - Network Service Rate	$/kW	2.8486
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.4714
Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	3.0788
Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Metered	$/kW	1.1337

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less whose average monthly maximum demand is less than, or is forecast to be less than, 50 kW and the consumption is unmetered. Such connections include cable TV power packs, bus shelters, telephone booths, traffic lights, railway crossings, etc. The level of the consumption will be agreed to by the distributor and the customer, based on detailed manufacturer information/ documentation with regard to electrical consumption of the unmetered load or periodic monitoring of actual consumption. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

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It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per customer)	$	20.33
Distribution Volumetric Rate	$/kWh	0.0061
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kWh	0.0007
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kWh	0.0011
Retail Transmission Rate - Network Service Rate	$/kWh	0.0070
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

STREET LIGHTING SERVICE CLASSIFICATION

This classification applies to an account for roadway lighting with a Municipality, Regional Municipality, Ministry of Transportation and private roadway lighting operation, controlled by photo cells. The consumption for these customers will be based on the calculated connected load times the required lighting times established by an approved OEB process. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per connection)	$	7.52
Distribution Volumetric Rate	$/kW	29.4403
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3511)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kW	0.1881
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kW	0.0573
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kW	(2.4157)
Retail Transmission Rate - Network Service Rate	$/kW	2.1480
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.3645

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

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EB-2014-0097

MICROFIT SERVICE CLASSIFICATION

This classification applies to an electricity generation facility contracted under the Ontario Power Authority's microFIT program and connected to the distributor's distribution system. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	5.40

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
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ALLOWANCES

Transformer Allowance for Ownership - per kW of billing demand/month	$/kW	(0.56)
Primary Metering Allowance for transformer losses – applied to measured demand and energy	%	(1.00)

SPECIFIC SERVICE CHARGES

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Customer Administration

Arrears certificate	$	15.00
Statement of Account	$	15.00
Pulling Post Dated Cheques	$	15.00
Duplicate Invoices for previous billing	$	15.00
Request for other billing information	$	15.00
Easement Letter	$	15.00
Account History	$	15.00
Credit check (plus credit agency costs)	$	15.00
Returned cheque (plus bank charges)	$	15.00
Charge to certify cheque	$	15.00
Account set up charge/change of occupancy charge (plus credit agency costs if applicable)	$	30.00
Special meter reads	$	30.00
Meter dispute charge plus Measurement Canada fees (if meter found correct)	$	30.00

Non-Payment of Account

Late Payment – per month	%	1.5000
Late Payment – per annum	%	19.5600
Collection of account charge – no disconnection	$	30.00
Disconnect/Reconnect at meter – during regular hours	$	65.00
Disconnect/Reconnect at meter – after regular hours	$	185.00
Disconnect/Reconnect at pole – during regular hours	$	185.00
Disconnect/Reconnect at pole – after regular hours	$	415.00
Service Call – Customer-owned Equipment – During Regular Hours	$	30.00
Service Call – Customer-owned Equipment – After Regular Hours	$	165.00
Install/Remove load control device – during regular hours	$	65.00
Install/Remove load control device – after regular hours	$	185.00
Temporary service install & remove – overhead – no transformer	$	500.00
Temporary Service – Install & remove – underground – no transformer	$	300.00
Temporary Service Install & Remove – Overhead – With Transformer	$	1,000.00
Specific Charge for Access to the Power Poles - $/pole/year	$	22.35

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

Specific Charge for Bell Canada Access to the Power Poles – per pole/year	$	18.36

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

RETAIL SERVICE CHARGES (if applicable)

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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Retail Service Charges refer to services provided by a distributor to retailers or customers related to the supply of competitive electricity.

One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	100.00
Monthly Fixed Charge, per retailer	$	20.00
Monthly Variable Charge, per customer, per retailer	$/cust.	0.50
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.30
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.30)
Service Transaction Requests (STR)		
Request fee, per request, applied to the requesting party	$	0.25
Processing fee, per request, applied to the requesting party	$	0.50
Request for customer information as outlined in Section 10.6.3 and Chapter 11 of the Retail Settlement Code directly to retailers and customers, if not delivered electronically through the Electronic Business Transaction (EBT) system, applied to the requesting party		
Up to twice a year	$	no charge
More than twice a year, per request (plus incremental delivery costs)	$	2.00

LOSS FACTORS

If the distributor is not capable of prorating changed loss factors jointly with distribution rates, the revised loss factors will be implemented upon the first subsequent billing for each billing cycle.

Total Loss Factor – Secondary Metered Customer < 5,000 kW	1.0379
Total Loss Factor – Primary Metered Customer < 5,000 kW	1.0275

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Version 1.1

Utility Name	Niagara-on-the-Lake Hydro Inc.
Service Territory	Niagara-on-the-Lake
Assigned EB Number	EB-2014-0097
Name of Contact and Title	Philip Wormwell, Director of Corporate Services
Phone Number	905-468-4235 ext. 380
Email Address	pwormwell@notlhydro.com
We are applying for rates effective	Friday, May 01, 2015
Rate-Setting Method	**Price Cap IR**
Please indicate in which Rate Year the Group 1 accounts were last cleared[1]	**2014**
Please indicate the last Cost of Service Re-Basing Year	**2014**

Notes

Pale green cells represent input cells.

Pale blue cells represent drop-down lists. The applicant should select the appropriate item from the drop-down list.

White cells contain fixed values, automatically generated values or formulae.

Note:
1. Rate year of application

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

- Ontario Energy Board's 2015 Electricity Distribution Rates Webpage
- An updated version of Chapter 3 of the Filing Requirements for Electricity Distribution Rate Applications for 2015 rates.

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Select the appropriate rate classes as they appear on your most recent Board-Approved Tariff of Rates and Charges, including the MicroFit Class.

How many classes are on your most recent Board-Approved Tariff of Rates and Charges? **6**

Select Your Rate Classes from the **Blue Cells** below. Please ensure that a rate class is assigned to **each shaded cell.**

	Rate Class Classification
1	RESIDENTIAL
2	GENERAL SERVICE LESS THAN 50 KW
3	GENERAL SERVICE 50 TO 4,999 KW
4	UNMETERED SCATTERED LOAD
5	STREET LIGHTING
6	microFIT

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

For each class, Applicants are required to copy and paste the class descriptions (located directly under the class name) and the description of the applicability of those rates (description is found under the class name and directly under the word "APPLICATION"). By using the drop-down lists located under the column labeled "Rate Description", please select the descriptions of the rates and charges that **BEST MATCHES** the descriptions on your most recent Board-Approved Tariff of Rates and Charges. If the description is not found in the drop-down list, please enter the description in the green cells under the correct class exactly as it appears on the tariff. Please do not enter more than one "Service Charge" for each class for which a base monthly fixed charge applies.

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES

RESIDENTIAL Service Classification

This classification applies to an account taking electricity at 750 volts or less where the electricity is used exclusively in a separately metered living accommodation. Customers shall be residing in single-dwelling units that consist of a detached house or one unit of a semi-detached, duplex, triplex or quadruplex house, with a residential zoning. Separately metered dwellings within a town house complex or apartment building also qualify as residential customers. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

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MONTHLY RATES AND CHARGES - Delivery Component (If applicable, Effective Date MUST be included in rate description)

Service Charge	$	17.94
Rate Rider for Recovery of Stranded Meter Assets – effective until April 30, 2015	$	0.48
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0126
Rate Rider for Deferral/Variance Account Disposition (2014) - effective until April 30, 2015	$/kWh	(0.0012)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0072
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015 Applicable only for Non-RPP Customers	$/kWh	(0.0021)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.2500

GENERAL SERVICE LESS THAN 50 KW Service Classification

This classification applies to a non-residential account taking electricity at 750 volts or less whose monthly average peak demand is less than, or is forecast to be less than, 50 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component **(If applicable, Effective Date MUST be included in rate description)**

Service Charge	$	37.28
Rate Rider for Recovery of Stranded Meter Assets – effective until April 30, 2015	$	3.34
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0112
Rate Rider for Deferral/Variance Account Disposition (2014) - effective until April 30, 2015	$/kWh	(0.0027)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0066
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015 Applicable only for Non-RPP Customers	$/kWh	(0.0021)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

GENERAL SERVICE 50 TO 4,999 KW Service Classification

This classification applies to a non-residential account whose monthly average peak demand is equal to or greater than, or is forecast to be equal to or greater than 50 kW but less than 5,000 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

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MONTHLY RATES AND CHARGES - Delivery Component **(If applicable, Effective Date MUST be included in rate description)**

Service Charge	$	266.42
Distribution Volumetric Rate	$/kW	2.1025
Rate Rider for Deferral/Variance Account Disposition (2014) - effective until April 30, 2015	$/kW	(1.6736)

Retail Transmission Rate - Network Service Rate	$/kW	2.6853
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.4602
Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.9023
Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Metered	$/kW	1.1068
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015 Applicable only for Non-RPP Customers	$/kW	(0.8249)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3801)

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.2500

UNMETERED SCATTERED LOAD Service Classification

This classification applies to an account taking electricity at 750 volts or less whose average monthly maximum demand is less than, or is forecast to be less than, 50 kW and the consumption is unmetered. Such connections include cable TV power packs, bus shelters, telephone booths, traffic lights, railway crossings, etc. The level of the consumption will be agreed to by the distributor and the customer, based on detailed manufacturer information/ documentation with regard to electrical consumption of the unmetered load or periodic monitoring of actual consumption. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES – Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component **(If applicable, Effective Date MUST be included in rate description)**

Service Charge (per customer)	$	20.05
Distribution Volumetric Rate	$/kWh	0.0060
Rate Rider for Deferral/Variance Account Disposition (2014) - effective until April 30, 2015	$/kWh	(0.0013)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0066
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.2500

STREET LIGHTING Service Classification

This classification applies to an account for roadway lighting with a Municipality, Regional Municipality, Ministry of Transportation and private roadway lighting operation, controlled by photo cells. The consumption for these customers will be based on the calculated connected load times the required lighting times established by an approved OEB process. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES – Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component (If applicable, Effective Date MUST be included in rate description)

Service Charge (per connection)	$	7.42
Distribution Volumetric Rate	$/kW	29.0338
Rate Rider for Deferral/Variance Account Disposition (2014) - effective until April 30, 2015	$/kW	(1.3699)
Retail Transmission Rate - Network Service Rate	$/kW	2.0249
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.3558
Rate Rider for Disposition of Global Adjustment Account (2014) - effective until April 30, 2015 Applicable only for Non-RPP Customers	$/kW	(0.7620)
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3511)

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.2500

microFIT Service Classification

This classification applies to an electricity generation facility contracted under the Ontario Power Authority's microFIT program and connected to the distributor's distribution system. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.
No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.
Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable.
It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component **(If applicable, Effective Date MUST be included in rate description)**

Service Charge	$	5.40

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Please complete the following continuity schedule for the following Deferral / Variance Accounts. Enter information into green cells only.

If you have received approval to dispose of balances from prior years, the starting point for entries in the 2015 DVA schedule below will be the balance sheet date as per your G/L for which you received approval. For example, if in the 2014 EDR process (CoS or IRM) you received approval for the December 31, 2012 balances, the starting point for your entries below should be the 2011 year. This will allow for the correct starting point for the 2012 opening balance columns for both principal and interest.

Please refer to the footnotes for further instructions.

Account Descriptions	Account Number	2010										
		Opening Principal Amounts as of Jan-1-10	Transactions Debit / (Credit) during 2010 excluding interest and adjustments [2]	Board-Approved Disposition during 2010	Adjustments during 2010 - other [1]	Closing Principal Balance as of Dec-31-10	Opening Interest Amounts as of Jan-1-10	Interest Jan-1 to Dec-31-10	Board-Approved Disposition during 2010	Adjustments during 2010 - other [2]	Closing Interest Amounts as of Dec-31-10	Opening Principal Amounts as of Jan-1-11
Group 1 Accounts												
LV Variance Account	1550					0					0	0
Smart Metering Entity Charge Variance	1551											
RSVA - Wholesale Market Service Charge	1580					0					0	0
RSVA - Retail Transmission Network Charge	1584					0					0	0
RSVA - Retail Transmission Connection Charge	1586					0					0	0
RSVA - Power (excluding Global Adjustment)	1588					0					0	0
RSVA - Global Adjustment	1589					0					0	0
Recovery of Regulatory Asset Balances	1590					0					0	0
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595					0					0	0
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595					0					0	0
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595					0					0	0
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595					0					0	0
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595					0					0	0
RSVA - Global Adjustment	**1589**	0	0	0	0	0	0	0	0	0	0	0
Total Group 1 Balance excluding Account 1589 - Global Adjustment		0	0	0	0	0	0	0	0	0	0	0
Total Group 1 Balance		0	0	0	0	0	0	0	0	0	0	0
LRAM Variance Account	**1568**					0					0	
Total including Account 1568		0	0	0	0	0	0	0	0	0	0	0

Ontario Energy Board

Incentive Regulation Model for 20

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-La

Please complete the following continuity schedule for the following Deferral / Variance Accounts. Enter information into green cells only.

If you have received approval to dispose of balances from prior years, the starting point for entries in the 2015 DVA schedule below will be the balance sheet date as per your G/L for which you received approval. For example, if in the 2014 EDR process (CoS or IRM) you received approval for the December 31, 2012 balances, the starting point for your entries below should be the 2011 year. This will allow for the correct starting point for the 2012 opening balance columns for both principal and interest.

Please refer to the footnotes for further instructions.

Account Descriptions	Account Number	2011										
		Transactions Debit / (Credit) during 2011 excluding interest and adjustments [2]	Board-Approved Disposition during 2011	Adjustments during 2011 - other [1]	Closing Principal Balance as of Dec-31-11	Opening Interest Amounts as of Jan-1-11	Interest Jan-1 to Dec-31-11	Board-Approved Disposition during 2011	Adjustments during 2011 - other [2]	Closing Interest Amounts as of Dec-31-11	Opening Principal Amounts as of Jan-1-12	Transactions Debit / (Credit) during 2012 excluding interest and adjustments [2]
Group 1 Accounts												
LV Variance Account	1550				0	0				0	0	
Smart Metering Entity Charge Variance	1551											
RSVA - Wholesale Market Service Charge	1580				0	0				0	0	
RSVA - Retail Transmission Network Charge	1584				0	0				0	0	
RSVA - Retail Transmission Connection Charge	1586				0	0				0	0	
RSVA - Power (excluding Global Adjustment)	1588				0	0				0	0	
RSVA - Global Adjustment	1589				0	0				0	0	
Recovery of Regulatory Asset Balances	1590				0	0				0	0	
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595				0	0				0	0	
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595				0	0				0	0	
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595				0	0				0	0	
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595				0	0				0	0	
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595				0	0				0	0	
RSVA - Global Adjustment	**1589**	0	0	0	0	0	0	0	0	0	0	0
Total Group 1 Balance excluding Account 1589 - Global Adjustment		0	0	0	0	0	0	0	0	0	0	0
Total Group 1 Balance		0	0	0	0	0	0	0	0	0	0	0
LRAM Variance Account	**1568**				0					0	0	
Total including Account 1568		0	0	0	0	0	0	0	0	0	0	0

Ontario Energy Board

Incentive Regulation Model for 2(

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-La

Please complete the following continuity schedule for the following Deferral / Variance Accounts. Enter information into green cells only.

If you have received approval to dispose of balances from prior years, the starting point for entries in the 2015 DVA schedule below will be the balance sheet date as per your G/L for which you received approval. For example, if in the 2014 EDR process (CoS or IRM) you received approval for the December 31, 2012 balances, the starting point for your entries below should be the 2011 year. This will allow for the correct starting point for the 2012 opening balance columns for both principal and interest.

Please refer to the footnotes for further instructions.

Account Descriptions	Account Number	2012										
		Board-Approved Disposition during 2012	Other 1 Adjustments during Q1 2012	Other 1 Adjustments during Q2 2012	Other 1 Adjustments during Q3 2012	Other 1 Adjustments during Q4 2012	Closing Principal Balance as of Dec-31-12	Opening Interest Amounts as of Jan-1-12	Interest Jan-1 to Dec-31-12	Board-Approved Disposition during 2012	Adjustments during 2012 - other 1	Closing Interest Amounts as of Dec-31-12
Group 1 Accounts												
LV Variance Account	1550					0	0	0				0
Smart Metering Entity Charge Variance	1551											0
RSVA - Wholesale Market Service Charge	1580					(878,588)	(878,588)	0			(17,817)	(17,817)
RSVA - Retail Transmission Network Charge	1584					105,767	105,767	0			510	510
RSVA - Retail Transmission Connection Charge	1586					(68,972)	(68,972)	0			(2,411)	(2,411)
RSVA - Power (excluding Global Adjustment)	1588					(34,492)	(34,492)	0			6,625	6,625
RSVA - Global Adjustment	1589					259,902	259,902	0			6,564	6,564
Recovery of Regulatory Asset Balances	1590					0	0	0			0	0
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595					0	0	0			0	0
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595					4,985	4,985	0			18,426	18,426
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595					(22,790)	(22,790)	0			(3,329)	(3,329)
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595					20,543	20,543	0			170	170
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595					28,151	28,151	0			192	192
RSVA - Global Adjustment	**1589**	0	0	0	0	259,902	259,902	0	0	0	6,564	6,564
Total Group 1 Balance excluding Account 1589 - Global Adjustment		0	0	0	0	(845,394)	(845,394)	0	0	0	2,366	2,366
Total Group 1 Balance		0	0	0	0	(585,492)	(585,492)	0	0	0	8,931	8,931
LRAM Variance Account	**1568**					26,936	26,936	0			726	726
Total including Account 1568		0	0	0	0	(558,556)	(558,556)	0	0	0	9,657	9,657

Ontario Energy Board

Incentive Regulation Model for 20

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-La

Please complete the following continuity schedule for the following Deferral / Variance Accounts. Enter information into green cells only.

If you have received approval to dispose of balances from prior years, the starting point for entries in the 2015 DVA schedule below will be the balance sheet date as per your G/L for which you received approval. For example, if in the 2014 EDR process (CoS or IRM) you received approval for the December 31, 2012 balances, the starting point for your entries below should be the 2011 year. This will allow for the correct starting point for the 2012 opening balance columns for both principal and interest.

Please refer to the footnotes for further instructions.

Account Descriptions	Account Number	2013										
		Opening Principal Amounts as of Jan-1-13	Transactions Debit / (Credit) during 2013 excluding interest and adjustments [2]	Board-Approved Disposition during 2013	Other 1 Adjustments during Q1 2013	Other 1 Adjustments during Q2 2013	Other 1 Adjustments during Q3 2013	Other 1 Adjustments during Q4 2013	Closing Principal Balance as of Dec-31-13	Opening Interest Amounts as of Jan-1-13	Interest Jan-1 to Dec-31-13	Board-Approved Disposition during 2013
Group 1 Accounts												
LV Variance Account	1550	0							0	0		
Smart Metering Entity Charge Variance	1551	0	4,098						4,098	0	11	
RSVA - Wholesale Market Service Charge	1580	(878,588)	(199,312)	(564,693)	0		0		(513,207)	(17,817)	(9,792)	(18,360)
RSVA - Retail Transmission Network Charge	1584	105,767	58,458	12,838	0		0		151,387	510	1,811	(88)
RSVA - Retail Transmission Connection Charge	1586	(68,972)	(3,001)	(73,231)	0		0		1,259	(2,411)	(448)	(2,743)
RSVA - Power (excluding Global Adjustment)	1588	(34,492)	157,781	556,870	0		0		(433,581)	6,625	(3,539)	15,082
RSVA - Global Adjustment	1589	259,902	(531,256)	423,287	0		0		(694,641)	6,564	(694)	10,358
Recovery of Regulatory Asset Balances	1590	0							0	0		
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595	0							0	0		
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595	4,985	(12,414)			7,429			0	18,426	9	
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595	(22,790)		(22,790)			0		0	(3,329)	(127)	(3,456)
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595	20,543	20				0		20,563	170	302	
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595	28,151	(31,901)			757	0		(2,993)	192	1,225	
RSVA - Global Adjustment	**1589**	259,902	(531,256)	423,287	0	0	0	0	(694,641)	6,564	(694)	10,358
Total Group 1 Balance excluding Account 1589 - Global Adjustment		(845,394)	(26,270)	(91,006)	0	8,186	0	0	(772,473)	2,366	(10,548)	(9,565)
Total Group 1 Balance		(585,492)	(557,527)	332,281	0	8,186	0	0	(1,467,114)	8,931	(11,243)	793
LRAM Variance Account	**1568**	26,936					0	0	26,936	726		
Total including Account 1568		(558,556)	(557,527)	332,281	0	8,186	0	0	(1,440,178)	9,657	(11,243)	793

Ontario Energy Board

Incentive Regulation Model for 20

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-La

Please complete the following continuity schedule for the following Deferral / Variance Accounts. Enter information into green cells only.

If you have received approval to dispose of balances from prior years, the starting point for entries in the 2015 DVA schedule below will be the balance sheet date as per your G/L for which you received approval. For example, if in the 2014 EDR process (CoS or IRM) you received approval for the December 31, 2012 balances, the starting point for your entries below should be the 2011 year. This will allow for the correct starting point for the 2012 opening balance columns for both principal and interest.

Please refer to the footnotes for further instructions.

Account Descriptions	Account Number			2014				Projected Interest on Dec-31-13 Balances		
		Adjustments during 2013 - other 1	Closing Interest Amounts as of Dec-31-13	Principal Disposition during 2014 - instructed by Board	Interest Disposition during 2014 - instructed by Board	Closing Principal Balances as of Dec 31-13 Adjusted for Dispositions during 2014	Closing Interest Balances as of Dec 31-13 Adjusted for Dispositions during 2014	Projected Interest from Jan 1, 2014 to December 31, 2014 on Dec 31 -13 balance adjusted for disposition during 2014 [3]	Projected Interest from January 1, 2015 to April 30, 2015 on Dec 31 - 13 balance adjusted for disposition during 2014 [3]	Total Claim
Group 1 Accounts										
LV Variance Account	1550		0			0	0			0
Smart Metering Entity Charge Variance	1551		11			4,098	11	60	20	4,190
RSVA - Wholesale Market Service Charge	1580		(9,249)	(313,895)	(5,610)	(199,312)	(3,640)	(2,930)	(977)	(206,858)
RSVA - Retail Transmission Network Charge	1584		2,408	92,929	2,419	58,458	(11)	859	286	59,593
RSVA - Retail Transmission Connection Charge	1586		(116)	4,259	416	(3,001)	(532)	(44)	(15)	(3,591)
RSVA - Power (excluding Global Adjustment)	1588		(11,997)	(591,362)	(24,673)	157,781	12,676	2,319	773	173,550
RSVA - Global Adjustment	1589		(4,488)	(163,385)	(6,996)	(531,256)	2,508	(7,809)	(2,603)	(539,161)
Recovery of Regulatory Asset Balances	1590		0			0	0			0
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595		0			0	0			0
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595	(7,429)	11,006	0	0	0	11,006	0	0	11,006
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595		0	0	0	0	0	0	0	0
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595		473	20,543	573	20	(100)	0	0	(80)
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595	(757)	660	0	0	(2,993)	660	(44)	(15)	(2,391)
RSVA - Global Adjustment	**1589**	0	(4,488)	(163,385)	(6,996)	(531,256)	2,508	(7,809)	(2,603)	(539,161)
Total Group 1 Balance excluding Account 1589 - Global Adjustment		(8,186)	(6,803)	(787,525)	(26,875)	15,052	20,072	221	74	35,419
Total Group 1 Balance		(8,186)	(11,291)	(950,910)	(33,870)	(516,204)	22,579	(7,588)	(2,529)	(503,742)
LRAM Variance Account	**1568**	0	726	26,936	726	0	0			0
Total including Account 1568		(8,186)	(10,565)	(923,974)	(33,145)	(516,204)	22,580	(7,588)	(2,529)	(503,742)

Ontario Energy Board

Incentive Regulation Model for 20

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-La

Please complete the following continuity schedule for the following Deferral / Variance Accounts. Enter information into green cells only.

If you have received approval to dispose of balances from prior years, the starting point for entries in the 2015 DVA schedule below will be the balance sheet date as per your G/L for which you received approval. For example, if in the 2014 EDR process (CoS or IRM) you received approval for the December 31, 2012 balances, the starting point for your entries below should be the 2011 year. This will allow for the correct starting point for the 2012 opening balance columns for both principal and interest.

Please refer to the footnotes for further instructions.

		2.1.7 RRR	
Account Descriptions	**Account Number**	**As of Dec 31-13**	**Variance RRR vs. 2013 Balance *(Principal + Interest)***
Group 1 Accounts			
LV Variance Account	1550	0	0
Smart Metering Entity Charge Variance	1551	4,110	0
RSVA - Wholesale Market Service Charge	1580	(522,456)	0
RSVA - Retail Transmission Network Charge	1584	153,796	0
RSVA - Retail Transmission Connection Charge	1586	1,143	0
RSVA - Power (excluding Global Adjustment)	1588	(445,577)	0
RSVA - Global Adjustment	1589	(699,129)	0
Recovery of Regulatory Asset Balances	1590		0
Disposition and Recovery/Refund of Regulatory Balances (2008)[4]	1595		0
Disposition and Recovery/Refund of Regulatory Balances (2009)[4]	1595	11,006	0
Disposition and Recovery/Refund of Regulatory Balances (2010)[4]	1595	0	0
Disposition and Recovery/Refund of Regulatory Balances (2011)[4]	1595	21,036	0
Disposition and Recovery/Refund of Regulatory Balances (2012)[4]	1595	(77,421)	(75,088)
RSVA - Global Adjustment	**1589**	(699,129)	0
Total Group 1 Balance excluding Account 1589 - Global Adjustment		(854,364)	(75,088)
Total Group 1 Balance		(1,553,493)	(75,088)
LRAM Variance Account	**1568**	37,545	9,883
Total including Account 1568		(1,515,948)	(65,205)

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

In the green shaded cells, enter the most recent Board Approved volumetric forecast. If there is a material difference between the latest Board-approved volumetric forecast and the most recent 12-month actual volumetric data, use the most recent 12-month actual data. Do not enter data for the MicroFit class.

Rate Class	Unit	Metered kWh	Metered kW	Billed kWh for Non-RPP Customers	Estimated kW for Non-RPP Customers	1590 Recovery Share Proportion*	1595 Recovery Share Proportion (2008) [1]	1595 Recovery Share Proportion (2009) [1]	1595 Recovery Share Proportion (2010) [1]	1595 Recovery Share Proportion (2011) [1]	1595 Recovery Share Proportion (2012) [1]	1568 LRAM Variance Account Class Allocation ($ amounts)	Number of Customers for Residential and GS<50 classes[3]
RESIDENTIAL	$/kWh	67,753,410		2,345,576	0			45.38%		36.33%	48.97%		7,083
GENERAL SERVICE LESS THAN 50 KW	$/kWh	37,260,698		3,196,489	0			22.26%		19.42%	24.30%		1,291
GENERAL SERVICE 50 TO 4,999 KW	$/kW	81,473,856	201,178	75,832,113	187,247			29.29%		43.47%	24.04%		
UNMETERED SCATTERED LOAD	$/kWh	240,322			0			2.22%		0.12%	0.54%		
STREET LIGHTING	$/kW	1,248,464	3,377	1,139,353	3,082			0.86%		0.66%	2.15%		
microFIT													
Total		**187,976,750**	**204,555**	**82,513,531**	**190,329**	**0.00%**	**0.00%**	**100.01%**	**0.00%**	**100.00%**	**100.00%**	**0**	**8,374**
											Balance as per Sheet 5	0	
											Variance	0	

Threshold Test

Total Claim (including Account 1568)	($503,742)
Total Claim for Threshold Test (All Group 1 Accounts)	($503,742)
Threshold Test (Total claim per kWh) [2]	(0.0027)

[1] Residual Account balance to be allocated to rate classes in proportion to the recovery share as established when rate riders were implemented.

[2] The Threshold Test does not include the amount in 1568.

[3] The proportion of customers for the Residential and GS<50 Classes will be used to allocate Account 1551.

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

No input required. This workshseet allocates the deferral/variance account balances (Group 1, 1589, and 1568) to the appropriate classes as per the EDDVAR Report dated July 31, 2009

Allocation of Group 1 Accounts (including Account 1568)

Rate Class	% of Total kWh	% of Total non-RPP kWh	% of Customer Numbers **	1550	1551	1580	1584	1586	1588	1589	1590	1595 (2008)	1595 (2009)	1595 (2010)	1595 (2011)	1595 (2012)	1568
RESIDENTIAL	36.0%	2.8%	84.6%	0	3,544	(74,559)	21,479	(1,294)	62,554	(15,326)	0	0	4,995	0	(29)	(1,171)	0
GENERAL SERVICE LESS THAN 50 KW	19.8%	3.9%	15.4%	0	646	(41,003)	11,812	(712)	34,401	(20,887)	0	0	2,450	0	(16)	(581)	0
GENERAL SERVICE 50 TO 4,999 KW	43.3%	91.9%		0	0	(89,657)	25,829	(1,557)	75,221	(495,503)	0	0	3,224	0	(35)	(575)	0
UNMETERED SCATTERED LOAD	0.1%	0.0%		0	0	(264)	76	(5)	222	0	0	0	244	0	(0)	(13)	0
STREET LIGHTING	0.7%	1.4%		0	0	(1,374)	396	(24)	1,153	(7,445)	0	0	95	0	(1)	(51)	0
microFIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**100.0%**	**100.0%**	**100.0%**	**0**	**4,190**	**(206,858)**	**59,593**	**(3,591)**	**173,550**	**(539,161)**	**0**	**0**	**11,007**	**0**	**(80)**	**(2,391)**	**0**

** RSVA - Power (Excluding Global Adjustment)*

*** Used to allocate Account 1551 as this account records the variances arising from the Smart Metering Entity Charges to Residential and GS<50 customers.*

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Input required at cell C15 only. This workshseet calculates rate riders related to the Deferral/Variance Account Disposition (if applicable), associated rate riders for the global adjustment account (1589) and Account 1568. Rate Riders will not be generated for the microFIT class.

Please indicate the Rate Rider Recovery Period (in years) 1

Rate Class	Unit	Billed kWh	Billed kW or kVA	Balance of Accounts Allocated by kWh/kW (RPP) or Distribution	Deferral/Variance Account Rate Rider	Allocation of Balance in Account 1589	Billed kWh or Estimated kW for Non-RPP	Global Adjustment Rate Rider	Allocation of Account 1568	Account 1568 Rate Rider
RESIDENTIAL	$/kWh	67,753,410		15,518	0.0002	(15,326)	2,345,576	(0.0065)		0.0000
GENERAL SERVICE LESS THAN 50 KW	$/kWh	37,260,698		6,998	0.0002	(20,887)	3,196,489	(0.0065)		0.0000
GENERAL SERVICE 50 TO 4,999 KW	$/kW	81,473,856	201,178	12,450	0.0619	(495,503)	187,247	(2.6463)		0.0000
UNMETERED SCATTERED LOAD	$/kWh	240,322		260	0.0011	0		0.0000		0.0000
STREET LIGHTING	$/kW	1,248,464	3,377	193	0.0573	(7,445)	3,082	(2.4157)		0.0000
microFIT										
Total		**187,976,750**	**204,555**	**35,420**		**(539,161)**	**5,732,394**		**0**	

One or more rate classes appear to have negligible rate riders in columns F and/or I. As per Appendix B of the Filing Requirements, please provide details of the Applicant's proposal in the Manager's Summary.

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Shared Tax Savings

Enter your 2014 Board-Approved Billing Determinents into columns B, C and D.
Enter your 2014 Board-Approved Base monthly service and volumetric charges into columns G, H and I.

Rate Class	Units	Re-based Billed Customers or Connections	Re-based Billed kWh	Re-based Billed kW (if applicable)	2014 Base Monthly Service Charge	2014 Base Distribution Volumetric Rate kWh	2014 Base Distribution Volumetric Rate kW
RESIDENTIAL	$/kWh	7,083	67,753,410		17.94	0.0126	0.0000
GENERAL SERVICE LESS THAN 50 KW	$/kWh	1,291	37,260,698		37.28	0.0112	0.0000
GENERAL SERVICE 50 TO 4,999 KW	$/kW	125		201,178	266.42	0.0000	2.1025
UNMETERED SCATTERED LOAD	$/kWh	22	240,322		20.05	0.0060	0.0000
STREET LIGHTING	$/kW	2,031		3,377	7.42	0.0000	29.0338
microFIT							

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Calculation of Rebased Revenue Requirement. No input required.

Rate Class	Re-based Billed Customers or Connections A	Re-based Billed kWh B	Re-based Billed kW C	Rate ReBal Base Service Charge D	Rate ReBal Base Distribution Volumetric Rate kWh E	Rate ReBal Base Distribution Volumetric Rate kW F	Service Charge Revenue G = A * D *12	Distribution Volumetric Rate Revenue kWh H = B * E	Distribution Volumetric Rate Revenue kW I = C * F	Revenue Requirement from Rates J = G + H + I	Service Charge % Revenue K = G / J	Distribution Volumetric Rate % Revenue kWh L = H / J	Distribution Volumetric Rate % Revenue kW M = I / J	Total % Revenue N = J / R
RESIDENTIAL	7,083	67,753,410		17.94	.0126	.0000	1,524,828.24	853,692.97	.00	2,378,521.21	64.11%	35.89%	0.00%	53.07%
GENERAL SERVICE LESS THAN 50 KW	1,291	37,260,698		37.28	.0112	.0000	577,541.76	417,319.82	.00	994,861.58	58.05%	41.95%	0.00%	22.20%
GENERAL SERVICE 50 TO 4,999 KW	125		201,178	266.42	.0000	2.1025	399,630.00	.00	422,976.75	822,606.75	48.58%	0.00%	51.42%	18.36%
UNMETERED SCATTERED LOAD	22	240,322		20.05	.0060	.0000	5,293.20	1,441.93	.00	6,735.13	78.59%	21.41%	0.00%	0.15%
STREET LIGHTING	2,031		3,377	7.42	.0000	29.0338	180,840.24	.00	98,047.14	278,887.38	64.84%	0.00%	35.16%	6.22%
microFIT							.00	.00	.00	.00	0.00%	0.00%	0.00%	0.00%
Total	**10,552**	**105,254,430**	**204,555**				**2,688,133.44**	**1,272,454.72**	**521,023.89**	**4,481,612.04**				**100.00%**

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Summary - Sharing of Tax Change Forecast Amounts

For the 2014 year, enter any Tax Credits from the Cost of Service Tax Calculation (Positive #)	12,000

1. Tax Related Amounts Forecast from Capital Tax Rate Changes	**2014**	**2015**
Taxable Capital **(if you are not claiming capital tax, please enter your Board-Approved Rate Base)**	$ 24,483,958	$ 24,483,958
Deduction from taxable capital up to $15,000,000	$ 15,000,000	$ 15,000,000
Net Taxable Capital	$ 9,483,958	$ 9,483,958
Rate	0.00%	0.00%
Ontario Capital Tax (Deductible, not grossed-up)	$ -	$ -
2. Tax Related Amounts Forecast from Income Tax Rate Changes		
Regulatory Taxable Income	$ 254,434	$ 254,434
Corporate Tax Rate	15.50%	15.50%
Tax Impact	$ 27,437	$ 27,437
Grossed-up Tax Amount	$ 32,470	$ 32,470
Tax Related Amounts Forecast from Capital Tax Rate Changes	$ -	$ -
Tax Related Amounts Forecast from Income Tax Rate Changes	$ 32,470	$ 32,470
Total Tax Related Amounts	$ 32,470	$ 32,470
Incremental Tax Savings		-$ 0
Sharing of Tax Savings (50%)		**-$ 0**

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

This worksheet calculates a tax change volumetric rate rider. If the rate riders are material (round to 4 decimal places), then the outputs in columns M and O will appear on Sheet 27 - Final Tariff Schedule.

Rate Class	Total Revenue $ by Rate Class	Total Revenue % by Rate Class	Allocation of Tax Savings by Rate Class	Billed kWh	Billed kW	Distribution Volumetric Rate kWh Rate Rider	Distribution Volumetric Rate kW Rate Rider
RESIDENTIAL	2,378,521	53.1%	$0	67,753,410		0.0000	
GENERAL SERVICE LESS THAN 50 KW	994,862	22.2%	$0	37,260,698		0.0000	
GENERAL SERVICE 50 TO 4,999 KW	822,607	18.4%	$0		201,178		
UNMETERED SCATTERED LOAD	6,735	0.2%	$0	240,322		0.0000	
STREET LIGHTING	278,887	6.2%	$0		3,377		
microFIT		0.0%	$0				
Total	**4,481,612**	**100.0%**	**$0**	**105,254,430**	**204,555**		

One or more rate classes appear to have negligible rate riders in columns M and/or O. As per Appendix B of the Filing Requirements, please provide details of the Applicant's proposal in the Manager's Summary.

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

No input required. This sheet consolidates all Current Retail Transmission Rates entered on Sheet 4.

Rate Class	Rate Description	Unit	RTSR-Network	RTSR-Connection
RESIDENTIAL	Retail Transmission Rate - Network Service Rate	$/kWh	0.0072	
RESIDENTIAL	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh		0.0013
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Network Service Rate	$/kWh	0.0066	
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh		0.0013
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate	$/kW	2.6853	
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW		0.4602
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.9023	
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Meter	$/kW		1.1068
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Network Service Rate	$/kWh	0.0066	
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh		0.0013
STREET LIGHTING	Retail Transmission Rate - Network Service Rate	$/kW	2.0249	
STREET LIGHTING	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW		0.3558

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

In the green shaded cells, enter the most recent reported RRR billing determinants. Please ensure that billing determinants are non-loss adjusted.

Rate Class	Rate Description	Unit	Non-Loss Adjusted Metered kWh	Non-Loss Adjusted Metered kW	Applicable Loss Factor	Load Factor	Loss Adjusted Billed kWh	Billed kW
RESIDENTIAL	Retail Transmission Rate - Network Service Rate	$/kWh	67,121,534	-	1.0379		69,665,440	-
RESIDENTIAL	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	67,121,534	-	1.0379		69,665,440	-
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Network Service Rate	$/kWh	34,819,170	-	1.0379		36,138,817	-
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	34,819,170	-	1.0379		36,138,817	-
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate	$/kW	35,856,874	100,252	-	0.00%	-	100,252
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	35,856,874	100,252	-	0.00%	-	100,252
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	42,724,121	90,561	-	0.00%	-	90,561
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Metered	$/kW	42,724,121	101,972	-	0.00%	-	101,972
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Network Service Rate	$/kWh	236,038	-	1.0379		244,984	-
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	236,038	-	1.0379		244,984	-
STREET LIGHTING	Retail Transmission Rate - Network Service Rate	$/kW	1,160,024	3,238	-	0.00%	-	3,238
STREET LIGHTING	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	1,160,024	3,238	-	0.00%	-	3,238

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Uniform Transmission Rates	Unit	Effective January 1, 2013	Effective January 1, 2014	Effective January 1, 2015
Rate Description		**Rate**	**Rate**	**Rate**
Network Service Rate	kW	$ 3.63	$ 3.82	$ 3.82
Line Connection Service Rate	kW	$ 0.75	$ 0.82	$ 0.82
Transformation Connection Service Rate	kW	$ 1.85	$ 1.98	$ 1.98

Hydro One Sub-Transmission Rates	Unit	Effective January 1, 2013	Effective January 1, 2014	Effective January 1, 2015
Rate Description		**Rate**	**Rate**	**Rate**
Network Service Rate	kW	$ 3.18	$ 3.23	$ 3.23
Line Connection Service Rate	kW	$ 0.70	$ 0.65	$ 0.65
Transformation Connection Service Rate	kW	$ 1.63	$ 1.62	$ 1.62
Both Line and Transformation Connection Service Rate	kW	$ 2.33	$ 2.27	$ 2.27

If needed , add extra host here (I)	Unit	Effective January 1, 2013	Effective January 1, 2014	Effective January 1, 2015
Rate Description		**Rate**	**Rate**	**Rate**
Network Service Rate	kW			
Line Connection Service Rate	kW			
Transformation Connection Service Rate	kW			
Both Line and Transformation Connection Service Rate	kW	$ -	$ -	$ -

If needed , add extra host here (II)	Unit	Effective January 1, 2013	Effective January 1, 2014	Effective January 1, 2015
Rate Description		**Rate**	**Rate**	**Rate**
Network Service Rate	kW			
Line Connection Service Rate	kW			
Transformation Connection Service Rate	kW			
Both Line and Transformation Connection Service Rate	kW	$ -	$ -	$ -

Hydro One Sub-Transmission Rate Rider 9A	Unit	Effective January 1, 2013	Effective January 1, 2014	Effective January 1, 2015
Rate Description		**Rate**	**Rate**	**Rate**
RSVA Transmission network – 4714 – which affects 1584	kW	$ -	$ 0.1465	$ 0.1465
RSVA Transmission connection – 4716 – which affects 1586	kW	$ -	$ 0.0667	$ 0.0667
RSVA LV – 4750 – which affects 1550	kW	$ -	$ 0.0475	$ 0.0475
RARA 1 – 2252 – which affects 1590	kW	$ -	$ 0.0419	$ 0.0419
RARA 1 – 2252 – which affects 1590 (2008)	kW	$ -	-$ 0.0270	-$ 0.0270
RARA 1 – 2252 – which affects 1590 (2009)	kW	$ -	-$ 0.0006	-$ 0.0006
Hydro One Sub-Transmission Rate Rider 9A	kW	$ -	$ 0.2750	$ 0.2750

		Historical 2013	Current 2014	Forecast 2015
Low Voltage Switchgear Credit (if applicable, enter as a negative value)	$			

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

In the green shaded cells, enter billing detail for wholesale transmission for the same reporting period as the billing determinants on Sheet "14. RTSR RRR Data". For Hydro One Sub-transmission Rates, if you are charged a combined Line and Transformer connection rate, please ensure that both the line connection and transformer connection columns are completed.

IESO	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	27,342	$3.63	$ 99,251	28,604	$0.75	$ 21,453		$0.00		$ 21,453
February	26,371	$3.63	$ 95,727	27,287	$0.75	$ 20,465		$0.00		$ 20,465
March	24,804	$3.63	$ 90,039	25,438	$0.75	$ 19,079		$0.00		$ 19,079
April	21,166	$3.63	$ 76,833	22,732	$0.75	$ 17,049		$0.00		$ 17,049
May	31,243	$3.63	$ 113,412	32,105	$0.75	$ 24,079		$0.00		$ 24,079
June	35,281	$3.63	$ 128,070	35,374	$0.75	$ 26,531		$0.00		$ 26,531
July	42,328	$3.63	$ 153,651	42,490	$0.75	$ 31,868		$0.00		$ 31,868
August	35,210	$3.63	$ 127,812	36,618	$0.75	$ 27,464		$0.00		$ 27,464
September	37,057	$3.63	$ 134,517	37,470	$0.75	$ 28,103		$0.00		$ 28,103
October	21,250	$3.63	$ 77,138	24,633	$0.75	$ 18,475		$0.00		$ 18,475
November	25,140	$3.63	$ 91,258	29,509	$0.75	$ 22,132		$0.00		$ 22,132
December	28,353	$3.63	$ 102,921	30,013	$0.75	$ 22,510		$0.00		$ 22,510
Total	355,545	$ 3.63	$ 1,290,628	372,273	$ 0.75	$ 279,205	-	$ -	$ -	$ 279,205

Hydro One	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January		$0.00			$0.00			$0.00		$ -
February		$0.00			$0.00			$0.00		$ -
March		$0.00			$0.00			$0.00		$ -
April		$0.00			$0.00			$0.00		$ -
May		$0.00			$0.00			$0.00		$ -
June		$0.00			$0.00			$0.00		$ -
July		$0.00			$0.00			$0.00		$ -
August		$0.00			$0.00			$0.00		$ -
September		$0.00			$0.00			$0.00		$ -
October		$0.00			$0.00			$0.00		$ -
November		$0.00			$0.00			$0.00		$ -
December		$0.00			$0.00			$0.00		$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (I) (if needed)	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January		$0.00			$0.00			$0.00		$ -
February		$0.00			$0.00			$0.00		$ -
March		$0.00			$0.00			$0.00		$ -
April		$0.00			$0.00			$0.00		$ -
May		$0.00			$0.00			$0.00		$ -
June		$0.00			$0.00			$0.00		$ -
July		$0.00			$0.00			$0.00		$ -
August		$0.00			$0.00			$0.00		$ -
September		$0.00			$0.00			$0.00		$ -
October		$0.00			$0.00			$0.00		$ -
November		$0.00			$0.00			$0.00		$ -
December		$0.00			$0.00			$0.00		$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (II) (if needed)	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January		$0.00			$0.00			$0.00		$ -
February		$0.00			$0.00			$0.00		$ -
March		$0.00			$0.00			$0.00		$ -
April		$0.00			$0.00			$0.00		$ -
May		$0.00			$0.00			$0.00		$ -
June		$0.00			$0.00			$0.00		$ -
July		$0.00			$0.00			$0.00		$ -
August		$0.00			$0.00			$0.00		$ -
September		$0.00			$0.00			$0.00		$ -
October		$0.00			$0.00			$0.00		$ -

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

In the green shaded cells, enter billing detail for wholesale transmission for the same reporting period as the billing determinants on Sheet "14. RTSR RRR Data". For Hydro One Sub-transmission Rates, if you are charged a combined Line and Transformer connection rate, please ensure that both the line connection and transformer connection columns are completed.

November		$0.00			$0.00			$0.00		$	-	
December		$0.00			$0.00			$0.00		$	-	
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$	-	
Total	**Network**			**Line Connection**			**Transformation Connection**			**Total Line**		
Month	**Units Billed**	**Rate**	**Amount**	**Units Billed**	**Rate**	**Amount**	**Units Billed**	**Rate**	**Amount**	**Amount**		
January	27,342	$3.63	$ 99,251	28,604	$0.75	$ 21,453	-	$0.00	$ -	$	21,453	
February	26,371	$3.63	$ 95,727	27,287	$0.75	$ 20,465	-	$0.00	$ -	$	20,465	
March	24,804	$3.63	$ 90,039	25,438	$0.75	$ 19,079	-	$0.00	$ -	$	19,079	
April	21,166	$3.63	$ 76,833	22,732	$0.75	$ 17,049	-	$0.00	$ -	$	17,049	
May	31,243	$3.63	$ 113,412	32,105	$0.75	$ 24,079	-	$0.00	$ -	$	24,079	
June	35,281	$3.63	$ 128,070	35,374	$0.75	$ 26,531	-	$0.00	$ -	$	26,531	
July	42,328	$3.63	$ 153,651	42,490	$0.75	$ 31,868	-	$0.00	$ -	$	31,868	
August	35,210	$3.63	$ 127,812	36,618	$0.75	$ 27,464	-	$0.00	$ -	$	27,464	
September	37,057	$3.63	$ 134,517	37,470	$0.75	$ 28,103	-	$0.00	$ -	$	28,103	
October	21,250	$3.63	$ 77,138	24,633	$0.75	$ 18,475	-	$0.00	$ -	$	18,475	
November	25,140	$3.63	$ 91,258	29,509	$0.75	$ 22,132	-	$0.00	$ -	$	22,132	
December	28,353	$3.63	$ 102,921	30,013	$0.75	$ 22,510	-	$0.00	$ -	$	22,510	
Total	355,545	$ 3.63	$ 1,290,628	372,273	$ 0.75	$ 279,205	-	$ -	$ -	$	279,205	

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to calculate the expected billing when current 2014 Uniform Transmission Rates are applied against historical 2013 transmission units.

IESO	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	27,342	$ 3.8200	$ 104,446	28,604	$ 0.8200	$ 23,455	-	$ 1.9800	$ -	$ 23,455
February	26,371	$ 3.8200	$ 100,737	27,287	$ 0.8200	$ 22,375	-	$ 1.9800	$ -	$ 22,375
March	24,804	$ 3.8200	$ 94,751	25,438	$ 0.8200	$ 20,859	-	$ 1.9800	$ -	$ 20,859
April	21,166	$ 3.8200	$ 80,854	22,732	$ 0.8200	$ 18,640	-	$ 1.9800	$ -	$ 18,640
May	31,243	$ 3.8200	$ 119,348	32,105	$ 0.8200	$ 26,326	-	$ 1.9800	$ -	$ 26,326
June	35,281	$ 3.8200	$ 134,773	35,374	$ 0.8200	$ 29,007	-	$ 1.9800	$ -	$ 29,007
July	42,328	$ 3.8200	$ 161,693	42,490	$ 0.8200	$ 34,842	-	$ 1.9800	$ -	$ 34,842
August	35,210	$ 3.8200	$ 134,502	36,618	$ 0.8200	$ 30,027	-	$ 1.9800	$ -	$ 30,027
September	37,057	$ 3.8200	$ 141,558	37,470	$ 0.8200	$ 30,725	-	$ 1.9800	$ -	$ 30,725
October	21,250	$ 3.8200	$ 81,175	24,633	$ 0.8200	$ 20,199	-	$ 1.9800	$ -	$ 20,199
November	25,140	$ 3.8200	$ 96,035	29,509	$ 0.8200	$ 24,197	-	$ 1.9800	$ -	$ 24,197
December	28,353	$ 3.8200	$ 108,308	30,013	$ 0.8200	$ 24,611	-	$ 1.9800	$ -	$ 24,611
Total	355,545	$ 3.82	$ 1,358,182	372,273	$ 0.82	$ 305,264	-	$ -	$ -	$ 305,264

Hydro One	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
February	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
March	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
April	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
May	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
June	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
July	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
August	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
September	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
October	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
November	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
December	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (I)	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to calculate the expected billing when current 2014 Uniform Transmission Rates are applied against historical 2013 transmission units.

Add Extra Host Here (II)	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Total	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	27,342	$3.82	$ 104,446	28,604	$0.82	$ 23,455	-	$0.00	$ -	$ 23,455
February	26,371	$3.82	$ 100,737	27,287	$0.82	$ 22,375	-	$0.00	$ -	$ 22,375
March	24,804	$3.82	$ 94,751	25,438	$0.82	$ 20,859	-	$0.00	$ -	$ 20,859
April	21,166	$3.82	$ 80,854	22,732	$0.82	$ 18,640	-	$0.00	$ -	$ 18,640
May	31,243	$3.82	$ 119,348	32,105	$0.82	$ 26,326	-	$0.00	$ -	$ 26,326
June	35,281	$3.82	$ 134,773	35,374	$0.82	$ 29,007	-	$0.00	$ -	$ 29,007
July	42,328	$3.82	$ 161,693	42,490	$0.82	$ 34,842	-	$0.00	$ -	$ 34,842
August	35,210	$3.82	$ 134,502	36,618	$0.82	$ 30,027	-	$0.00	$ -	$ 30,027
September	37,057	$3.82	$ 141,558	37,470	$0.82	$ 30,725	-	$0.00	$ -	$ 30,725
October	21,250	$3.82	$ 81,175	24,633	$0.82	$ 20,199	-	$0.00	$ -	$ 20,199
November	25,140	$3.82	$ 96,035	29,509	$0.82	$ 24,197	-	$0.00	$ -	$ 24,197
December	28,353	$3.82	$ 108,308	30,013	$0.82	$ 24,611	-	$0.00	$ -	$ 24,611
Total	355,545	$ 3.82	$ 1,358,182	372,273	$ 0.82	$ 305,264	-	$ -	$ -	$ 305,264

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to calculate the expected billing when forecasted 2015 Uniform Transmission Rates are applied against historical 2013 transmission units.

IESO	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	27,342	$ 3.8200	$ 104,446	28,604	$ 0.8200	$ 23,455	-	$ 1.9800	$ -	$ 23,455
February	26,371	$ 3.8200	$ 100,737	27,287	$ 0.8200	$ 22,375	-	$ 1.9800	$ -	$ 22,375
March	24,804	$ 3.8200	$ 94,751	25,438	$ 0.8200	$ 20,859	-	$ 1.9800	$ -	$ 20,859
April	21,166	$ 3.8200	$ 80,854	22,732	$ 0.8200	$ 18,640	-	$ 1.9800	$ -	$ 18,640
May	31,243	$ 3.8200	$ 119,348	32,105	$ 0.8200	$ 26,326	-	$ 1.9800	$ -	$ 26,326
June	35,281	$ 3.8200	$ 134,773	35,374	$ 0.8200	$ 29,007	-	$ 1.9800	$ -	$ 29,007
July	42,328	$ 3.8200	$ 161,693	42,490	$ 0.8200	$ 34,842	-	$ 1.9800	$ -	$ 34,842
August	35,210	$ 3.8200	$ 134,502	36,618	$ 0.8200	$ 30,027	-	$ 1.9800	$ -	$ 30,027
September	37,057	$ 3.8200	$ 141,558	37,470	$ 0.8200	$ 30,725	-	$ 1.9800	$ -	$ 30,725
October	21,250	$ 3.8200	$ 81,175	24,633	$ 0.8200	$ 20,199	-	$ 1.9800	$ -	$ 20,199
November	25,140	$ 3.8200	$ 96,035	29,509	$ 0.8200	$ 24,197	-	$ 1.9800	$ -	$ 24,197
December	28,353	$ 3.8200	$ 108,308	30,013	$ 0.8200	$ 24,611	-	$ 1.9800	$ -	$ 24,611
Total	355,545	$ 3.82	$ 1,358,182	372,273	$ 0.82	$ 305,264	-	$ -	$ -	$ 305,264

Hydro One	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
February	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
March	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
April	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
May	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
June	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
July	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
August	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
September	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
October	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
November	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
December	-	$ 3.3765	$ -	-	$ 0.7167	$ -	-	$ 1.6200	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Add Extra Host Here (I)	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to calculate the expected billing when forecasted 2015 Uniform Transmission Rates are applied against historical 2013 transmission units.

Add Extra Host Here (II)	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
February	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
March	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
April	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
May	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
June	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
July	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
August	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
September	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
October	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
November	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
December	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -
Total	-	$ -	$ -	-	$ -	$ -	-	$ -	$ -	$ -

Total	Network			Line Connection			Transformation Connection			Total Line
Month	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Units Billed	Rate	Amount	Amount
January	27,342	$ 3.82	$ 104,446	28,604	$ 0.82	$ 23,455	-	$ -	$ -	$ 23,455
February	26,371	$ 3.82	$ 100,737	27,287	$ 0.82	$ 22,375	-	$ -	$ -	$ 22,375
March	24,804	$ 3.82	$ 94,751	25,438	$ 0.82	$ 20,859	-	$ -	$ -	$ 20,859
April	21,166	$ 3.82	$ 80,854	22,732	$ 0.82	$ 18,640	-	$ -	$ -	$ 18,640
May	31,243	$ 3.82	$ 119,348	32,105	$ 0.82	$ 26,326	-	$ -	$ -	$ 26,326
June	35,281	$ 3.82	$ 134,773	35,374	$ 0.82	$ 29,007	-	$ -	$ -	$ 29,007
July	42,328	$ 3.82	$ 161,693	42,490	$ 0.82	$ 34,842	-	$ -	$ -	$ 34,842
August	35,210	$ 3.82	$ 134,502	36,618	$ 0.82	$ 30,027	-	$ -	$ -	$ 30,027
September	37,057	$ 3.82	$ 141,558	37,470	$ 0.82	$ 30,725	-	$ -	$ -	$ 30,725
October	21,250	$ 3.82	$ 81,175	24,633	$ 0.82	$ 20,199	-	$ -	$ -	$ 20,199
November	25,140	$ 3.82	$ 96,035	29,509	$ 0.82	$ 24,197	-	$ -	$ -	$ 24,197
December	28,353	$ 3.82	$ 108,308	30,013	$ 0.82	$ 24,611	-	$ -	$ -	$ 24,611
Total	355,545	$ 3.82	$ 1,358,182	372,273	$ 0.82	$ 305,264	-	$ -	$ -	$ 305,264

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to re-align the current RTS Network Rates to recover current wholesale network costs.

Rate Class	Rate Description	Unit	Current RTSR-Network	Loss Adjusted Billed kWh	Loss Adjusted Billed kW	Billed Amount	Billed Amount %	Current Wholesale Billing	Proposed RTSR Network
RESIDENTIAL	Retail Transmission Rate - Network Service Rate	$/kWh	0.0072	69,665,440	-	501,591	39.2%	532,094	0.0076
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Network Service Rate	$/kWh	0.0066	36,138,817	-	238,516	18.6%	253,021	0.0070
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate	$/kW	2.6853	-	100,252	269,206	21.0%	285,577	2.8486
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	2.9023	-	90,561	262,836	20.5%	278,820	3.0788
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Network Service Rate	$/kWh	0.0066	244,984	-	1,617	0.1%	1,715	0.0070
STREET LIGHTING	Retail Transmission Rate - Network Service Rate	$/kW	2.0249	-	3,238	6,557	0.5%	6,955	2.1480

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to re-align the current RTS Connection Rates to recover current wholesale connection costs.

Rate Class	Rate Description	Unit	Current RTSR-Connection	Loss Adjusted Billed kWh	Loss Adjusted Billed kW	Billed Amount	Billed Amount %	Current Wholesale Billing	Proposed RTSR Connection
RESIDENTIAL	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013	69,665,440	-	90,565	30.4%	92,768	0.0013
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013	36,138,817	-	46,980	15.8%	48,123	0.0013
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.4602	-	100,252	46,136	15.5%	47,258	0.4714
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Meter	$/kW	1.1068	-	101,972	112,863	37.9%	115,608	1.1337
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013	244,984	-	318	0.1%	326	0.0013
STREET LIGHTING	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.3558	-	3,238	1,152	0.4%	1,180	0.3645

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to update the re-align RTS Network Rates to recover forecast wholesale network costs.

Rate Class	Rate Description	Unit	Adjusted RTSR-Network	Loss Adjusted Billed kWh	Loss Adjusted Billed kW	Billed Amount	Billed Amount %	Forecast Wholesale Billing	Proposed RTSR Network
RESIDENTIAL	Retail Transmission Rate - Network Service Rate	$/kWh	0.0076	69,665,440	-	532,094	39.2%	532,094	0.0076
GENERAL SERVICE LESS THAN 50 K	Retail Transmission Rate - Network Service Rate	$/kWh	0.0070	36,138,817	-	253,021	18.6%	253,021	0.0070
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate	$/kW	2.8486	-	100,252	285,577	21.0%	285,577	2.8486
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	3.0788	-	90,561	278,820	20.5%	278,820	3.0788
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Network Service Rate	$/kWh	0.0070	244,984	-	1,715	0.1%	1,715	0.0070
STREET LIGHTING	Retail Transmission Rate - Network Service Rate	$/kW	2.1480	-	3,238	6,955	0.5%	6,955	2.1480

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

The purpose of this sheet is to update the re-aligned RTS Connection Rates to recover forecast wholesale connection costs.

Rate Class	Rate Description	Unit	Adjusted RTSR-Connection	Loss Adjusted Billed kWh	Loss Adjusted Billed kW	Billed Amount	Billed Amount %	Forecast Wholesale Billing	Proposed RTSR Connection
RESIDENTIAL	Retail Transmission Rate - Line and Transformation Connection Servic	$/kWh	0.0013	69,665,440	-	92,768	30.4%	92,768	0.0013
GENERAL SERVICE LESS THAN 50 I	Retail Transmission Rate - Line and Transformation Connection Servic	$/kWh	0.0013	36,138,817	-	48,123	15.8%	48,123	0.0013
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Servic	$/kW	0.4714	-	100,252	47,258	15.5%	47,258	0.4714
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Servic	$/kW	1.1337	-	101,972	115,608	37.9%	115,608	1.1337
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Line and Transformation Connection Servic	$/kWh	0.0013	244,984	-	326	0.1%	326	0.0013
STREET LIGHTING	Retail Transmission Rate - Line and Transformation Connection Servic	$/kW	0.3645	-	3,238	1,180	0.4%	1,180	0.3645

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

This sheet lists proposed RTSRs for all classes. No input required.

Rate Class	Rate Description	Unit	Proposed Retail Transmission Rate
RESIDENTIAL	Retail Transmission Rate - Network Service Rate	$/kWh	0.0076
RESIDENTIAL	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Network Service Rate	$/kWh	0.0070
GENERAL SERVICE LESS THAN 50 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate	$/kW	2.8486
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.4714
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	3.0788
GENERAL SERVICE 50 TO 4,999 KW	Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Metered	$/kW	1.1337
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Network Service Rate	$/kWh	0.0070
UNMETERED SCATTERED LOAD	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013
STREET LIGHTING	Retail Transmission Rate - Network Service Rate	$/kW	2.1480
STREET LIGHTING	Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.3645

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

If applicable, please enter any adjustments related to the revenue to cost ratio model into columns C and E. The Price Escalator and Stretch Factor have been set at the 2014 values and will be updated by Board staff at a later date.

Price Escalator	**1.70%**	**Choose Stretch Factor Group**	III
Productivity Factor	**0.00%**	**Associated Stretch Factor Value**	**0.30%**
Price Cap Index	**1.40%**		

Rate Class	Current MFC	MFC Adjustment from R/C Model	Current Volumetric Charge	DVR Adjustment from R/C Model	Price Cap Index to be Applied to MFC and DVR	Proposed MFC	Proposed Volumetric Charge

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Please enter the following charges as found on your most recent Board-Approved Tariff Schedule. The standard Allowance rates have been included as default entries. If you have different rates, please make the appropriate corrections in the applicable cells below. As well, please enter the current Specific Service Charges below. The standard Retail Service Charges have been entered below. If you have different rates, please make the appropriate corrections in columns A, C or D as applicable (cells are unlocked).

ALLOWANCES

	UNIT	RATE
Transformer Allowance for Ownership - per kW of billing demand/month	$/kW	(0.56)
Primary Metering Allowance for transformer losses – applied to measured demand and energy	%	(1.00)

SPECIFIC SERVICE CHARGES

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

No charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

Customer Administration

Arrears certificate	$	15.00
Statement of Account	$	15.00
Pulling Post Dated Cheques	$	15.00
Duplicate Invoices for previous billing	$	15.00
Request for other billing information	$	15.00
Easement Letter	$	15.00
Account History	$	15.00
Credit check (plus credit agency costs)	$	15.00
Returned cheque (plus bank charges)	$	15.00
Charge to certify cheque	$	15.00
Account set up charge/change of occupancy charge (plus credit agency costs if applicable)	$	30.00
Special meter reads	$	30.00
Meter dispute charge plus Measurement Canada fees (if meter found correct)	$	30.00

Non-Payment of Account

Late Payment – per month	%	1.50
Late Payment – per annum	%	19.56
Collection of account charge – no disconnection	$	30.00
Disconnect/Reconnect at meter – during regular hours	$	65.00
Disconnect/Reconnect at meter – after regular hours	$	185.00
Disconnect/Reconnect at pole – during regular hours	$	185.00
Disconnect/Reconnect at pole – after regular hours	$	415.00

Service Call – Customer-owned Equipment – During Regular Hours	$	30.00
Service Call – Customer-owned Equipment – After Regular Hours	$	165.00
Install/Remove load control device – during regular hours	$	65.00
Install/Remove load control device – after regular hours	$	185.00
Temporary service install & remove – overhead – no transformer	$	500.00
Temporary Service – Install & remove – underground – no transformer	$	300.00
Temporary Service Install & Remove – Overhead – With Transformer	$	1,000.00
Specific Charge for Access to the Power Poles - $/pole/year	$	22.35
Specific Charge for Bell Canada Access to the Power Poles – per pole/year Note: Specific Charge for Bell Canada Access to the Power Pole is valid only until the existing joint-use agreement is terminated	$	18.36

RETAIL SERVICE CHARGES (if applicable)

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable.

It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

Retail Service Charges refer to services provided by a distributor to retailers or customers related to the supply of competitive electricity.

One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	100.00
Monthly Fixed Charge, per retailer	$	20.00
Monthly Variable Charge, per customer, per retailer	$/cust.	0.50
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.30
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.30)
Service Transaction Requests (STR)		
Request fee, per request, applied to the requesting party	$	0.25
Processing fee, per request, applied to the requesting party	$	0.50
Request for customer information as outlined in Section 10.6.3 and Chapter 11 of the Retail Settlement Code directly to retailers and customers, if not delivered electronically through the Electronic Business Transaction (EBT) system, applied to the requesting party		
Up to twice a year	$	no charge
More than twice a year, per request (plus incremental delivery costs)	$	2.00

LOSS FACTORS

If the distributor is not capable of prorating changed loss factors jointly with distribution rates, the revised loss factors will be implemented upon the first subsequent billing for each billing cycle.

Total Loss Factor – Secondary Metered Customer < 5,000 kW	1.0379
Total Loss Factor – Primary Metered Customer < 5,000 kW	1.0275

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

RESIDENTIAL SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less where the electricity is used exclusively in a separately metered living accommodation. Customers shall be residing in single-dwelling units that consist of a detached house or one unit of a semi-detached, duplex, triplex or quadruplex house, with a residential zoning. Separately metered dwellings within a town house complex or apartment building also qualify as residential customers. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this

No rates and charges for the distribution of electricity and charges to meet the costs of any work or service done or furnished for the purpose of the distribution of electricity shall be made except as permitted by this schedule, unless required by the Distributor's Licence or a Code or Order of the Board, and amendments thereto as approved by the Board, or as specified herein.

Unless specifically noted, this schedule does not contain any charges for the electricity commodity, be it under the Regulated Price Plan, a contract with a retailer or the wholesale market price, as applicable. In addition, the charges in the MONTHLY RATES AND CHARGES – Regulatory Component of this schedule do not apply to a customer that is an embedded wholesale market participant.

It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	18.19
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0128
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kWh	0.0007
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kWh	0.0002
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kWh	(0.0065)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0076
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.

TARIFF OF RATES AND CHARGES

Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

GENERAL SERVICE LESS THAN 50 KW SERVICE CLASSIFICATION

This classification applies to a non-residential account taking electricity at 750 volts or less whose monthly average peak demand is less than, or is forecast to be less than, 50 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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It should be noted that this schedule does not list any charges, assessments or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	37.80
Rate Rider for Smart Metering Entity Charge - effective until October 31, 2018	$	0.79
Distribution Volumetric Rate	$/kWh	0.0114
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kWh	0.0007
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kWh	0.0002
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kWh	(0.0065)
Retail Transmission Rate - Network Service Rate	$/kWh	0.0070
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

GENERAL SERVICE 50 TO 4,999 KW SERVICE CLASSIFICATION

This classification applies to a non-residential account whose monthly average peak demand is equal to or greater than, or is forecast to be equal to or greater than 50 kW but less than 5,000 kW. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	270.15
Distribution Volumetric Rate	$/kW	2.1319
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3801)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kW	0.4356
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kW	0.0619
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kW	(2.6463)
Retail Transmission Rate - Network Service Rate	$/kW	2.8486
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.4714
Retail Transmission Rate - Network Service Rate - Interval Metered	$/kW	3.0788
Retail Transmission Rate - Line and Transformation Connection Service Rate - Interval Metered	$/kW	1.1337

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

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EB-2014-0097

UNMETERED SCATTERED LOAD SERVICE CLASSIFICATION

This classification applies to an account taking electricity at 750 volts or less whose average monthly maximum demand is less than, or is forecast to be less than, 50 kW and the consumption is unmetered. Such connections include cable TV power packs, bus shelters, telephone booths, traffic lights, railway crossings, etc. The level of the consumption will be agreed to by the distributor and the customer, based on detailed manufacturer information/ documentation with regard to electrical consumption of the unmetered load or periodic monitoring of actual consumption. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per customer)	$	20.33
Distribution Volumetric Rate	$/kWh	0.0061
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kWh	(0.0010)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kWh	0.0007
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kWh	0.0011
Retail Transmission Rate - Network Service Rate	$/kWh	0.0070
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kWh	0.0013

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

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EB-2014-0097

STREET LIGHTING SERVICE CLASSIFICATION

This classification applies to an account for roadway lighting with a Municipality, Regional Municipality, Ministry of Transportation and private roadway lighting operation, controlled by photo cells. The consumption for these customers will be based on the calculated connected load times the required lighting times established by an approved OEB process. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge (per connection)	$	7.52
Distribution Volumetric Rate	$/kW	29.4403
Rate Rider for Disposition of Account 1576 - effective until April 30, 2019	$/kW	(0.3511)
Rate Rider for Recovery of Incremental Capital Costs - effective until April 30, 2019	$/kW	0.1881
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until April 30, 2016	$/kW	0.0573
Rate Rider for Disposition of Global Adjustment Account (2015) - effective until April 30, 2016 Applicable only for Non RPP Customers	$/kW	(2.4157)
Retail Transmission Rate - Network Service Rate	$/kW	2.1480
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	0.3645

MONTHLY RATES AND CHARGES - Regulatory Component

Wholesale Market Service Rate	$/kWh	0.0044
Rural or Remote Electricity Rate Protection Charge (RRRP)	$/kWh	0.0013
Standard Supply Service - Administrative Charge (if applicable)	$	0.25

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

This schedule supersedes and replaces all previously approved schedules of Rates, Charges and Loss Factors

EB-2014-0097

MICROFIT SERVICE CLASSIFICATION

This classification applies to an electricity generation facility contracted under the Ontario Power Authority's microFIT program and connected to the distributor's distribution system. Further servicing details are available in the distributor's Conditions of Service.

APPLICATION

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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MONTHLY RATES AND CHARGES - Delivery Component

Service Charge	$	5.40

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
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EB-2014-0097

ALLOWANCES

Transformer Allowance for Ownership - per kW of billing demand/month	$/kW	(0.56)
Primary Metering Allowance for transformer losses – applied to measured demand and energy	%	(1.00)

SPECIFIC SERVICE CHARGES

The application of these rates and charges shall be in accordance with the Licence of the Distributor and any Code or Order of the Board, and amendments thereto as approved by the Board, which may be applicable to the administration of this schedule.

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It should be noted that this schedule does not list any charges, assessments, or credits that are required by law to be invoiced by a distributor and that are not subject to Board approval, such as the Debt Retirement Charge, the Global Adjustment, the Ontario Clean Energy Benefit and the HST.

Customer Administration

Arrears certificate	$	15.00
Statement of Account	$	15.00
Pulling Post Dated Cheques	$	15.00
Duplicate Invoices for previous billing	$	15.00
Request for other billing information	$	15.00
Easement Letter	$	15.00
Account History	$	15.00
Credit check (plus credit agency costs)	$	15.00
Returned cheque (plus bank charges)	$	15.00
Charge to certify cheque	$	15.00
Account set up charge/change of occupancy charge (plus credit agency costs if applicable)	$	30.00
Special meter reads	$	30.00
Meter dispute charge plus Measurement Canada fees (if meter found correct)	$	30.00

Non-Payment of Account

Late Payment – per month	%	1.5000
Late Payment – per annum	%	19.5600
Collection of account charge – no disconnection	$	30.00
Disconnect/Reconnect at meter – during regular hours	$	65.00
Disconnect/Reconnect at meter – after regular hours	$	185.00
Disconnect/Reconnect at pole – during regular hours	$	185.00
Disconnect/Reconnect at pole – after regular hours	$	415.00
Service Call – Customer-owned Equipment – During Regular Hours	$	30.00
Service Call – Customer-owned Equipment – After Regular Hours	$	165.00
Install/Remove load control device – during regular hours	$	65.00
Install/Remove load control device – after regular hours	$	185.00
Temporary service install & remove – overhead – no transformer	$	500.00
Temporary Service – Install & remove – underground – no transformer	$	300.00
Temporary Service Install & Remove – Overhead – With Transformer	$	1,000.00
Specific Charge for Access to the Power Poles - $/pole/year	$	22.35

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

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EB-2014-0097

Specific Charge for Bell Canada Access to the Power Poles – per pole/year	$	18.36

Niagara-on-the-Lake Hydro Inc.
TARIFF OF RATES AND CHARGES
Effective and Implementation Date May 01, 2015

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EB-2014-0097

RETAIL SERVICE CHARGES (if applicable)

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Retail Service Charges refer to services provided by a distributor to retailers or customers related to the supply of competitive electricity.

One-time charge, per retailer, to establish the service agreement between the distributor and the retailer	$	100.00
Monthly Fixed Charge, per retailer	$	20.00
Monthly Variable Charge, per customer, per retailer	$/cust.	0.50
Distributor-consolidated billing monthly charge, per customer, per retailer	$/cust.	0.30
Retailer-consolidated billing monthly credit, per customer, per retailer	$/cust.	(0.30)
Service Transaction Requests (STR)		
Request fee, per request, applied to the requesting party	$	0.25
Processing fee, per request, applied to the requesting party	$	0.50
Request for customer information as outlined in Section 10.6.3 and Chapter 11 of the Retail Settlement Code directly to retailers and customers, if not delivered electronically through the Electronic Business Transaction (EBT) system, applied to the requesting party		
Up to twice a year	$	no charge
More than twice a year, per request (plus incremental delivery costs)	$	2.00

LOSS FACTORS

If the distributor is not capable of prorating changed loss factors jointly with distribution rates, the revised loss factors will be implemented upon the first subsequent billing for each billing cycle.

Total Loss Factor – Secondary Metered Customer < 5,000 kW	1.0379
Total Loss Factor – Primary Metered Customer < 5,000 kW	1.0275

Ontario Energy Board

Incentive Regulation Model for 2015 Filers

Niagara-on-the-Lake Hydro Inc. - Niagara-on-the-Lake

Rate Class	**RESIDENTIAL**	
Loss Factor		**1.0379**
Consumption	**kWh**	**800**
If Billed on a kW basis:		
Demand	**kW**	

	Current Board-Approved			Proposed			Impact	
	Rate ($)	**Volume**	**Charge ($)**	**Rate ($)**	**Volume**	**Charge ($)**	**$ Change**	**% Change**
Monthly Service Charge	$ 17.94	1	$ 17.94	$ 18.19	1	$ 18.19	$ 0.25	1.39%
Distribution Volumetric Rate	$ 0.0126	800	$ 10.08	$ 0.0128	800	$ 10.24	$ 0.16	1.59%
Fixed Rate Riders	$ 0.48	1	$ 0.48	$ -	1	$ -	-$ 0.48	-100.00%
Volumetric Rate Riders	-0.0010	800	-$ 0.80	-0.0003	800	-$ 0.24	$ 0.56	-70.00%
Sub-Total A (excluding pass through)			$ 27.70			$ 28.19	**$ 0.49**	**1.77%**
Line Losses on Cost of Power	$ 0.0839	30	$ 2.54	$ 0.0839	30	$ 2.54	$ -	0.00%
Total Deferral/Variance Account Rate Riders	-0.0012	800	-$ 0.96	0.0002	800	$ 0.16	$ 1.12	-116.67%
Low Voltage Service Charge		800	$ -		800	$ -	$ -	
Smart Meter Entity Charge	$ 0.7900	1	$ 0.79	$ 0.7900	1	$ 0.79	$ -	0.00%
Sub-Total B - Distribution (includes Sub-Total A)			**$ 30.07**			**$ 31.68**	**$ 1.61**	**5.35%**
RTSR - Network	$ 0.0072	830	$ 5.98	$ 0.0076	830	$ 6.31	$ 0.33	5.56%
RTSR - Connection and/or Line and Transformation Connection	$ 0.0013	830	$ 1.08	$ 0.0013	830	$ 1.08	$ -	0.00%
Sub-Total C - Delivery (including Sub-Total B)			**$ 37.13**			**$ 39.07**	**$ 1.94**	**5.23%**
Wholesale Market Service Charge (WMSC)	$ 0.0044	830	$ 3.65	$ 0.0044	830	$ 3.65	$ -	0.00%
Rural and Remote Rate Protection (RRRP)	$ 0.0013	830	$ 1.08	$ 0.0013	830	$ 1.08	$ -	0.00%
Standard Supply Service Charge	$ 0.2500	1	$ 0.25	$ 0.2500	1	$ 0.25	$ -	0.00%
Debt Retirement Charge (DRC)	$ 0.0070	800	$ 5.60	$ 0.0070	800	$ 5.60	$ -	0.00%
TOU - Off Peak	$ 0.0670	512	$ 34.30	$ 0.0670	512	$ 34.30	$ -	0.00%
TOU - Mid Peak	$ 0.1040	144	$ 14.98	$ 0.1040	144	$ 14.98	$ -	0.00%
TOU - On Peak	$ 0.1240	144	$ 17.86	$ 0.1240	144	$ 17.86	$ -	0.00%
Total Bill on TOU (before Taxes)			**$ 114.85**			**$ 116.79**	**$ 1.94**	**1.69%**
HST	13%		$ 14.93	13%		$ 15.18	$ 0.25	1.69%
Total Bill (including HST)			$ 129.78			$ 131.98	$ 2.19	1.69%
Ontario Clean Energy Benefit [1]			-$ 12.98			-$ 13.20	-$ 0.22	1.69%
Total Bill on TOU (including OCEB)			**$ 116.80**			**$ 118.78**	**$ 1.97**	**1.69%**

Note: For distributors who have a majority of customers on Tiered pricing, please provide a separate bill impact for such customers.

Ontario Energy Board

Incremental Capital Project Summary for 2015 Filers

Version **1.0**

Applicant Name:	**Niagara-on-the-Lake Hydro Inc.**
Service Territory:	*Niagara-on-the-Lake*
Name:	**Philip Wormwell**
Title:	**Director of Corporate Services**
Phone Number:	**905-468-4235 ext 380**
Email Address:	**pwormwell@notlhydro.com**

Ontario Energy Board

Incremental Capital Project Summary for 2015 Filers

Using the pull-down menu below, please identify what year of the IRM cycle you are in.

1st year of IRM cycle

Name or General Description of Project

NOTL TS Transformer Station (MTS#2) Upgrade

Details of Project

To replace one 25 mVA transformer at MTS#2 with a 50 mVA transformer

Asset Component	Capital Cost	Depreciation Rate	CCA Class	CCA Rate
1 Power transformer	1,732,500	2%	47	8%
2 Structure	844,500	2%	47	8%
3				
4				
5				

	2015	2016	2017	2018
Closing Net Fixed Asset	2,523,145	2,469,291	2,415,436	2,361,582
Amortization Expense	53,855	53,855	53,855	53,855
CCA	206,160	189,667	174,494	160,534

Ontario Energy Board

Incremental Capital Project Summary for 2015 Filers

Fixed Asset Amortization and UCC 1

Name or General Description of Project

NOTL TS Transformer Station (MTS#2) Upgrade

Asset Component

Power transformer

Average Net Fixed Assets

Net Fixed Assets

		2015 Forecasted	2016 Forecasted	2017 Forecasted	2018 Forecasted	2019 Forecasted
Opening Capital Investment		$ -	$ 1,732,500	$ 1,732,500	$ 1,732,500	$ 1,732,500
Capital Investment		$ 1,732,500	$ -	$ -	$ -	$ -
Closing Capital Investment		$ 1,732,500	$ 1,732,500	$ 1,732,500	$ 1,732,500	$ 1,732,500
Opening Accumulated Amortization		$ -	$ 38,500	$ 77,000	$ 115,500	$ 154,000
Amortization	2%	$ 38,500	$ 38,500	$ 38,500	$ 38,500	$ 38,500
Closing Accumulated Amortization		$ 38,500	$ 77,000	$ 115,500	$ 154,000	$ 192,500
Opening Net Fixed Assets		$ -	$ 1,694,000	$ 1,655,500	$ 1,617,000	$ 1,578,500
Closing Net Fixed Assets		$ 1,694,000	$ 1,655,500	$ 1,617,000	$ 1,578,500	$ 1,540,000
Average Net Fixed Assets		$ 847,000	$ 1,674,750	$ 1,636,250	$ 1,597,750	$ 1,559,250

For PILs Calculation

UCC

		2015 Forecasted	2016 Forecasted	2017 Forecasted	2018 Forecasted	2019 Forecasted
Opening UCC		$ -	$ 1,593,900	$ 1,466,388	$ 1,349,077	$ 1,241,151
Capital Additions		$ 1,732,500	$ -	$ -	$ -	$ -
UCC Before Half Year Rule		$ 1,732,500	$ 1,593,900	$ 1,466,388	$ 1,349,077	$ 1,241,151
Half Year Rule (1/2 Additions - Disposals)		$ -	$ -	$ -	$ -	$ -
Reduced UCC		$ 1,732,500	$ 1,593,900	$ 1,466,388	$ 1,349,077	$ 1,241,151
CCA Rate Class	47					
CCA Rate	8%					
CCA		$ 138,600	$ 127,512	$ 117,311	$ 107,926	$ 99,292
Closing UCC		$ 1,593,900	$ 1,466,388	$ 1,349,077	$ 1,241,151	$ 1,141,859

Ontario Energy Board

Incremental Capital Project Summary for 2015 Filers

Fixed Asset Amortization and UCC 2

Name or General Description of Project

NOTL TS Transformer Station (MTS#2) Upgrade

Asset Component

Structure

Average Net Fixed Assets

Net Fixed Assets

		2015 Forecasted	2016 Forecasted	2017 Forecasted	2018 Forecasted	2019 Forecasted
Opening Capital Investment		$ -	$ 844,500	$ 844,500	$ 844,500	$ 844,500
Capital Investment		$ 844,500	$ -	$ -	$ -	$ -
Closing Capital Investment		$ 844,500	$ 844,500	$ 844,500	$ 844,500	$ 844,500
Opening Accumulated Amortization		$ -	$ 15,355	$ 30,709	$ 46,064	$ 61,418
Amortization	2%	$ 15,355	$ 15,355	$ 15,355	$ 15,355	$ 15,355
Closing Accumulated Amortization		$ 15,355	$ 30,709	$ 46,064	$ 61,418	$ 76,773
Opening Net Fixed Assets		$ -	$ 829,145	$ 813,791	$ 798,436	$ 783,082
Closing Net Fixed Assets		$ 829,145	$ 813,791	$ 798,436	$ 783,082	$ 767,727
Average Net Fixed Assets		$ 414,573	$ 821,468	$ 806,114	$ 790,759	$ 775,405

For PILs Calculation

UCC

		2015 Forecasted	2016 Forecasted	2017 Forecasted	2018 Forecasted	2019 Forecasted
Opening UCC		$ -	$ 776,940	$ 714,785	$ 657,602	$ 604,994
Capital Additions		$ 844,500	$ -	$ -	$ -	$ -
UCC Before Half Year Rule		$ 844,500	$ 776,940	$ 714,785	$ 657,602	$ 604,994
Half Year Rule (1/2 Additions - Disposals)		$ -	$ -	$ -	$ -	$ -
Reduced UCC		$ 844,500	$ 776,940	$ 714,785	$ 657,602	$ 604,994
CCA Rate Class	47					
CCA Rate	8%					
CCA		$ 67,560	$ 62,155	$ 57,183	$ 52,608	$ 48,400
Closing UCC		$ 776,940	$ 714,785	$ 657,602	$ 604,994	$ 556,594

Ontario Energy Board

Incremental Capital Module for 2015 Filers

VERSION 1.1

Applicant Name	**Niagara-on-the-Lake Hydro Inc.**
Service Territory Name	**Niagara-on-the-Lake**
Application Type	**IRM4**
LDC Licence Number	**ED-2002-0547**
Applied for Effective Date	**May 1 2015**
Stretch Factor Group	**III**
Stretch Factor Value	**0.30%**
Last COS Re-based Year	**2014**
Last COS OEB Application Number	**EB-2013-0155**
ICM Billing Determinants for Growth - Numerator	**2014 Re-Based Forecast**
ICM Billing Determinants for Growth - Denominator	**2013 Actual**

Ontario Energy Board

Incremental Capital Module for 2015 Filers

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Incremental Capital Module for 2015 Filers

Rate Class and Re-Based Billing Determinants & Rates

Select the appropriate Rate Groups and Rate Classes from the drop-down menus in Columns C and D respectively. Following your selection, all appropriate input cells will be shaded green. Please input the billing determinants and base distribution rates from your last cost of service based rate application.

Last COS Re-based Year	2014
Last COS OEB Application Number	EB-2013-0155

Rate Group	Rate Class	Fixed Metric	Vol Metric	Re-based Billed Customers or Connections	Re-based Billed kWh	Re-based Billed kW	Re-based Tariff Service Charge	Re-based Tariff Distribution Volumetric Rate kWh	Re-based Tariff Distribution Volumetric Rate kW
				A	B	C	D	E	F
RES	Residential	Customer	kWh	7,083	67,753,410		17.94	0.0126	
GSLT50	General Service Less Than 50 kW	Customer	kWh	1,291	37,260,698		37.28	0.0112	
GSGT50	General Service 50 to 4,999 kW	Customer	kW	125		201,178	266.42		2.1025
USL	Unmetered Scattered Load	Customer	kWh	22	240,322		20.05	0.0060	
SL	Street Lighting	Connection	kW	2,031		3,377	7.42		29.0338
NA	Rate Class 6	NA	NA						
NA	Rate Class 7	NA	NA						
NA	Rate Class 8	NA	NA						
NA	Rate Class 9	NA	NA						
NA	Rate Class 10	NA	NA						
NA	Rate Class 11	NA	NA						
NA	Rate Class 12	NA	NA						
NA	Rate Class 13	NA	NA						
NA	Rate Class 14	NA	NA						
NA	Rate Class 15	NA	NA						
NA	Rate Class 16	NA	NA						
NA	Rate Class 17	NA	NA						
NA	Rate Class 18	NA	NA						
NA	Rate Class 19	NA	NA						
NA	Rate Class 20	NA	NA						
NA	Rate Class 21	NA	NA						
NA	Rate Class 22	NA	NA						
NA	Rate Class 23	NA	NA						
NA	Rate Class 24	NA	NA						
NA	Rate Class 25	NA	NA						

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Removal of Rate Adders

Last COS Re-based Year	**2014**
Last COS OEB Application Number	**EB-2013-0155**

Rate Class	Re-based Tariff Service Charge A	Re-based Tariff Distribution Volumetric Rate kWh B	Re-based Tariff Distribution Volumetric Rate kW C	Service Charge Rate Adders D	Distribution Volumetric kWh Rate Adders E	Distribution Volumetric kW Rate Adders F
Residential	17.94	0.0126	0.0000	0.00	0.0000	0.0000
General Service Less Than 50 kW	37.28	0.0112	0.0000	0.00	0.0000	0.0000
General Service 50 to 4,999 kW	266.42	0.0000	2.1025	0.00	0.0000	0.0000
Unmetered Scattered Load	20.05	0.0060	0.0000	0.00	0.0000	0.0000
Street Lighting	7.42	0.0000	29.0338	0.00	0.0000	0.0000

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Calculated Re-Based Revenue From Rates

Last COS Re-based Year	**2014**
Last COS OEB Application Number	**EB-2013-0155**

Rate Class	Re-based Billed Customers or Connections A	Re-based Billed kWh B	Re-based Billed kW C	Re-based Base Service Charge D	Re-based Base Distribution Volumetric Rate kWh E	Re-based Base Distribution Volumetric Rate kW F	Service Charge Revenue *12	Distribution Volumetric Rate Revenue kWh H = B * E	Distribution Volumetric Rate Revenue kW I = C * F	Revenue Requirement from Rates I
Residential	7,083	67,753,410	0	17.94	0.0126	0.0000	1,524,899	853,693	0	2,378,592
General Service Less Than 50 kW	1,291	37,260,698	0	37.28	0.0112	0.0000	577,641	417,320	0	994,961
General Service 50 to 4,999 kW	125	0	201,178	266.42	0.0000	2.1025	399,348	0	422,976	822,324
Unmetered Scattered Load	22	240,322	0	20.05	0.0060	0.0000	5,224	1,442	0	6,666
Street Lighting	2,031	0	3,377	7.42	0.0000	29.0338	180,880	0	98,039	278,919
							2,687,993	1,272,455	521,015	4,481,462

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Detailed Re-Based Revenue From Rates

Last COS Re-based Year	**2014**
Last COS OEB Application Number	**EB-2013-0155**

Applicants Rate Base

				Last Rate Re-based Amount		
Average Net Fixed Assets						
Gross Fixed Assets - Re-based Opening	$	44,938,119	A			
Add: CWIP Re-based Opening	$	-	B			
Re-based Capital Additions	$	1,285,000	C			
Re-based Capital Disposals	-$	477,000	D			
Re-based Capital Retirements			E			
Deduct: CWIP Re-based Closing			F			
Gross Fixed Assets - Re-based Closing	$	45,746,119	G			
Average Gross Fixed Assets				$	45,342,119	H = (A + G) / 2
Accumulated Depreciation - Re-based Opening	$	23,010,427	I			
Re-based Depreciation Expense	$	1,005,631	J			
Re-based Disposals	-$	447,000	K			
Re-based Retirements			L			
Accumulated Depreciation - Re-based Closing	$	23,569,057	M			
Average Accumulated Depreciation				$	23,289,742	N = (I + M) / 2
Average Net Fixed Assets				**$**	**22,052,377**	O = H - N
Working Capital Allowance						
Working Capital Allowance Base	$	22,105,278	P			
Working Capital Allowance Rate		11.0%	Q			
Working Capital Allowance				**$**	**2,431,581**	R = P * Q
Rate Base				**$**	**24,483,958**	S = O + R
Return on Rate Base						
Deemed ShortTerm Debt %		4.00%	T	$	979,358	W = S * T
Deemed Long Term Debt %		56.00%	U	$	13,711,016	X = S * U
Deemed Equity %		40.00%	V	$	9,793,583	Y = S * V
Short Term Interest		2.11%	Z	$	20,664	AC = W * Z
Long Term Interest		4.96%	AA	$	680,095	AD = X * AA
Return on Equity		9.36%	AB	$	916,679	AE = Y * AB
Return on Rate Base				**$**	**1,617,439**	AF = AC + AD + AE
Distribution Expenses						
OM&A Expenses	$	2,155,262	AG			
Amortization	$	911,109	AH			
Ontario Capital Tax (F1.1 Z-Factor Tax Changes)	$	-	AI			
Grossed Up PILs (F1.1 Z-Factor Tax Changes)	$	32,470	AJ			
Low Voltage	$	-	AK			
Transformer Allowance	$	21,894	AL			
Property Tax	$	28,596	AM			
			AN			
			AO			
				$	**3,149,332**	AP = SUM (AG : AO)
Revenue Offsets						
Specific Service Charges	-$	76,330	AQ			
Late Payment Charges	-$	38,000	AR			
Other Distribution Income	-$	112,847	AS			
Other Income and Deductions	-$	55,700	AT	**-$**	**282,877**	AU = SUM (AQ : AT)
Revenue Requirement from Distribution Rates				**$**	**4,483,893**	AV = AF + AP + AU
Rate Classes Revenue						
Rate Classes Revenue - Total (B1.1 Re-based Revenue - Gen)				$	4,481,462	AW

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Load Actual - 2013 Actual

Rate Class	Fixed Metric	Vol Metric	Billed Customers or Connections A	Billed kWh B	Billed kW C	Base Service Charge D	Distribution Volumetric Rate kWh E	Distribution Volumetric Rate kW F	Service Charge Revenue G = A * D *	Distribution Volumetric Rate Revenue kWh H = B * E	Distribution Volumetric Rate Revenue kW I = C * F	Total Revenue by Rate Class J = G + H +
Residential	Customer	kWh	7,061	67,855,093	0	$17.94	$0.0126	$0.0000	$1,519,984	$854,974	$0	$2,374,959
General Service Less Than 50 kW	Customer	kWh	1,226	35,118,069	0	$37.28	$0.0112	$0.0000	$548,463	$393,322	$0	$941,786
General Service 50 to 4,999 kW	Customer	kW	127	79,438,754	202,224	$266.42	$0.0000	$2.1025	$404,426	$0	$425,176	$829,602
Unmetered Scattered Load	Customer	kWh	22	222,197	0	$20.05	$0.0060	$0.0000	$5,172	$1,333	$0	$6,505
Street Lighting	Connection	kW	1,981	1,167,738	3,238	$7.42	$0.0000	$29.0338	$176,406	$0	$94,014	$270,420
									$2,654,451	$1,249,630	$519,191	$4,423,271

Ontario Energy Board

Incremental Capital Module for 2015 Filers

This sheet is used to determine the applicants most current allocation of revenues (after the most recent revenue to cost ratio adjustment, if applicable) to be used to calculate the incremental capital rate riders.

Current Revenue from Rates

Rate Class	Fixed Metric	Vol Metric	Current Base Service Charge A	Current Base Distribution Volumetric Rate kWh B	Current Base Distribution Volumetric Rate kW C	Re-based Billed Customers or Connections D	Re-based Billed kWh E	Re-based Billed kW F	Current Base Service Charge Revenue G = A * D *12	Distribution Volumetric Rate kWh Revenue H = B * E	Distribution Volumetric Rate kW Revenue I = C * F	Total Current Base Revenue J = G + H + I	Service Charge % Total Revenue L = G / $K	Distribution Volumetric Rate % Total Revenue M = H / $K	Distribution Volumetric Rate % Total Revenue N = I / $K	Total % Revenue $K
Residential	Customer	kWh	17.94	0.0126		7,083	67,753,410	0	1,524,899	853,693	0	2,378,592	34.0%	19.0%	0.0%	53.1%
General Service Less Than 50 kW	Customer	kWh	37.28	0.0112		1,291	37,260,698	0	577,641	417,320	0	994,961	12.9%	9.3%	0.0%	22.2%
General Service 50 to 4,999 kW	Customer	kW	266.42		2.1025	125	0	201,178	399,348	0	422,976	822,324	8.9%	0.0%	9.4%	18.3%
Unmetered Scattered Load	Customer	kWh	20.05	0.0060		22	240,322	0	5,224	1,442	0	6,666	0.1%	0.0%	0.0%	0.1%
Street Lighting	Connection	kW	7.42		29.0338	2,031	0	3,377	180,880	0	98,039	278,919	4.0%	0.0%	2.2%	6.2%
									2,687,993	1,272,455	521,015	4,481,462 K	60.0%	28.4%	11.6%	100.0%

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Threshold Parameters

Price Cap Index

Price Escalator (GDP-IPI)	1.70%	
Less Productivity Factor	0.00%	
Less Stretch Factor	-0.30%	
Price Cap Index		**1.40%**

Growth

ICM Billing Determinants for Growth - Numerator : 2014 Re-Based Forecast	$4,481,462	A	
ICM Billing Determinants for Growth - Denominator : 2013 Actual	$4,423,271	B	
Growth	**1.32%**	C = A / B	

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Threshold Test

Year	**2014**	
Price Cap Index	**1.40%**	**A**
Growth	**1.32%**	**B**
Dead Band	**20%**	**C**
Average Net Fixed Assets		
Gross Fixed Assets Opening	$44,938,119	
Add: CWIP Opening	$ -	
Capital Additions	$ 1,285,000	
Capital Disposals	-$ 477,000	
Capital Retirements	$ -	
Deduct: CWIP Closing	$ -	
Gross Fixed Assets - Closing	$45,746,119	
Average Gross Fixed Assets	$45,342,119	
Accumulated Depreciation - Opening	$23,010,427	
Depreciation Expense	$ 1,005,631	**D**
Disposals	-$ 447,000	
Retirements	$ -	
Accumulated Depreciation - Closing	$23,569,057	
Average Accumulated Depreciation	$23,289,742	
Average Net Fixed Assets	$22,052,377	**E**
Working Capital Allowance		
Working Capital Allowance Base	$22,105,278	
Working Capital Allowance Rate	11%	
Working Capital Allowance	$ 2,431,581	**F**
Rate Base	**$24,483,958**	**G = E + F**
Depreciation	**D $ 1,005,631**	**H**
Threshold Test	**186.56%**	**I = 1 + (G / H) * (B + A * (1 + B)) + C**
Threshold CAPEX	$ 1,876,146	**J = H *I**

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Summary of Incremental Capital Projects (ICPs)

Calculation of Eligible Incremental Capital Amount

2015 Non-Discretionary Capital Budget (Including ICM Projects)		$3,827,000.00	**A**
Threshold CAPEX (as calculated on sheet E2.1)		$1,876,145.56	**B**
Eligible Incremental Capital Amount	=	$1,950,854.44	**C = A - B**

Summary of Proposed Incremental Capital Projects

Number of ICPs
1

Project ID #	Incremental Capital Non-Discretionary Project Description	Incremental Capital CAPEX	Amortization Expense	CCA
ICP 1	To replace one 25 mVA transformer at MTS#2 with a 50 mVA transformer	$2,577,000.00	$53,854.55	$206,160.00
	Total Proposed Incremental Capital CAPEX	$2,577,000.00	$53,854.55	$206,160.00

Total Incremental Capital Amount for ICM Rate Rider Calculation $1,950,854.44

Note: The total incremental capital amount for the ICM rate rider calculation cannot exceed the eligible incremental capital amount.

Ontario Energy Board

Incremental Capital Module for 2015 Filers

Incremental Capital Adjustment

Current Revenue Requirement

Current Revenue Requirement - Total			$4,483,893	**A**

Return on Rate Base

Incremental Capital CAPEX			$1,950,854	**B**
Depreciation Expense			$ 53,855	**C**
Incremental Capital CAPEX to be included in Rate Base			$1,897,000	**D = B - C**
Deemed ShortTerm Debt %	4.0%	**E**	$ 75,880	**G = D * E**
Deemed Long Term Debt %	56.0%	**F**	$1,062,320	**H = D * F**
Short Term Interest	2.11%	**I**	$ 1,601	**K = G * I**
Long Term Interest	4.96%	**J**	$ 52,693	**L = H * J**
Return on Rate Base - Interest			$ 54,294	**M = K + L**
Deemed Equity %	40.0%	**N**	$ 758,800	**P = D * N**
Return on Rate Base -Equity	9.36%	**O**	$ 71,024	**Q = P * O**
Return on Rate Base - Total			$ 125,318	**R = M + Q**

Amortization Expense

Amortization Expense - Incremental		**C**	$ 53,855	**S**

Grossed up PIL's

Regulatory Taxable Income		**O**	$ 71,024	**T**
Add Back Amortization Expense		**S**	$ 53,855	**U**
Deduct CCA			$ 206,160	**V**
Incremental Taxable Income			-$ 81,282	**W = T + U - V**
Current Tax Rate (F1.1 Z-Factor Tax Changes)	15.5%	**X**		
PIL's Before Gross Up			-$ 12,599	**Y = W * X**
Incremental Grossed Up PIL's			-$ 14,910	**Z = Y / (1 - X)**

Ontario Capital Tax

Incremental Capital CAPEX			$1,950,854	**AA**
Less : Available Capital Exemption (if any)			$ -	**AB**
Incremental Capital CAPEX subject to OCT			$1,950,854	**AC = AA - AB**
Ontario Capital Tax Rate (F1.1 Z-Factor Tax Changes)	0.000%	**AD**		
Incremental Ontario Capital Tax			$ -	**AE = AC * AD**

Incremental Revenue Requirement

Return on Rate Base - Total		**Q**	$ 125,318	**AF**
Amortization Expense - Total		**S**	$ 53,855	**AG**
Incremental Grossed Up PIL's		**Z**	-$ 14,910	**AH**
Incremental Ontario Capital Tax		**AE**	$ -	**AI**
Incremental Revenue Requirement			$ 164,263	**AJ = AF + AG + AH + AI**

Niagara-on-the-Lake Hydro Inc. **EB-2014-0097**

Incremental Revenue Requirement as calculated by ICM Workform and allocated by Transmission Connection Costs

Rate Class	Total Transmission Costs by Rate Class	Total % Costs by Rate Class	Allocation of Incremental Revenue Requirement	Billed kWh	Billed kW	kWh Volumetric Rate Rider	kW Volumetric Rate Rider
	From IRM Sheet 22 RTSR		*Total From Sheet E4.1 ICM Workform*	*From Sheet F1.1 ICM Workform*	*From Sheet F1.1 ICM Workform*		
RESIDENTIAL	$ 92,767.98	30.39%	$ 49,918.57	67,753,410	-	$ 0.0007	
GENERAL SERVICE LESS THAN 50 KW	$ 48,123.22	15.76%	$ 25,895.16	37,260,698	-	$ 0.0007	
GENERAL SERVICE 50 TO 4,999 KW	$ 162,866.33	53.35%	$ 87,638.58	-	201,178		$ 0.4356
UNMETERED SCATTERED LOAD	$ 326.23	0.11%	$ 175.54	240,322	-	$ 0.0007	
STREET LIGHTING	$ 1,180.10	0.39%	$ 635.02	-	3,377		$ 0.1881
Total	*$ 305,263.86*	*100.00%*	*$ 164,262.88*				
Checksum	*$ -*						