TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.1:

Reference(s): Tab 6F, Schedule 7-24

Table 2 shows Option 1 (performing reactive work on the feeder) is the same cost as Option 3 (doing the replacement work on a planned basis). Is this correct as the impression created in the evidence is that reactive work is more costly than planned work?

RESPONSE:

In the example provided, the cost of reactive repair only includes the cost of simply repairing the failed cable, and does not encompass other labour costs typically incurred in a reactive situation. Reactive work would also include other costs, such as dispatching a grid response crew to assess the outage root cause and perform switching operations to localize the fault and restore power. In addition, the lifecycle cost of continually performing reactive repairs, in this case splicing to repair cable faults, will be much higher than replacing the segment on the first fault as the reactive repair cost will be incurred multiple times before the cable reaches a point where the entire segment requires replacement to re-energize.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.2:

Reference(s): **Tab 6F, Schedule 7-24**

To break down $8,912.08 per segment costs into grounding, abandoning existing DB cable, switching, conductor stringing, primary risers, and pole framing and guying.

RESPONSE:

The electrical cost indicated for Option 5 is for an entire segment of 114 meters, consisting of three 38 meter spans. The breakdown of the electrical labour cost is as follows:

- Grounding and abandoning existing direct buried cable: $350.00
- Switching: $362.00
- Primary risers: $1,104.48
- Pole framing and guying: $7,095.60

Please note that Footnote 1 should not have included conductor stringing, because conductor stringing is part of the $350 per-span under material cost.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.3:

Reference(s):

Are secondary risers not included in THESL's response to EP IR 24? Or does THESL's example assume overhead secondaries?

RESPONSE:

Secondary distribution, which could include secondary risers, is not included in the costs in Table 2 for the reasons given in the response to part (c) of EP interrogatory 24 (Tab 6F, Schedule 7-24):

> “All costs do not include transformers or switchgear. Including these components would not provide a realistic picture of the associated costs since not all projects proposed by THESL require transformers or switchgear. To this end, only the common components of all projects have been included for the purposes of this analysis.”

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.4:

Reference(s): Tab 6F, Schedule 7-33 and 7-34

Provide a rough approximation of how many customers are fed off overhead vs underground primaries.

RESPONSE:

THESL has approximately 475,000 customers fed from overhead primary and approximately 243,000 customers fed from underground primary. Note that customers fed from the secondary network in the downtown area are included in the customer count for customers fed from underground primary.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.5:

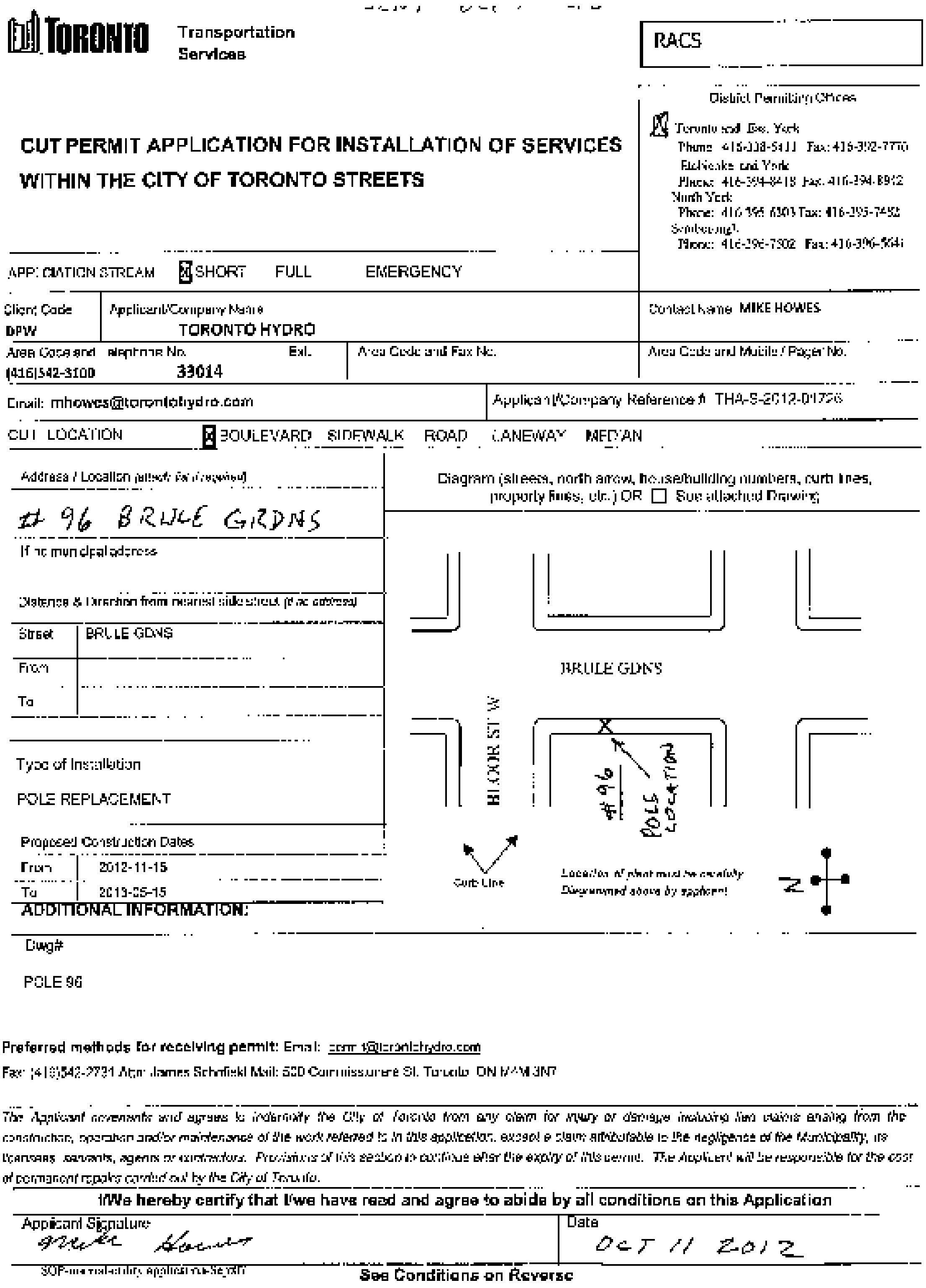
Reference(s): Tab 6F, Schedule 7-36

Give an example of the documentation that THESL has to submit to the City in respect of an overhead line that requires an application to the City for permission regarding poles and overhead conductors.

RESPONSE:

An example of the required documentation, defined as a Cut Permit Application – Short Stream, is provided below. Please note that even for large rebuild projects, individual cut permits must be submitted for each pole, so the attached example is indicative of all overhead rebuilds where there was existing overhead plant which is being replaced with new overhead plant.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION



TORONTO Transportation Services

RACS

District Permitting Offices

☒ Toronto and East York
Phone 416-338-5411 Fax: 416-392-7770
Etobicoke and York
Phone 416-394-8418 Fax: 416-394-8942
North York
Phone: 416-395-6303 Fax: 416-395-7458
Scarborough
Phone: 416-396-7302 Fax: 416-396-5641

CUT PERMIT APPLICATION FOR INSTALLATION OF SERVICES WITHIN THE CITY OF TORONTO STREETS

APPLICATION STREAM ☒ SHORT FULL EMERGENCY

Client Code: DPW

Applicant/Company Name: TORONTO HYDRO

Contact Name: MIKE HOWES

Area Code and Telephone No.: (416)542-3100 Ext. 33014

Area Code and Fax No.:

Area Code and Mobile / Pager No.:

Email: mhowes@torontohydro.com

Applicant/Company Reference #: THA-S-2012-01726

CUT LOCATION ☒ BOULEVARD SIDEWALK ROAD LANEWAY MEDIAN

Address / Location (attach list if required)

96 BRULE GRDNS

If no municipal address

Distance & Direction from nearest side street (if no address)

Street	BRULE GDNS
From	
To	

Type of Installation

POLE REPLACEMENT

Proposed Construction Dates

From	2012-11-15
To	2013-05-15

Diagram (streets, north arrow, house/building numbers, curb lines, property lines, etc.) OR ☐ See attached Drawing

Location of plant must be carefully Diagrammed above by applicant

ADDITIONAL INFORMATION:

Dwg#

POLE 96

Preferred methods for receiving permit: Email: comm t@torontohydro.com

Fax: (416)542-2731 Attn James Schofield Mail: 500 Commissioners St. Toronto ON M4M 3N7

The Applicant covenants and agrees to indemnify the City of Toronto from any claim for injury or damage including lien claims arising from the construction, operation and/or maintenance of the work referred to in this application, except a claim attributable to the negligence of the Municipality, its licensees, servants, agents or contractors. Provisions of this section to continue after the expiry of this permit. The Applicant will be responsible for the cost of permanent repairs carried out by the City of Toronto.

I/We hereby certify that I/we have read and agree to abide by all conditions on this Application

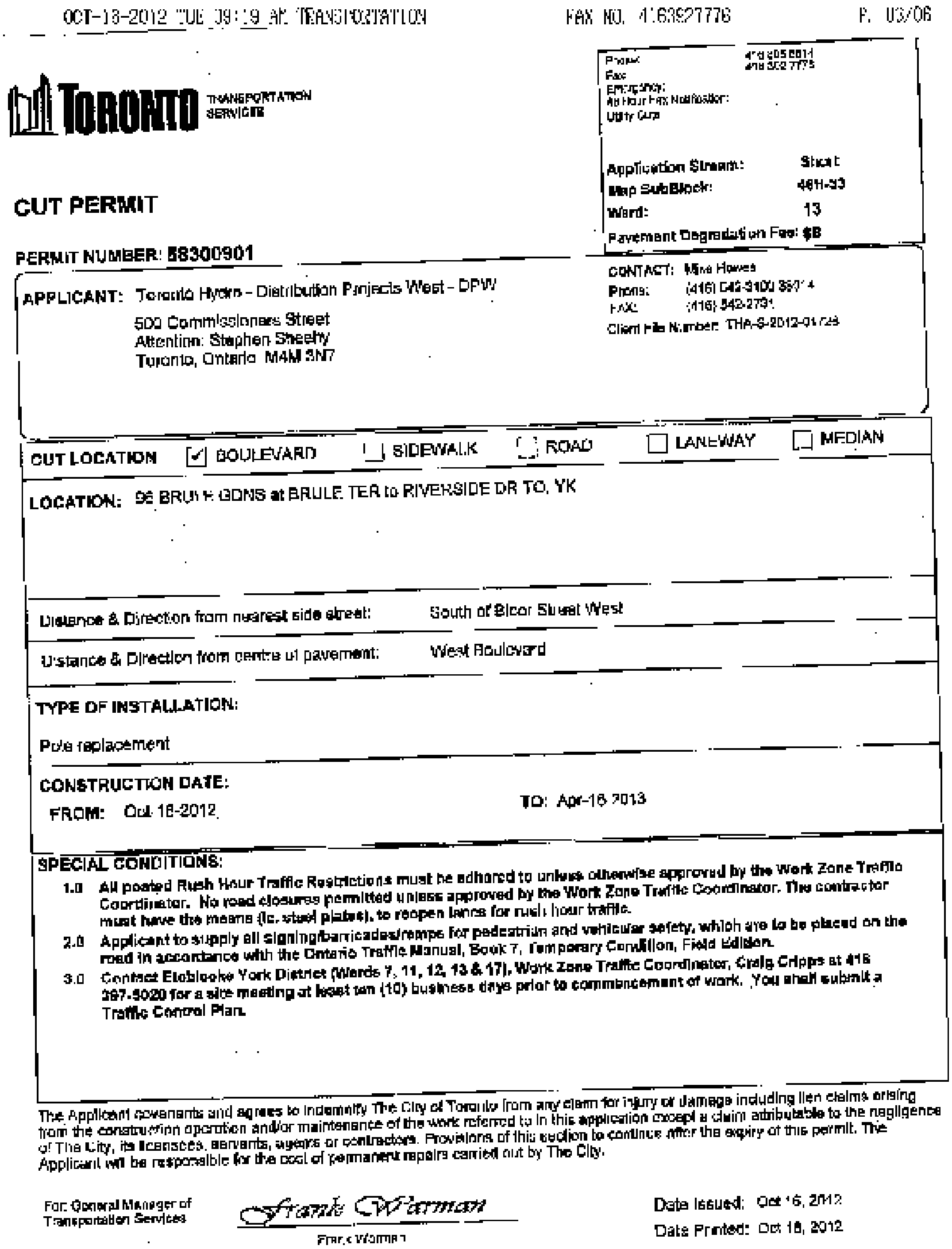
Applicant Signature: Mike Howes

Date: OCT 11 2012

SOP-municipal-utility application-Sept07

See Conditions on Reverse

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION



OCT-18-2012 TUE 09:19 AM TRANSPORTATION FAX NO. 4163927776 P. 03/06

TORONTO TRANSPORTATION SERVICES

Phone: 416 205 6014
Fax: 416 392 7775
Emergency:
48 Hour Fax Notification:
Utility Cuts

Application Stream: Street
Map SubBlock: 46H-33
Ward: 13
Pavement Degradation Fee: $0

CUT PERMIT

PERMIT NUMBER: 58300901

APPLICANT: Toronto Hydro - Distribution Projects West - DPW
500 Commissioners Street
Attention: Stephen Sheehy
Toronto, Ontario M4M 3N7

CONTACT: Mike Howes
Phone: (416) 542-3100 55714
FAX: (416) 542-2791
Client File Number: THA-S-2012-01729

CUT LOCATION ☑ BOULEVARD ☐ SIDEWALK ☐ ROAD ☐ LANEWAY ☐ MEDIAN

LOCATION: 96 BRULE GDNS at BRULE TER to RIVERSIDE DR TO, YK

Distance & Direction from nearest side street: South of Bloor Street West

Distance & Direction from centre of pavement: West Boulevard

TYPE OF INSTALLATION:
Pole replacement

CONSTRUCTION DATE:
FROM: Oct-18-2012 **TO:** Apr-18-2013

SPECIAL CONDITIONS:

1.0 **All posted Rush Hour Traffic Restrictions must be adhered to unless otherwise approved by the Work Zone Traffic Coordinator. No road closures permitted unless approved by the Work Zone Traffic Coordinator. The contractor must have the means (ie. steel plates), to reopen lanes for rush hour traffic.**

2.0 **Applicant to supply all signing/barricades/ramps for pedestrian and vehicular safety, which are to be placed on the road in accordance with the Ontario Traffic Manual, Book 7, Temporary Condition, Field Edition.**

3.0 **Contact Etobicoke York District (Wards 7, 11, 12, 13 & 17), Work Zone Traffic Coordinator, Craig Cripps at 416 397-5020 for a site meeting at least ten (10) business days prior to commencement of work. You shall submit a Traffic Control Plan.**

The Applicant covenants and agrees to indemnify The City of Toronto from any claim for injury or damage including lien claims arising from the construction operation and/or maintenance of the work referred to in this application except a claim attributable to the negligence of The City, its licensees, servants, agents or contractors. Provisions of this section to continue after the expiry of this permit. The Applicant will be responsible for the cost of permanent repairs carried out by The City.

For: General Manager of Transportation Services

Frank Warman
Frank Warman

Date Issued: Oct 16, 2012
Date Printed: Oct 18, 2012

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.6:

Reference(s): **Tab 6F, Schedule 7-39**

Regarding the chart on page 2 of the IRR, please provide cost breakdowns of the $57.1M and $66.14M estimates for OH and UG into reasonable components: Labour, equipment, material, and similar. Also note any major assumptions that have been used, (e.g., how many poles, average span, how many poles would be required for an "average subdivision").

RESPONSE:

Please note that as per the evidentiary update filed on October 31st, 2012, the total costs associated with Option 4 (Replace existing Rear Lot with U/G Front Lot) have been updated. In addition, the total costs associated with Option 3 (Replace existing Rear Lot with O/H Front Lot) have been corrected to account for errors with respect to the estimates used to derive total secondary installation costs. The cost breakdowns provided below are based on these updated and corrected amounts.

Option 3: Replace Existing Rear Lot with O/H Front Lot

Due to an error in calculating the total costs for Secondary Services, the revised cost for Option #3 is $34.15M and is broken down as follows:

- Material: $ 1,998,234,75
- Labour: $ 5,357,656.24
- Secondary Services: $26,790,750

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

The secondary service includes the following components:

- Per customer cost: $5,250
- Relocation of Standpipe and Relocation of Meter: $4,000
- Restoration: $1,000
- Service Wire: $250

Unit counts required to achieve the overhead installation option are as follows:

- Overhead Transformers: 217
- Overhead Switches: 120
- Poles: 430

Option 4: Replace Existing Rear Lot with U/G Front Lot

The updated cost for Option #4 is $60.8M and is broken down as follows:

- Material: $ 36,273,797
- Labour: $ 11,697,074
- Vehicle: $ 1,467,551
- Other: $ 11,361,578

The cost of installing new underground secondary services is embedded in the above cost break down and totals $19,962,936 based on an average cost of $3,912 per service. This average secondary service cost is further broken down as follows:

- Meter Base and Riser: $1,750
- Boring and Restoration: $1,712
- Cabling: $250
- Civil (tapbox): $200

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT1.7:

Reference(s): Tab 6F, Schedule 7-52

Number of poles for which THESL pays Bell a joint use fee.

RESPONSE:

THESL currently pays Bell a joint use fee for approximately 7,400 poles.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT1.8:

Reference(s): Tab 4, Schedule B2, Tables 2, 3 and 4 (Updated)

Provide a breakdown of each of the ten jobs in Table 4.

RESPONSE:

The tables below provide a breakdown and comparison of Option 2, Option 3 and Option 4 to Option 1 for the ten proposed Jobs.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21216

Business Case Element	**PV (in Millions)**
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$1.76**
Environmental Cost	$0.25
Emergency Repairs—Additional Tool Time	$1.51
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$146.02**
Cost of Customer Interruptions	$145.77
Environmental Cost	**$0.25**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$0.91**
2012 Project Cost	-
2013 Project Cost	**$1.02**
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.45**
2012 Project Cost	-
2013 Project Cost	**$0.51**
Option 1 versus Option 2 PV [CO1-CO2]	**-$144.26**
Option 1 versus Option 3 PV [CO1-CO3]	**$0.85**
Option 1 versus Option 4 PV [CO1-CO4]	**$1.30**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21217

Business Case Element	**PV (in Millions)**
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$1.54**
Environmental Cost	**$0.22**
Emergency Repairs—Additional Tool Time	$1.32
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$127.77**
Cost of Customer Interruptions	$127.55
Environmental Cost	**$0.22**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$0.43**
2012 Project Cost	-
2013 Project Cost	**$0.48**
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.21**
2012 Project Cost	-
2013 Project Cost	**$0.24**
Option 1 versus Option 2 PV [CO1-CO2]	**-$126.23**
Option 1 versus Option 3 PV [CO1-CO3]	**$1.11**
Option 1 versus Option 4 PV [CO1-CO4]	**$1.32**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21218

Business Case Element	**PV (in Millions)**
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$0.88**
Environmental Cost	**$0.12**
Emergency Repairs—Additional Tool Time	$0.76
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$73.01**
Cost of Customer Interruptions	$72.89
Environmental Cost	**$0.12**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$0.20**
2012 Project Cost	-
2013 Project Cost	**$0.22**
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.10**
2012 Project Cost	-
2013 Project Cost	**$0.11**
Option 1 versus Option 2 PV [CO1-CO2]	**-$72.13**
Option 1 versus Option 3 PV [CO1-CO3]	**$0.68**
Option 1 versus Option 4 PV [CO1-CO4]	**$0.78**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21219

Business Case Element	PV (in Millions)
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$1.10**
Environmental Cost	**$0.15**
Emergency Repairs—Additional Tool Time	$0.94
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$91.26**
Cost of Customer Interruptions	$91.11
Environmental Cost	**$0.15**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$0.55**
2012 Project Cost	**$0.58**
2013 Project Cost	-
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.27**
2012 Project Cost	**$0.27**
2013 Project Cost	-
Option 1 versus Option 2 PV [CO1-CO2]	**-$90.17**
Option 1 versus Option 3 PV [CO1-CO3]	**$0.55**
Option 1 versus Option 4 PV [CO1-CO4]	**$0.82**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21220

Business Case Element	PV (in Millions)
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$1.24**
Environmental Cost	**$0.17**
Emergency Repairs—Additional Tool Time	$1.07
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$103.43**
Cost of Customer Interruptions	$103.26
Environmental Cost	**$0.17**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$0.38**
2012 Project Cost	**$0.40**
2013 Project Cost	-
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.19**
2012 Project Cost	**$0.20**
2013 Project Cost	-
Option 1 versus Option 2 PV [CO1-CO2]	**-$102.19**
Option 1 versus Option 3 PV [CO1-CO3]	**$0.87**
Option 1 versus Option 4 PV [CO1-CO4]	**$1.06**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21221

Business Case Element	**PV (in Millions)**
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$3.00**
Environmental Cost	**$0.42**
Emergency Repairs—Additional Tool Time	$2.58
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$249.45**
Cost of Customer Interruptions	$249.03
Environmental Cost	**$0.42**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$1.15**
2012 Project Cost	**$1.22**
2013 Project Cost	-
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.58**
2012 Project Cost	**$0.61**
2013 Project Cost	-
Option 1 versus Option 2 PV [CO1-CO2]	**-$246.45**
Option 1 versus Option 3 PV [CO1-CO3]	**$1.85**
Option 1 versus Option 4 PV [CO1-CO4]	**$2.43**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 21222

Business Case Element	PV (in Millions)
Option 1 — Deferral of Repair and Replacement Activities Cost of Ownership [CO1]	**$2.27**
Environmental Cost	$0.32
Emergency Repairs—Additional Tool Time	$1.95
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$188.61**
Cost of Customer Interruptions	$188.29
Environmental Cost	**$0.32**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$1.09**
2012 Project Cost	**$1.16**
2013 Project Cost	-
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.55**
2012 Project Cost	**$0.58**
2013 Project Cost	-
Option 1 versus Option 2 PV [CO1-CO2]	**-$186.34**
Option 1 versus Option 3 PV [CO1-CO3]	**$1.18**
Option 1 versus Option 4 PV [CO1-CO4]	**$1.72**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 19798

Business Case Element	**PV (in Millions)**
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$2.10**
Environmental Cost	**$0.09**
Emergency Repairs—Additional Tool Time	**$2.01**
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$48.67**
Cost of Customer Interruptions	$48.59
Environmental Cost	**$0.08**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$3.98**
2012 Project Cost	-
2013 Project Cost	**$4.48**
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$1.99**
2012 Project Cost	-
2013 Project Cost	**$2.24**
Option 1 versus Option 2 PV [CO1-CO2]	**-$46.58**
Option 1 versus Option 3 PV [CO1-CO3]	**-$1.88**
Option 1 versus Option 4 PV [CO1-CO4]	**$0.11**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 19554

Business Case Element	**PV (in Millions)**
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$3.59**
Environmental Cost	**$0.50**
Emergency Repairs—Additional Tool Time	$3.09
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$298.12**
Cost of Customer Interruptions	$297.62
Environmental Cost	**$0.50**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$1.43**
2012 Project Cost	**$1.52**
2013 Project Cost	-
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$0.72**
2012 Project Cost	**$0.76**
2013 Project Cost	-
Option 1 versus Option 2 PV [CO1-CO2]	**-$294.54**
Option 1 versus Option 3 PV [CO1-CO3]	**$2.15**
Option 1 versus Option 4 PV [CO1-CO4]	**$2.87**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

Job Estimate 27177

Business Case Element	PV (in Millions)
Option 1 — Deferral of Repair and Replacement Activities **Cost of Ownership [CO1]**	**$4.46**
Environmental Cost	**$0.17**
Emergency Repairs—Additional Tool Time	**$4.28**
Option 2 – De-energize Feeders within Cable Chamber during work activities—Cost of Ownership **[CO2]**	**$103.43**
Cost of Customer Interruptions	$103.26
Environmental Cost	**$0.17**
Option 3— Repair Leakers and Cables Requiring Piece Outs When Performing Emergency Work –Present Value **[CO3]**	**$6.93**
2012 Project Cost	-
2013 Project Cost	**$7.80**
Option 4— Proactively Repair or Replace the Affected Cables – Present Value **[CO4]**	**$3.47**
2012 Project Cost	-
2013 Project Cost	**$3.90**
Option 1 versus Option 2 PV [CO1-CO2]	**-$98.98**
Option 1 versus Option 3 PV [CO1-CO3]	**-$2.48**
Option 1 versus Option 4 PV [CO1-CO4]	**$0.99**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.9:

Reference(s): Tab 6F, Schedule 1-30

Board Staff 30 Update (for updated 2012-2013 project list)

RESPONSE:

The table below updates the information originally provided in response to Board Staff Interrogatory 30 (Tab 6F, Schedule 1-30) to only include 2012-2013 projects.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

Feeder	**Number of Submersible Transformers on Feeder**	**Submersible Transformers Included in Job**	**Total Number of Submersible Transformer Outages 2006-2011**	**CI Contribution of Submersible Transformer Failures**	**CHI Contribution of Submersible Transformer Failures**	**Estimated Cost of Transformer Replacements in Job**
NY80M29	73	12	7	864	1,781	$133,270
SCNAR26M34	268	18	7	1,281	5,283	$199,905
NY55M8	81	31	6	1,410	3,734	$344,281
~~SCNT63M4~~	~~170~~	~~1~~	~~10~~	~~3,388~~	~~3,717~~	~~$11,106~~
SCNA47M14	115	37	7	429	1,610	$410,916
~~NY80M8~~	~~55~~	~~18~~	~~2~~	~~1,885~~	~~690~~	~~$199,905~~
~~NY85M6~~	~~4~~	~~4~~	~~2~~	~~1,247~~	~~243~~	~~$44,423~~
SCNA502M22	142	28	2	251	678	$310,963
SCNAH9M30	5	25	3	298	776	$277,646
NY85M4	35	30	7	3,868	2,243	$333,175
SCNA47M13	244	63	6	4,353	1,302	$699,667
NY51M7	72	1	4	2,440	533	$11,106
NY51M24	123	22	7	1,619	3,655	$244,328
NY80M30	68	30	0	0	0	$333,175
~~NY55M23~~	~~17~~	~~3~~	~~0~~	~~0~~	~~0~~	~~$33,317~~
~~NY85M7~~	~~46~~	~~41~~	~~6~~	~~2522~~	~~2,180~~	~~$455,339~~
SCNT63M12	233	121	15	4,356	6,340	$1,343,806
SCNT63M8	242	58	9	4,882	2,769	$644,138
SCNAE51M29	20	30	1	1,620	462	$333,175
~~NY80M9~~	~~5~~	~~3~~	~~0~~	~~0~~	~~0~~	~~$33,317~~
SCNT47M3	419	13	22	5,883	8,221	$144,376
NY51M3	69	54	3	266	426	$599,715
SCNA47M17	312	1	16	8,154	6,304	$11,106
SCNT47M1	242	16	8	3,001	3,027	$177,693
NYSS58F1	8	3	4	219	1,265	$33,317
NY55M21	42	3	2	168	382	$33,317

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.10:

Reference(s): Tab 6F, Schedule 1-31

Board Staff 31 Update (for updated 2012-2013 project list)

RESPONSE:

Appendices A and B to this schedule update the information originally provided in response to Board Staff Interrogatory 31 (Tab 6F, Schedule 1-31) to only include 2012-2013 projects.

Table 1

Job #	Job Title	Historical Reliability Performance 2006		Historical Reliability Performance 2007		Historical Reliability Performance 2008		Historical Reliability Performance 2009		Historical Reliability Performance 2010		Historical Reliability Performance 2011	
		CI	CHI	CI	CHI	CI	CHI	CI	CHI	CI	CHI	CI	CHI
1	Underground Rehabilitation of Feeder NY80M29	20096	2386.2	8294	9781.4	10000	1829.4	10473	3704.4	2430	1631.4	8255	2294.1
2	Underground Rehabilitation of Feeder SCNAR26M34	1230	3576.4	1687	3982.4	3592	8995.2	1183	7220.9	9101	5567.4	7560	14615.7
3	Underground Rehabilitation of Feeder NY55M8	2219	640.6	4388	1548.6	7595	21434.9	15626	6944.5	6227	3920.1	10734	8972.8
4	Underground Rehabilitation of Feeder YK35M10	9708	8575.3	13452	5959.8	12575	4410.0	12687	4099.1	3289	548.4	17593	2332.9
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~26083~~	~~18129.6~~	~~12452~~	~~9976.0~~	~~1504~~	~~3899.0~~	~~397~~	~~131.1~~	~~230~~	~~648.8~~	~~28124~~	~~22101.8~~
6	Underground Rehabilitation of Feeder SCNA47M14	5009	2395.0	6026	4910.7	3924	1226.2	4076	3364.7	14227	7657.6	11491	7586.0
7	Underground Rehabilitation of Feeder NY51M6	4678	4228.9	201	594.0	3015	2851.5	7099	6992.4	5131	2937.5	5408	8757.6
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~138~~	~~379.1~~	~~2036~~	~~1006.0~~	~~4010~~	~~1002.7~~	~~4622~~	~~5143.6~~	~~4616~~	~~3768.3~~	~~3004~~	~~2975.2~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~1196~~	~~1033.9~~	~~753~~	~~370.1~~	~~118~~	~~217.0~~	~~576~~	~~38.4~~	~~1831~~	~~782.2~~	~~5833~~	~~12279.2~~
10	Underground Rehabilitation of Feeder NY51M8	12195	2501.3	3179	481.9	5601	1154.2	6124	2786.9	2277	2634.0	2480	460.9
11	Underground Rehabilitation of Feeder SCNA502M22	11918	9346.4	27672	1755.8	3705	4775.5	19233	11978.6	7957	4184.7	20126	7458.2
12	Underground Rehabilitation of Feeder SCNAH9M30	5625	11707.0	80	356.6	5139	3820.8	8147	8174.7	6796	9441.2	2461	3238.7
13	Underground Rehabilitation of Feeder NY85M4	6802	2290.8	2243	1185.8	3261	470.1	524	129.1	26	84.1	2862	6235.2
14	Underground Rehabilitation of Feeder SCNA47M13	366	315.0	8142	2355.0	5692	2919.2	4889	2652.9	10328	11820.5	17600	12499.5
15	Underground Rehabilitation of Feeder NY80M2	7957	2924.5	21400	1176.4	4228	1898.7	2050	394.5	7966	5441.0	2809	1354.4
16	Underground Rehabilitation of Feeder NY51M7	2855	1815.2	4744	2243.7	14020	5422.4	5466	1782.7	9764	3676.3	3126	1728.4
17	Underground Rehabilitation of Feeder NY51M24	13331	8871.9	2086	2757.4	5141	2156.1	4337	3518.4	6265	5409.8	270	942.0
18	Underground Rehabilitation of Feeder NY80M30	9600	2859.7	460	647.0	7916	1695.7	7419	5809.5	9370	4961.8	442	255.7
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~4354~~	~~5488.3~~	~~3485~~	~~3904.9~~	~~37~~	~~120.1~~	~~115~~	~~455.1~~	~~6533~~	~~1367.2~~	~~3170~~	~~914.9~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~8722~~	~~2063.9~~	~~4271~~	~~5339.0~~	~~6324~~	~~5005.1~~	~~2726~~	~~1321.5~~	~~62~~	~~52.1~~	~~4793~~	~~3023.6~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	9160	2485.8	3607	6725.1	4391	4697.6	174	447.6	297	1376.3	2374	757.7
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~1788~~	~~2487.6~~	~~169~~	~~431.0~~	~~2871~~	~~1248.0~~	~~1228~~	~~1415.1~~	~~3414~~	~~772.7~~	~~85~~	~~35.8~~
23	Underground Rehabilitation of Feeder SCNT63M12	39452	28309.6	23815	22638.4	985	2658.3	4968	6925.4	1459	5414.3	18772	31571.0
24	Underground Rehabilitation of Feeder SCNT63M8	4582	1871.0	15468	6657.7	6986	3533.3	11495	5276.3	227	658.5	5313	5879.2
25	Underground Rehabilitation of Feeder SCNAE5-1M29	786	351.7	1477	119.2	2955	494.0	1934	3827.0	8032	4101.2	2676	1952.3
26	Underground Rehabilitation of Feeder NY53M25	13233	3779.8	21402	6421.1	260	854.4	19054	10647.6	563	1167.2	1393	919.9
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~1984~~	~~1295.2~~	~~104~~	~~203.6~~	~~1721~~	~~1292.7~~	~~3666~~	~~1662.2~~	~~141~~	~~422.6~~	~~927~~	~~816.7~~
28	Underground Rehabilitation of Feeder SCNT47M3	34440	21518.3	54593	20824.6	20841	8681.3	47262	21607.5	102883	45728.6	12750	8963.5
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~827~~	~~194.3~~	~~4217~~	~~2527.4~~	~~397~~	~~757.2~~	~~1963~~	~~432.5~~	~~1163~~	~~134.8~~	~~10042~~	~~7207.5~~
30	Underground Rehabilitation of Feeder NY51M3	45	62.3	2103	2722.5	259	265.9	150	454.2	4500	1420.2	1638	3012.8
31	Underground Rehabilitation of Feeder SCNA47M17	137	581.6	17982	6314.2	9360	10051.7	7260	1916.2	7740	3305.4	3303	665.4
32	Underground Rehabilitation of Feeder NY85M31	1376	2722.2	1917	494.3	1048	34.9333	1	2.716667	12	23.2	517	58.31667
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~70469~~	~~39422.5~~	~~3893~~	~~1750.0~~	~~13067~~	~~12822.7~~	~~7099~~	~~941.1~~	~~4814~~	~~1534.0~~	~~8992~~	~~6298.1~~
34	Underground Rehabilitation of Feeder SCNT47M1	1277	2306.1	26818	5632.0	14377	8393.7	6436	3492.6	11039	7162.5	2151	142.6
35	Underground Rehabilitation of Feeder NY55M21	1413	3549.92	2568	617.483	1297	1005.22	844	752.9333	1254	716.2	189	380.7
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	10793	14196.5	4055	2379.4	8005	6655.3	2191	1825.2	3359	3380.0	10731	6601.7

Table 2

Job #	Job Title	Contributions to Feeder CI in 2006			Contributions to Feeder CHI in 2006		
		Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers	Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers
1	Underground Rehabilitation of Feeder NY80M29	20.0	6196.0	280.0	28.0	154.9	365.2
2	Underground Rehabilitation of Feeder SCNAR26M34	1165.0	0.0	29.0	3287.4	0.0	188.8
3	Underground Rehabilitation of Feeder NY55M8	255.0	0.0	0.0	506.3	0.0	0.0
4	Underground Rehabilitation of Feeder YK35M10	4400.0	0.0	0.0	4913.3	0.0	0.0
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~11338.0~~	~~1403.0~~	~~351.0~~	~~5010.3~~	~~2954.7~~	~~294.6~~
6	Underground Rehabilitation of Feeder SCNA47M14	130.0	0.0	10.0	340.3	0.0	67.0
7	Underground Rehabilitation of Feeder NY51M6	183.0	2470.0	0.0	426.1	102.9	0.0
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~110.0~~	~~0.0~~	~~0.0~~	~~336.2~~	~~0.0~~	~~0.0~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
10	Underground Rehabilitation of Feeder NY51M8	0.0	0.0	0.0	0.0	0.0	0.0
11	Underground Rehabilitation of Feeder SCNA502M22	6780.0	1724.0	0.0	9173.3	116.2	0.0
12	Underground Rehabilitation of Feeder SCNAH9M30	2093.0	0.0	0.0	3919.6	0.0	0.0
13	Underground Rehabilitation of Feeder NY85M4	2179.0	4214.0	0.0	354.1	873.8	0.0
14	Underground Rehabilitation of Feeder SCNA47M13	288.0	0.0	78.0	244.8	0.0	70.2
15	Underground Rehabilitation of Feeder NY80M2	2952.0	0.0	0.0	579.5	0.0	0.0
16	Underground Rehabilitation of Feeder NY51M7	0.0	0.0	0.0	0.0	0.0	0.0
17	Underground Rehabilitation of Feeder NY51M24	5.0	1665.0	317.0	2.3	1632.2	1149.6
18	Underground Rehabilitation of Feeder NY80M30	0.0	3636.0	0.0	0.0	121.2	0.0
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~1248.0~~	~~0.0~~	~~0.0~~	~~985.6~~	~~0.0~~	~~0.0~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	2987.0	0.0	0.0	1397.5	0.0	0.0
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~1732.0~~	~~0.0~~	~~0.0~~	~~2247.9~~	~~0.0~~	~~0.0~~
23	Underground Rehabilitation of Feeder SCNT63M12	0.0	1000.0	388.0	0.0	2087.5	704.4
24	Underground Rehabilitation of Feeder SCNT63M8	499.0	0.0	180.0	1458.6	0.0	129.8
25	Underground Rehabilitation of Feeder SCNAE5-1M29	0.0	0.0	0.0	0.0	0.0	0.0
26	Underground Rehabilitation of Feeder NY53M25	84.0	0.0	848.0	33.3	0.0	1597.0
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
28	Underground Rehabilitation of Feeder SCNT47M3	6960.0	13360.0	685.0	16049.3	1964.4	1080.7
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
30	Underground Rehabilitation of Feeder NY51M3	45.0	0.0	0.0	62.3	0.0	0.0
31	Underground Rehabilitation of Feeder SCNA47M17	80.0	0.0	31.0	332.0	0.0	171.5
32	Underground Rehabilitation of Feeder NY85M31	688.0	0.0	0.0	653.6	0.0	0.0
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~3750.0~~	~~1813.0~~	~~17.0~~	~~17428.4~~	~~60.4~~	~~254.2~~
34	Underground Rehabilitation of Feeder SCNT47M1	0.0	950.0	156.0	0.0	1725.7	258.0
35	Underground Rehabilitation of Feeder NY55M21	0.0	0.0	0.0	0.0	0.0	0.0
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	0.0	0.0	119.0	0.0	0.0	299.7

Table 2

Job #	Job Title	Contributions to Feeder CI in 2007			Contributions to Feeder CHI in 2007		
		Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers	Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers
1	Underground Rehabilitation of Feeder NY80M29	4598.0	0.0	208.0	6725.3	0.0	580.9
2	Underground Rehabilitation of Feeder SCNAR26M34	147.0	1470.0	0.0	1348.3	2552.5	0.0
3	Underground Rehabilitation of Feeder NY55M8	2659.0	0.0	0.0	463.2	0.0	0.0
4	Underground Rehabilitation of Feeder YK35M10	0.0	0.0	0.0	0.0	0.0	0.0
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~11581.0~~	~~0.0~~	~~238.0~~	~~8563.7~~	~~0.0~~	~~228.7~~
6	Underground Rehabilitation of Feeder SCNA47M14	300.0	417.0	60.0	620.0	465.4	154.0
7	Underground Rehabilitation of Feeder NY51M6	30.0	0.0	105.0	68.0	0.0	342.0
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~48.0~~	~~0.0~~	~~0.0~~	~~220.8~~	~~0.0~~	~~0.0~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~576.0~~	~~0.0~~	~~0.0~~	~~31.0~~	~~0.0~~	~~0.0~~
10	Underground Rehabilitation of Feeder NY51M8	0.0	0.0	0.0	0.0	0.0	0.0
11	Underground Rehabilitation of Feeder SCNA502M22	22244.0	0.0	0.0	451.4	0.0	0.0
12	Underground Rehabilitation of Feeder SCNAH9M30	0.0	0.0	0.0	0.0	0.0	0.0
13	Underground Rehabilitation of Feeder NY85M4	930.0	0.0	1220.0	31.0	0.0	939.7
14	Underground Rehabilitation of Feeder SCNA47M13	1470.0	0.0	4172.0	1270.2	0.0	751.5
15	Underground Rehabilitation of Feeder NY80M2	0.0	0.0	0.0	0.0	0.0	0.0
16	Underground Rehabilitation of Feeder NY51M7	40.0	0.0	0.0	66.0	0.0	0.0
17	Underground Rehabilitation of Feeder NY51M24	1665.0	30.0	0.0	2216.1	55.5	0.0
18	Underground Rehabilitation of Feeder NY80M30	244.0	0.0	0.0	39.7	0.0	0.0
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~0.0~~	~~0.0~~	~~290.0~~	~~0.0~~	~~0.0~~	~~500.2~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	3545.0	0.0	0.0	6650.9	0.0	0.0
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~84.0~~	~~0.0~~	~~84.0~~	~~280.0~~	~~0.0~~	~~148.2~~
23	Underground Rehabilitation of Feeder SCNT63M12	19336.0	3000.0	15.0	16717.7	4825.0	133.6
24	Underground Rehabilitation of Feeder SCNT63M8	360.0	3860.0	310.0	761.8	128.7	612.7
25	Underground Rehabilitation of Feeder SCNAE5-1M29	0.0	0.0	0.0	0.0	0.0	0.0
26	Underground Rehabilitation of Feeder NY53M25	0.0	0.0	156.0	0.0	0.0	520.9
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
28	Underground Rehabilitation of Feeder SCNT47M3	21923.0	0.0	2784.0	6609.3	0.0	1942.6
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~650.0~~	~~1025.0~~	~~0.0~~	~~791.5~~	~~877.4~~	~~0.0~~
30	Underground Rehabilitation of Feeder NY51M3	45.0	0.0	0.0	99.0	0.0	0.0
31	Underground Rehabilitation of Feeder SCNA47M17	8129.0	0.0	2941.0	1709.1	0.0	1239.2
32	Underground Rehabilitation of Feeder NY85M31	0.0	0.0	0.0	0.0	0.0	0.0
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~52.0~~	~~0.0~~	~~0.0~~	~~122.6~~	~~0.0~~	~~0.0~~
34	Underground Rehabilitation of Feeder SCNT47M1	0.0	0.0	15.0	0.0	0.0	131.3
35	Underground Rehabilitation of Feeder NY55M21	720.0	0.0	0.0	84.0	0.0	0.0
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	634.0	0.0	15.0	237.7	0.0	24.0

Table 2

Job #	Job Title	Contributions to Feeder CI in 2008			Contributions to Feeder CHI in 2008		
		Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers	Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers
1	Underground Rehabilitation of Feeder NY80M29	156.0	0.0	230.0	264.6	0.0	223.2
2	Underground Rehabilitation of Feeder SCNAR26M34	100.0	0.0	0.0	235.8	0.0	0.0
3	Underground Rehabilitation of Feeder NY55M8	33.0	0.0	110.0	78.1	0.0	244.8
4	Underground Rehabilitation of Feeder YK35M10	2302.0	0.0	0.0	268.2	0.0	0.0
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
6	Underground Rehabilitation of Feeder SCNA47M14	1980.0	0.0	140.0	393.8	0.0	529.7
7	Underground Rehabilitation of Feeder NY51M6	1586.0	0.0	0.0	613.9	0.0	0.0
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~0.0~~	~~0.0~~	~~75.0~~	~~0.0~~	~~0.0~~	~~187.5~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
10	Underground Rehabilitation of Feeder NY51M8	0.0	0.0	0.0	0.0	0.0	0.0
11	Underground Rehabilitation of Feeder SCNA502M22	0.0	0.0	0.0	0.0	0.0	0.0
12	Underground Rehabilitation of Feeder SCNAH9M30	0.0	0.0	255.0	0.0	0.0	610.3
13	Underground Rehabilitation of Feeder NY85M4	0.0	0.0	2331.0	0.0	0.0	439.1
14	Underground Rehabilitation of Feeder SCNA47M13	1059.0	0.0	73.0	1879.1	0.0	146.1
15	Underground Rehabilitation of Feeder NY80M2	0.0	0.0	0.0	0.0	0.0	0.0
16	Underground Rehabilitation of Feeder NY51M7	7054.0	0.0	0.0	2021.2	0.0	0.0
17	Underground Rehabilitation of Feeder NY51M24	21.0	1665.0	435.0	12.5	305.3	291.3
18	Underground Rehabilitation of Feeder NY80M30	5913.0	0.0	0.0	898.0	0.0	0.0
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	0.0	3400.0	783.0	0.0	3950.6	519.5
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~2859.0~~	~~0.0~~	~~0.0~~	~~1197.8~~	~~0.0~~	~~0.0~~
23	Underground Rehabilitation of Feeder SCNT63M12	150.0	172.0	319.0	385.0	101.9	611.4
24	Underground Rehabilitation of Feeder SCNT63M8	2201.0	4010.0	0.0	576.5	1604.7	0.0
25	Underground Rehabilitation of Feeder SCNAE5-1M29	0.0	0.0	1620.0	0.0	0.0	462.4
26	Underground Rehabilitation of Feeder NY53M25	110.0	0.0	0.0	614.2	0.0	0.0
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~1473.0~~	~~0.0~~	~~0.0~~	~~695.8~~	~~0.0~~	~~0.0~~
28	Underground Rehabilitation of Feeder SCNT47M3	4342.0	0.0	745.0	3776.5	0.0	1008.4
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~87.0~~	~~150.0~~	~~0.0~~	~~362.7~~	~~242.5~~	~~0.0~~
30	Underground Rehabilitation of Feeder NY51M3	0.0	0.0	30.0	0.0	0.0	70.2
31	Underground Rehabilitation of Feeder SCNA47M17	105.0	5682.0	2445.0	369.8	5663.1	2235.7
32	Underground Rehabilitation of Feeder NY85M31	0.0	0.0	0.0	0.0	0.0	0.0
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~8522.0~~	~~0.0~~	~~105.0~~	~~9247.3~~	~~0.0~~	~~356.5~~
34	Underground Rehabilitation of Feeder SCNT47M1	482.0	0.0	2235.0	1337.8	0.0	1743.1
35	Underground Rehabilitation of Feeder NY55M21	1232.0	0.0	0.0	860.3	0.0	0.0
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	577.0	577.0	262.0	1366.4	86.6	1294.5

Table 2

Job #	Job Title	Contributions to Feeder CI in 2009			Contributions to Feeder CHI in 2009		
		Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers	Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers
1	Underground Rehabilitation of Feeder NY80M29	6356.0	0.0	110.0	618.7	0.0	500.0
2	Underground Rehabilitation of Feeder SCNAR26M34	580.0	0.0	591.0	3880.7	0.0	3328.4
3	Underground Rehabilitation of Feeder NY55M8	2.0	0.0	1.0	39.9	0.0	3.3
4	Underground Rehabilitation of Feeder YK35M10	0.0	0.0	0.0	0.0	0.0	0.0
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~0.0~~	~~0.0~~	~~396.0~~	~~0.0~~	~~0.0~~	~~126.6~~
6	Underground Rehabilitation of Feeder SCNA47M14	702.0	0.0	0.0	2463.4	0.0	0.0
7	Underground Rehabilitation of Feeder NY51M6	6816.0	0.0	0.0	3951.4	0.0	0.0
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~74.0~~	~~0.0~~	~~0.0~~	~~249.2~~	~~0.0~~	~~0.0~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
10	Underground Rehabilitation of Feeder NY51M8	0.0	0.0	0.0	0.0	0.0	0.0
11	Underground Rehabilitation of Feeder SCNA502M22	11494.0	0.0	0.0	6576.3	0.0	0.0
12	Underground Rehabilitation of Feeder SCNAH9M30	7939.0	0.0	0.0	7315.3	0.0	0.0
13	Underground Rehabilitation of Feeder NY85M4	20.0	0.0	0.0	46.7	0.0	0.0
14	Underground Rehabilitation of Feeder SCNA47M13	592.0	0.0	0.0	2352.7	0.0	0.0
15	Underground Rehabilitation of Feeder NY80M2	0.0	0.0	0.0	0.0	0.0	0.0
16	Underground Rehabilitation of Feeder NY51M7	275.0	0.0	0.0	541.6	0.0	0.0
17	Underground Rehabilitation of Feeder NY51M24	197.0	0.0	352.0	372.8	0.0	404.7
18	Underground Rehabilitation of Feeder NY80M30	0.0	0.0	0.0	0.0	0.0	0.0
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~1467.0~~	~~0.0~~	~~0.0~~	~~1173.8~~	~~0.0~~	~~0.0~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	0.0	0.0	0.0	0.0	0.0	0.0
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~0.0~~	~~0.0~~	~~1228.0~~	~~0.0~~	~~0.0~~	~~1415.1~~
23	Underground Rehabilitation of Feeder SCNT63M12	300.0	3338.0	785.0	1234.2	1248.1	3216.3
24	Underground Rehabilitation of Feeder SCNT63M8	174.0	3240.0	140.0	977.3	304.6	714.0
25	Underground Rehabilitation of Feeder SCNAE5-1M29	3.0	337.0	0.0	0.3	2653.3	0.0
26	Underground Rehabilitation of Feeder NY53M25	14031.0	0.0	806.0	8011.2	0.0	1451.7
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~1400.0~~	~~0.0~~	~~0.0~~	~~694.8~~	~~0.0~~	~~0.0~~
28	Underground Rehabilitation of Feeder SCNT47M3	3990.0	7280.0	229.0	380.0	1280.9	415.8
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
30	Underground Rehabilitation of Feeder NY51M3	150.0	0.0	0.0	454.2	0.0	0.0
31	Underground Rehabilitation of Feeder SCNA47M17	190.0	0.0	1590.0	419.3	0.0	542.5
32	Underground Rehabilitation of Feeder NY85M31	0.0	0.0	0.0	0.0	0.0	0.0
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~5286.0~~	~~0.0~~	~~0.0~~	~~850.5~~	~~0.0~~	~~0.0~~
34	Underground Rehabilitation of Feeder SCNT47M1	344.0	2141.0	375.0	698.6	1251.8	545.3
35	Underground Rehabilitation of Feeder NY55M21	628.0	0.0	168.0	633.8	0.0	381.6
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	0.0	0.0	45.0	0.0	0.0	206.0

Table 2

Job #	Job Title	Contributions to Feeder CI in 2010			Contributions to Feeder CHI in 2010		
		Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers	Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers
1	Underground Rehabilitation of Feeder NY80M29	0.0	0.0	0.0	0.0	0.0	0.0
2	Underground Rehabilitation of Feeder SCNAR26M34	410.0	2.0	0.0	2666.9	0.1	0.0
3	Underground Rehabilitation of Feeder NY55M8	5492.0	0.0	394.0	2247.4	0.0	1050.4
4	Underground Rehabilitation of Feeder YK35M10	0.0	1788.0	0.0	0.0	150.8	0.0
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~0.0~~	~~0.0~~	~~15.0~~	~~0.0~~	~~0.0~~	~~21.8~~
6	Underground Rehabilitation of Feeder SCNA47M14	7807.0	0.0	94.0	1055.7	0.0	163.9
7	Underground Rehabilitation of Feeder NY51M6	2839.0	0.0	30.0	2001.6	0.0	178.8
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~3222.0~~	~~0.0~~	~~0.0~~	~~1117.5~~	~~0.0~~	~~0.0~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~576.0~~	~~0.0~~	~~1240.0~~	~~470.4~~	~~0.0~~	~~164.0~~
10	Underground Rehabilitation of Feeder NY51M8	30.0	0.0	204.0	138.8	0.0	331.9
11	Underground Rehabilitation of Feeder SCNA502M22	3815.0	0.0	0.0	127.6	0.0	0.0
12	Underground Rehabilitation of Feeder SCNAH9M30	148.0	0.0	0.0	542.7	0.0	0.0
13	Underground Rehabilitation of Feeder NY85M4	2.0	0.0	0.0	10.1	0.0	0.0
14	Underground Rehabilitation of Feeder SCNA47M13	0.0	0.0	15.0	0.0	0.0	161.5
15	Underground Rehabilitation of Feeder NY80M2	2020.0	0.0	0.0	4191.3	0.0	0.0
16	Underground Rehabilitation of Feeder NY51M7	4825.0	0.0	0.0	465.8	0.0	0.0
17	Underground Rehabilitation of Feeder NY51M24	1297.0	108.0	0.0	2885.7	295.2	0.0
18	Underground Rehabilitation of Feeder NY80M30	7188.0	1720.0	0.0	2991.6	401.3	0.0
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~4837.0~~	~~0.0~~	~~0.0~~	~~1193.5~~	~~0.0~~	~~0.0~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	60.0	0.0	0.0	793.0	0.0	0.0
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~0.0~~	~~0.0~~	~~1200.0~~	~~0.0~~	~~0.0~~	~~602.0~~
23	Underground Rehabilitation of Feeder SCNT63M12	699.0	250.0	90.0	2491.7	1637.5	204.0
24	Underground Rehabilitation of Feeder SCNT63M8	200.0	0.0	10.0	534.0	0.0	28.5
25	Underground Rehabilitation of Feeder SCNAE5-1M29	3964.0	0.0	0.0	2332.4	0.0	0.0
26	Underground Rehabilitation of Feeder NY53M25	6.0	0.0	0.0	22.7	0.0	0.0
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
28	Underground Rehabilitation of Feeder SCNT47M3	300.0	5194.0	506.0	712.5	1745.9	1279.6
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~50.0~~	~~0.0~~	~~0.0~~	~~1.7~~	~~0.0~~	~~0.0~~
30	Underground Rehabilitation of Feeder NY51M3	141.0	0.0	236.0	379.8	0.0	356.0
31	Underground Rehabilitation of Feeder SCNA47M17	330.0	300.0	120.0	1233.5	525.0	517.0
32	Underground Rehabilitation of Feeder NY85M31	12.0	0.0	0.0	29.6	0.0	0.0
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~2901.0~~	~~0.0~~	~~0.0~~	~~1208.5~~	~~0.0~~	~~0.0~~
34	Underground Rehabilitation of Feeder SCNT47M1	5512.0	11.0	0.0	1463.2	1.1	0.0
35	Underground Rehabilitation of Feeder NY55M21	189.0	0.0	0.0	380.7	0.0	0.0
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	42.0	0.0	0.0	116.5	0.0	0.0

Table 2

Job #	Job Title	Contributions to Feeder CI in 2011			Contributions to Feeder CHI in 2011		
		Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers	Primary Cable	Air- insulated Pad-mounted and Air insulated Vault mounted Switchgear	Submersible Transformers
1	Underground Rehabilitation of Feeder NY80M29	3386.0	0.0	36.0	499.2	0.0	112.2
2	Underground Rehabilitation of Feeder SCNAR26M34	1322.0	4668.0	100.0	6744.8	7198.1	574.8
3	Underground Rehabilitation of Feeder NY55M8	2412.0	0.0	165.0	584.1	0.0	924.5
4	Underground Rehabilitation of Feeder YK35M10	0.0	0.0	0.0	0.0	0.0	0.0
~~5~~	~~Underground Rehabilitation of Feeder SCNT63M4~~	~~10795.0~~	~~2346.0~~	~~0.0~~	~~7597.5~~	~~3922.3~~	~~0.0~~
6	Underground Rehabilitation of Feeder SCNA47M14	5189.0	0.0	125.0	5123.1	0.0	695.3
7	Underground Rehabilitation of Feeder NY51M6	2052.0	3037.0	0.0	2633.7	4892.7	0.0
~~8~~	~~Underground Rehabilitation of Feeder NY80M8~~	~~2887.0~~	~~0.0~~	~~0.0~~	~~1644.5~~	~~0.0~~	~~0.0~~
~~9~~	~~Underground Rehabilitation of Feeder NY85M6~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
10	Underground Rehabilitation of Feeder NY51M8	30.0	0.0	2281.0	135.2	0.0	82.3
11	Underground Rehabilitation of Feeder SCNA502M22	14501.0	0.0	0.0	7177.0	0.0	0.0
12	Underground Rehabilitation of Feeder SCNAH9M30	20.0	0.0	0.0	38.5	0.0	0.0
13	Underground Rehabilitation of Feeder NY85M4	16.0	0.0	0.0	293.9	0.0	0.0
14	Underground Rehabilitation of Feeder SCNA47M13	13298.0	0.0	15.0	8729.4	0.0	172.8
15	Underground Rehabilitation of Feeder NY80M2	2700.0	2.0	0.0	725.0	14.5	0.0
16	Underground Rehabilitation of Feeder NY51M7	0.0	0.0	0.0	0.0	0.0	0.0
17	Underground Rehabilitation of Feeder NY51M24	2.0	40.0	205.0	0.5	111.8	779.3
18	Underground Rehabilitation of Feeder NY80M30	349.0	0.0	0.0	68.5	0.0	0.0
~~19~~	~~Underground Rehabilitation of Feeder NY55M23~~	~~99.0~~	~~0.0~~	~~0.0~~	~~255.3~~	~~0.0~~	~~0.0~~
~~20~~	~~Underground Rehabilitation of Feeder NY85M24~~	~~1247.0~~	~~0.0~~	~~130.0~~	~~1559.2~~	~~0.0~~	~~374.6~~
21	Underground Rehabilitation of Feeder SCNAE5-2M3	0.0	0.0	0.0	0.0	0.0	0.0
~~22~~	~~Underground Rehabilitation of Feeder NY85M7~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
23	Underground Rehabilitation of Feeder SCNT63M12	0.0	0.0	115.0	0.0	0.0	57.7
24	Underground Rehabilitation of Feeder SCNT63M8	0.0	5297.0	0.0	0.0	5862.8	0.0
25	Underground Rehabilitation of Feeder SCNAE5-1M29	259.0	0.0	0.0	1831.5	0.0	0.0
26	Underground Rehabilitation of Feeder NY53M25	1063.0	0.0	0.0	338.8	0.0	0.0
~~27~~	~~Underground Rehabilitation of Feeder NY80M9~~	~~0.0~~	~~800.0~~	~~0.0~~	~~0.0~~	~~231.7~~	~~0.0~~
28	Underground Rehabilitation of Feeder SCNT47M3	0.0	0.0	0.0	0.0	0.0	0.0
~~29~~	~~Underground Rehabilitation of Feeder SCNAH9M23~~	~~3901.0~~	~~0.0~~	~~0.0~~	~~3290.1~~	~~0.0~~	~~0.0~~
30	Underground Rehabilitation of Feeder NY51M3	0.0	0.0	0.0	0.0	0.0	0.0
31	Underground Rehabilitation of Feeder SCNA47M17	40.0	0.0	0.0	520.0	0.0	0.0
32	Underground Rehabilitation of Feeder NY85M31	497.0	0.0	0.0	58.8	0.0	0.0
~~33~~	~~Underground Rehabilitation of Feeder SCNA502M21~~	~~8965.0~~	~~0.0~~	~~0.0~~	~~6252.2~~	~~0.0~~	~~0.0~~
34	Underground Rehabilitation of Feeder SCNT47M1	2141.0	10.0	0.0	107.1	35.6	0.0
35	Underground Rehabilitation of Feeder NY55M21	233.0	0.0	0.0	860.2	0.0	0.0
36	Underground Rehabilitation of Feeders NY85M1, NY85M9 and NYSS58F1	1.0	0.0	12.0	6.9	0.0	126.2

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.11:

Reference(s): Tab 6F, Schedule 11-33

VECC 33 Update (for updated 2012-2013 project list)

RESPONSE:

The table in Appendix A updates the information originally provided in response to VECC Interrogatory 33 (Tab 6F, Schedule 11-33) to only include 2012-2013 projects.

Table 1

Job #	Feeder Name	Unplanned Sustained Outages					Historical Reliability Performance 2007		Historical Reliability Performance 2008		Historical Reliability Performance 2009		Historical Reliability Performance 2010		Historical Reliability Performance 2011	
		2007	2008	2009	2010	2011	CI	CHI	CI	CHI	CI	CHI	CI	CHI	CI	CHI
1	NY80M29	11	13	14	7	15	8294	9781.4	10000	1829.4	10473	3704.4	2430	1631.4	8255	2294.1
2	SCNAR26M34	3	8	7	7	12	1687	3982.4	3592	8995.2	1183	7220.9	9101	5567.4	7560	14615.7
3	NY55M8	9	7	9	10	12	4388	1548.6	7595	21434.9	15626	6944.5	6227	3920.1	10734	8972.8
4	YK35M10	8	11	12	6	11	13452	5959.8	12575	4410.0	12687	4099.1	3289	548.4	17593	2332.9
~~5~~	~~SCNT63M4~~	~~14~~	~~2~~	~~2~~	~~3~~	~~10~~	~~12452~~	~~9976.0~~	~~1504~~	~~3899.0~~	~~397~~	~~131.1~~	~~230~~	~~648.8~~	~~28124~~	~~22101.8~~
6	SCNA47M14	9	6	8	6	10	6026	4910.7	3924	1226.2	4076	3364.7	14227	7657.6	11491	7586.0
7	NY51M6	6	6	6	10	10	201	594.0	3015	2851.5	7099	6992.4	5131	2937.5	5408	8757.6
~~8~~	~~NY80M8~~	~~6~~	~~4~~	~~6~~	~~7~~	~~8~~	~~2036~~	~~1006.0~~	~~4010~~	~~1002.7~~	~~4622~~	~~5143.6~~	~~4616~~	~~3768.3~~	~~3004~~	~~2975.2~~
~~9~~	~~NY85M6~~	~~4~~	~~3~~	~~1~~	~~3~~	~~8~~	~~753~~	~~370.1~~	~~118~~	~~217.0~~	~~576~~	~~38.4~~	~~1831~~	~~782.2~~	~~5833~~	~~12279.2~~
10	NY51M8	7	6	2	7	8	3179	481.9	5601	1154.2	6124	2786.9	2277	2634.0	2480	460.9
11	SCNA502M22	6	1	6	6	7	27672	1755.8	3705	4775.5	19233	11978.6	7957	4184.7	20126	7458.2
12	SCNAH9M30	6	7	6	11	7	80	356.6	5139	3820.8	8147	8174.7	6796	9441.2	2461	3238.7
13	NY85M4	7	4	2	4	7	2243	1185.8	3261	470.1	524	129.1	26	84.1	2862	6235.2
14	SCNA47M13	6	8	6	6	6	8142	2355.0	5692	2919.2	4889	2652.9	10328	11820.5	17600	12499.5
15	NY80M2	5	6	4	7	6	21400	1176.4	4228	1898.7	2050	394.5	7966	5441.0	2809	1354.4
16	NY51M7	9	12	11	9	6	4744	2243.7	14020	5422.4	5466	1782.7	9764	3676.3	3126	1728.4
17	NY51M24	4	6	11	6	6	2086	2757.4	5141	2156.1	4337	3518.4	6265	5409.8	270	942.0
18	NY80M30	5	8	14	13	6	460	647.0	7916	1695.7	7419	5809.5	9370	4961.8	442	255.7
~~19~~	~~NY55M23~~	~~3~~	~~3~~	~~6~~	~~8~~	~~6~~	~~3485~~	~~3904.9~~	~~37~~	~~120.1~~	~~115~~	~~455.1~~	~~6533~~	~~1367.2~~	~~3170~~	~~914.9~~
~~20~~	~~NY85M24~~	~~8~~	~~4~~	~~3~~	~~3~~	~~6~~	~~4271~~	~~5339.0~~	~~6324~~	~~5005.1~~	~~2726~~	~~1321.5~~	~~62~~	~~52.1~~	~~4793~~	~~3023.6~~
21	SCNAE5-2M3	3	5	5	6	6	3607	6725.1	4391	4697.6	174	447.6	297	1376.3	2374	757.7
~~22~~	~~NY85M7~~	~~3~~	~~4~~	~~2~~	~~4~~	~~6~~	~~169~~	~~431.0~~	~~2871~~	~~1248.0~~	~~1228~~	~~1415.1~~	~~3414~~	~~772.7~~	~~85~~	~~35.8~~
23	SCNT63M12	11	8	9	9	5	23815	22638.4	985	2658.3	4968	6925.4	1459	5414.3	18772	31571.0
24	SCNT63M8	10	7	6	4	5	15468	6657.7	6986	3533.3	11495	5276.3	227	658.5	5313	5879.2
25	SCNAE5-1M29	5	2	6	5	5	1477	119.2	2955	494.0	1934	3827.0	8032	4101.2	2676	1952.3
26	NY53M25	13	3	11	6	5	21402	6421.1	260	854.4	19054	10647.6	563	1167.2	1393	919.9
~~27~~	~~NY80M9~~	~~2~~	~~6~~	~~10~~	~~3~~	~~5~~	~~104~~	~~203.6~~	~~1721~~	~~1292.7~~	~~3666~~	~~1662.2~~	~~141~~	~~422.6~~	~~927~~	~~816.7~~
28	SCNT47M3	18	14	21	12	4	54593	20824.6	20841	8681.3	47262	21607.5	102883	45728.6	12750	8963.5
~~29~~	~~SCNAH9M23~~	~~8~~	~~3~~	~~2~~	~~4~~	~~4~~	~~4217~~	~~2527.4~~	~~397~~	~~757.2~~	~~1963~~	~~432.5~~	~~1163~~	~~134.8~~	~~10042~~	~~7207.5~~
30	NY51M3	4	3	1	7	4	2103	2722.5	259	265.9	150	454.2	4500	1420.2	1638	3012.8
31	SCNA47M17	15	11	6	12	3	17982	6314.2	9360	10051.7	7260	1916.2	7740	3305.4	3303	665.4
32	NY85M31	3	1	1	1	3	1917	494.3	1048	34.9333	1	2.71667	12	23.2	517	58.3167
~~33~~	~~SCNA502M21~~	~~6~~	~~10~~	~~3~~	~~3~~	~~2~~	~~3893~~	~~1750.0~~	~~13067~~	~~12822.7~~	~~7099~~	~~941.1~~	~~4814~~	~~1534.0~~	~~8992~~	~~6298.1~~
34	SCNT47M1	6	12	9	7	2	26818	5632.0	14377	8393.7	6436	3492.6	11039	7162.5	2151	142.6
35	NY55M21	4	7	5	5	2	2568	617.483	1297	1005.22	844	752.933	1254	716.2	189	380.7
36	NY85M1	8	8	5	6	6	2997	755.7	5596	3031.3	178	374.7	341	1837.1	9883	3059.2
36	NY85M9	5	3	1	9	4	170	753.6	1731	1472.2	1553	155.3	1789	367.3	608	2710.4
36	NYSS58F1	8	10	6	9	6	888	870.1	678	2151.9	460	1295.3	1229	1175.6	240	832.1

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.12:

Reference(s): **Tab 6F, Schedule 11-37**

Explain the drivers behind the variation in cost, year-over-year, in the referenced IRR.

RESPONSE:

Table 1 below was provided in THESL's initial response to the referenced IRR. It shows actual capital spending on piecing out congested cable chambers and repairing leaking PILC cable from 2007 to 2011, but erroneously included planned, rather than actual kilometres of PILC cable replaced.

Table 1

	2007	2008	2009	2010	2011
Capital Spending ($000)	$0	$799	$234	$732	$344
Kilometres of PILC cable replaced	0.0	9.7	9.6	11.5	7.7

Table 2 below corrects Table 1 to show actual capital spending and estimated actual kilometres of PILC cable replaced for piecing out congested cable chambers and repairing leaking PILC cable. When the actual kilometres are used, much of the variation in the historical numbers is removed. The remainder is attributable to the variation in the amount of associated civil work in the chambers and in the number of leakers encountered.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

Table 2

	2007	2008	2009	2010	2011
Capital Spending ($000)	$0	$799	$234	$732	$344
Kilometres of PILC cable replaced	0.0	12.05	3.30	6.78	4.10

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.13:

Reference(s):

Provide an estimate of how many submersible transformers have been installed in THESL's system since the new standard was introduced.

RESPONSE:

Based on information from THESL's Geographic Information System, 3,628 new standard switchable submersible transformers are currently installed in THESL's system.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.14:

Reference(s): Tab 6F, Schedule 10-23

Revise response to SEC IR 23 to provide breakdown of labour, equipment, materials, and overhead for projects in excess of $4M.

RESPONSE:

The requested breakdown is provided below.

Job Title	*Initial Filing -* Total Estimated Project Cost	*Revised Filing -* Total Estimated Project Cost	Resource Breakdown				
	($M)	($M)	Material ($M)	Labour ($M)	Equipment ($M)	Overhead Percentage	Overhead ($M)
Queens Quay Rebuild Phase 1	$4.67	$4.37	$1.28	$1.46	$0.91	19.9%	$0.73
Queens Quay Rebuild Phase 2	$5.30	$5.30	$1.55	$1.77	$1.11	19.9%	$0.88
Queens Quay Rebuild Phase 3	$3.42	$3.42	$1.00	$1.14	$0.71	19.9%	$0.57
Queens Quay Rebuild Phase 4	$12.43	$12.43	$3.63	$4.15	$2.59	19.9%	$2.06
Queens Quay Rebuild Phase 5	$7.98	Not included in phase one filing	$2.33	$2.66	$1.66	19.9%	$1.32

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

Job Title	*Initial Filing -* **Total Estimated Project Cost**	*Revised Filing -* **Total Estimated Project Cost**	**Resource Breakdown**				
	($M)	($M)	Material	Labour	Equipment	Overhead Percentage	Overhead
Strachan Electrical Relocation Part 1	$1.98	$1.67	$0.81	$0.48	$0.09	19.9%	$0.28
Strachan Electrical Relocation Part 2	$1.73	$1.12	$0.57	$0.33	$0.03	19.9%	$0.19
Strachan Electrical Relocation Part 3	$1.34	$1.01	$0.41	$0.38	$0.04	19.9%	$0.16
Strachan Electrical Relocation Part 4	$0.92	$0.46	$0.12	$0.24	$0.03	19.9%	$0.08
GO Strachan UG Crossing Civil	$0.26	$0.26	$0.08	$0.08	$0.05	19.9%	$0.04
GO Strachan UG Crossing Civil	$0.13	$0.13	$0.04	$0.04	$0.03	19.9%	$0.02
Dundas Street Overhead to Underground Phase 1 - Design	$0.64	$0.64	$0.00	$0.53	$0.00	19.9%	$0.11
Dundas Street Overhead to Underground Phase 2	$8.77	$3.02	$0.88	$1.01	$0.63	19.9%	$0.50

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

Job Title	*Initial Filing -* **Total Estimated Project Cost**	*Revised Filing -* **Total Estimated Project Cost**	**Resource Breakdown**				
	($M)	($M)	Material	Labour	Equipment	Overhead Percentage	Overhead
Dundas Street Overhead to Underground Phase 3	$8.01	Not included in phase one filing	$2.34	$2.67	$1.67	19.9%	$1.33

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 12 – ENVIRONMENTAL DEFENCE

UNDERTAKING NO. JT1.15:

Reference(s): ED TCQ 4

Provide an electronic spreadsheet showing the demands (in MW) of each of the five downtown transformer stations in hourly intervals for every hour in 2011.

RESPONSE:

The attached spreadsheet, Appendix 1 to this Schedule, contains hourly loading at the five downtown Toronto transformer stations. Please note that the data is presented in kilowatts rather than megawatts.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT1.16:

Reference(s): Tab 6F, Schedule 11-72, page 3

Confirm whether vMCS_33, vMCS_34, vMCS_35, vMCS_36 are still part of THESL's 2012-2013 capital plan.

RESPONSE:

vMCS_33 (Midland Lawrence MS), vMCS_34 (Pharmacy CPR MS) and vMCS_35 (Islington MS) are not included in THESL's 2012-2013 capital plan.

Preliminary work for vMCS_36 (Thornton MS) is included in THESL's 2012-2013 capital plan.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT1.17:

Reference(s): **Tab 6F, Schedule 1-51**

Advise whether there are any breakers that have a poor condition rating that are not currently scheduled for replacement in 2012-2013? If so, indicate the reason why such work is not being done in 2012-2013.

RESPONSE:

There are four KSO oil circuit breakers with a "Poor" health index score. Three of these circuit breakers were never included in THESL's original or updated 2012-2013 plan. One of the circuit breakers (85M25) is planned for replacement in 2014 and appears as such in the original and updated application.

These four circuit breakers are not and were not included in the 2012-2013 plans because THESL did not rely solely on health index scores to identify and prioritize replacement needs. In addition to overall health index scores, THESL gave consideration to raw inspection data, the presence of oil leaks and detailed ad-hoc feedback from the field crews who maintain these assets. In the future, THESL intends to review health index formulations to ensure that these considerations are appropriately accounted for and weighted in the overall health index formula for this asset class.

As a general matter, all of the work contained is this application is THESL's "must do" work, driven primarily by safety and reliability. However, given the passage of time, the realm of non-discretionary work exceeds what can be executed in 2012. As noted elsewhere, THESL has attempted to account for this passage of time by structuring its

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

capital work in a manner that contemplates factors such as executability and principles including rate-smoothing for its customers.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.18:

Reference(s):

On a best efforts basis, provide a line-diagram and elevation views of Hydro One's initial concept for a transformer station on the Bremner site. In addition, also on a best efforts basis, provide an elevation-view of two sides of Bremner TS and a section-view of each floor of THESL's design for Bremner TS.

RESPONSE:

Attached please find the following views of the Bremner TS:

1) Appendix A – THESL plan view A21-00-01 Cable Floor (basement level)
2) Appendix B – THESL plan view A21-00-04 Master Roof Slab Plan
3) Appendix C – THESL Building Cross Sections A31-00-01
4) Appendix D – THESL Building Elevations A30-00-01
5) Appendix E – HONI Plan View Hydro Option lands
6) Appendix F – HONI Concept Drawings Railwaylands TS

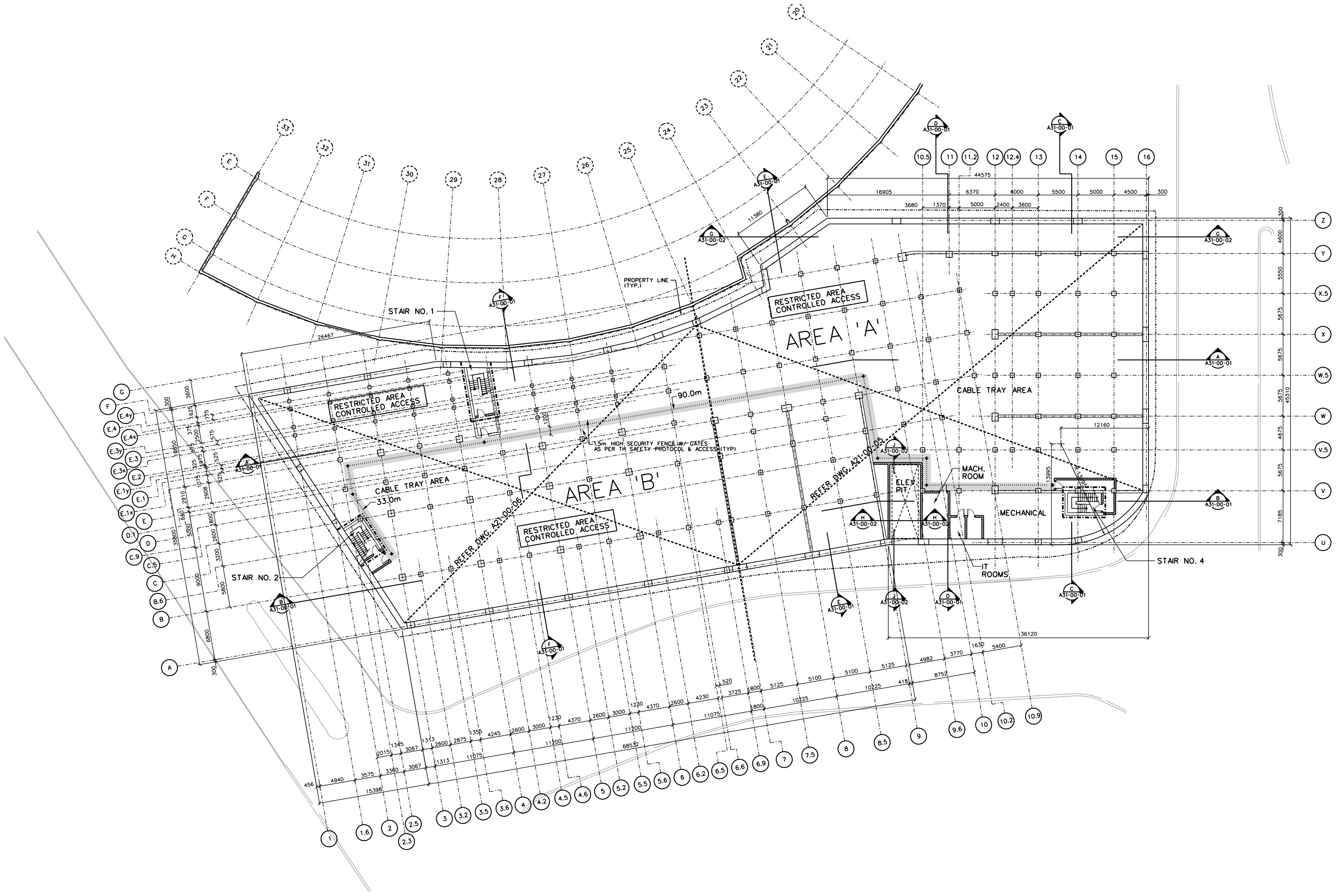
THESL requested elevation-view drawings from HONI. In its response to THESL, HONI provided the Concept Drawings attached as Appendix F. HONI also indicated that the considered concept design removed the access road for the Roundhouse tenants and contemplated the demolition of the machine shop.

Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7, Schedule 1-18, Appendix A
Filed: 2012 Nov 27 (1 page)

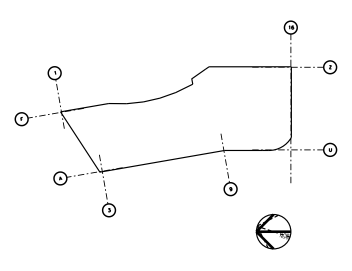
SHEET CUT LINE

DRAWING No.

DRAWING No.



KEY PLAN



MASTER CABLE ROOM FLOOR PLAN
LEVEL 67 900
SCALE 1:200

FIN. FLOOR EL. 67 900
(UNLESS NOTED OTHERWISE)

LEGEND:

-·-·-·-	DENOTES 2.0 HOUR FIRE SEPARATION
▨	DENOTES EXIT WALKWAY
········	DENOTES EXIT PATH

IBI Group
IBI Group Architects
30 International Boulevard
Toronto ON M9W 5P3 Canada
tel 416 679 1930
fax 416 675 4620

IBI Group Project No.	IBI Group Drawing No.
AAR2090576	A21-00-01

Check Scale (may be photo-reduced)
0 1 Inch 0 10mm

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Project Manager	Architect/Engineer	Project Leader
A. HADDAD	R. KUCHARCZYK	R. KRAWCHUK
Drawn	Checked	
J. PATAI, R. ZAHIROVIC		
Detail Symbol	North Arrow	Professional Seal
DETAIL NUMBER LOCATION OR DETAIL SHEET	True North	ROMAN W. KUCHARCZYK LICENCE 4189

DATE (mmm dd yyyy)	ISSUED FOR	REV
MAR 17 2011	PROJECT REVIEW REQUEST	A
MAR 30 2011	DESIGN PROGRESS REVIEW	B
APR 13 2011	DESIGN PROGRESS REVIEW	C
JUN 08 2011	PROJECT REVIEW REQUEST	D
JUN 24 2011	SITE PLAN APPROVAL	E
JUL 11 2011	30% REVIEW	F
JUL 29 2011	60% REVIEW	G
NOV 29 2011	TORONTO HYDRO FINAL REVIEW	H
DEC 02 2011	BUILDING PERMIT	I
JAN 19 2012	TENDER (NOT ISSUED)	0
FEB 24 2012	SITE PLAN REVISIONS	1
OCT 25 2012	RE-ISSUED FOR TENDER	2

CERTIFICATE OF APPROVAL
THE INSTALLATION WORK COVERED BY THIS PLAN MEETS THE SAFETY REQUIREMENTS OF SECTION 4 OF ONTARIO REGULATION 22/04.

Print Name ____ Date ____
Signature of Professional Engineer ____ Position ____

No.	DATE	STN PROJ No.	REVISION	MADE	CHECKED	APPROVED

TORONTO HYDRO–ELECTRIC SYSTEM
STATIONS DEPARTMENT

STATION: BREMNER
ADDRESS
AREA
TYPE: TS
VOLTAGE
CLASSIFICATION
CATEGORY
DRAWING TITLE: MASTER CABLE ROOM FLOOR PLAN – LEVEL 67 900
TECHNICIAN
DESIGNER
CONSULTANT
TEAM LEADER
DATE
SCALE
PREVIOUS DWG No.: A21–00–01
CAD FILE No.
SIZE: A0
STATION CODE: BR_TO
DRAWING No.
REV
ISSUE
APPROVED

REFERENCE DRAWING LIST	
DWG.No.	TITLE

ACTIVE DRAWING PLOTTING LEVELS TURNED ON

TORONTO HYDRO

REFERENCED CAD FILES

CAD FILE No.	LEVELS OFF
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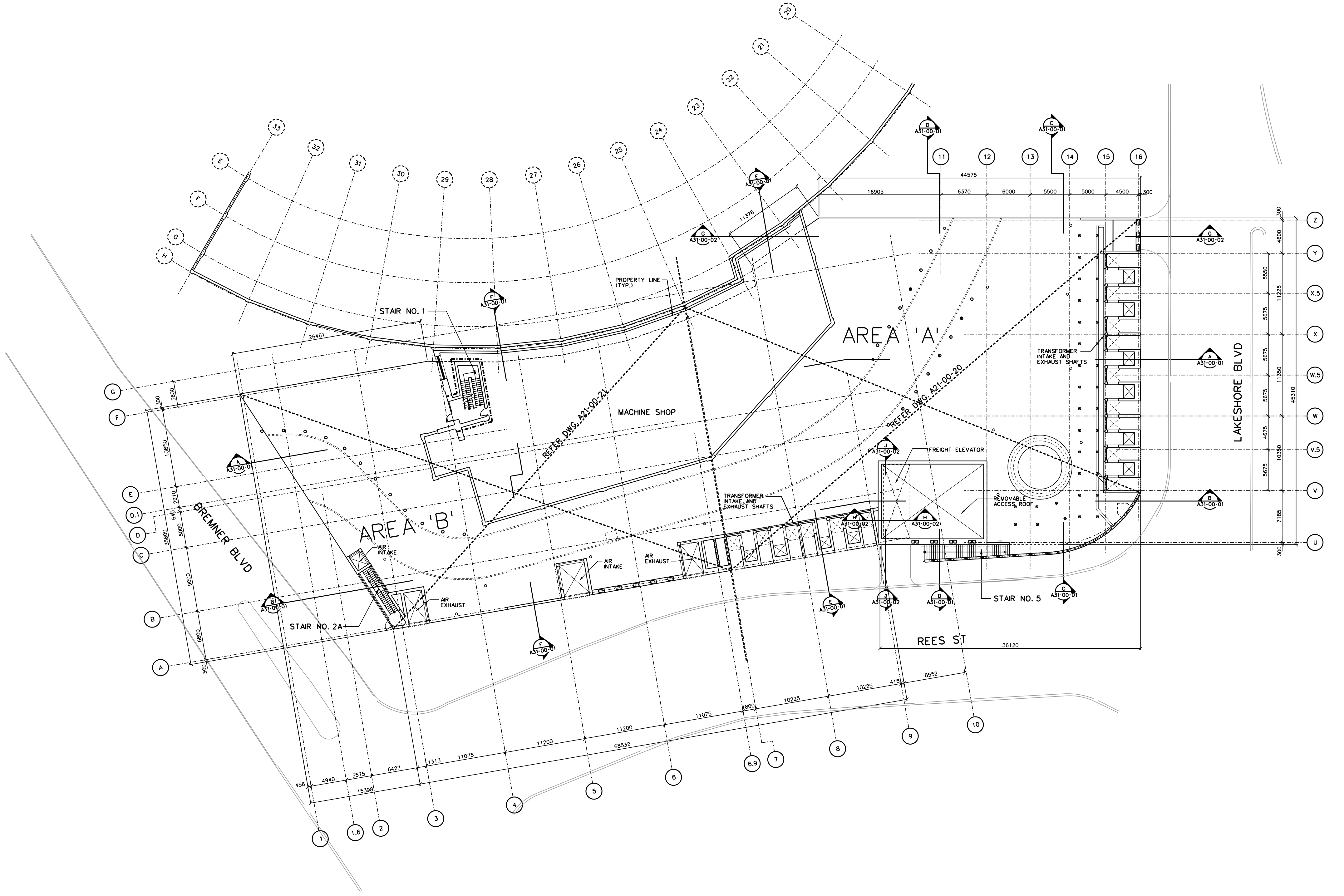
SHEET CUT LINE

DRAWING No.

DRAWING No.



MASTER ROOF SLAB PLAN

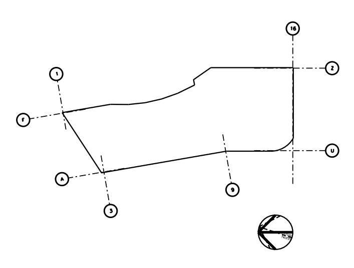
SCALE 1:200

FIN. FLOOR EL. 80 500
(UNLESS NOTED OTHERWISE)

LEGEND:

-·-·-·-·- DENOTES 2.0 HOUR FIRE SEPARATION

KEY PLAN



IBI GROUP

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30 International Boulevard
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tel 416 679 1930
fax 416 675 4620

IBI Group Project No.	IBI Group Drawing No.
AAR2090576	A21-00-04

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Drawn	Checked	
J. PATAI, R. ZAHIROVIC		
Detail Symbol	North Arrow	Professional Seal
DETAIL NUMBER LOCATION OR DETAIL SHEET	True North	

DATE (mmm dd yyyy)	ISSUED FOR	REV
JUL 29 2011	60% REVIEW	A
NOV 29 2011	TORONTO HYDRO FINAL REVIEW	B
DEC 02 2011	BUILDING PERMIT	C
JAN 19 2012	TENDER (NOT ISSUED)	0
FEB 03 2012	ADDENDUM 1	1
OCT 25 2012	RE-ISSUED FOR TENDER	2

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Signature of Professional Engineer ____________ Position ____________

No.	DATE	STN PROJ No.	REVISION	MADE	CHECKED	APPROVED

TORONTO HYDRO–ELECTRIC SYSTEM
STATIONS DEPARTMENT

REFERENCE DRAWING LIST	
DWG.No.	TITLE

ACTIVE DRAWING PLOTTING LEVELS TURNED ON

TORONTO HYDRO

REFERENCED CAD FILES

CAD FILE No.	LEVELS OFF
GEN6DS35	–

STATION: BREMNER

ADDRESS	AREA	TYPE	VOLTAGE
		TS	

CLASSIFICATION

CATEGORY

DRAWING TITLE: MASTER ROOF SLAB PLAN – LEVEL 80 500

TECHNICIAN	DESIGNER	CONSULTANT	TEAM LEADER
DATE	SCALE	PREVIOUS DWG No.	A21–00–04

CAD FILE No.	SIZE	STATION CODE	DRAWING No.	REV	ISSUE
	A0	BR_TO			

APPROVED

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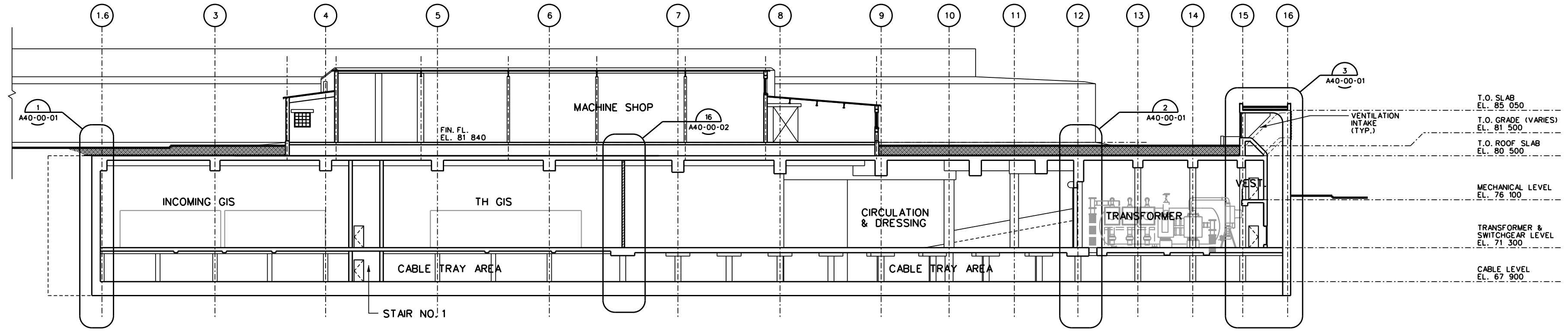

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A23-00-01
BUILDING CROSS SECTION
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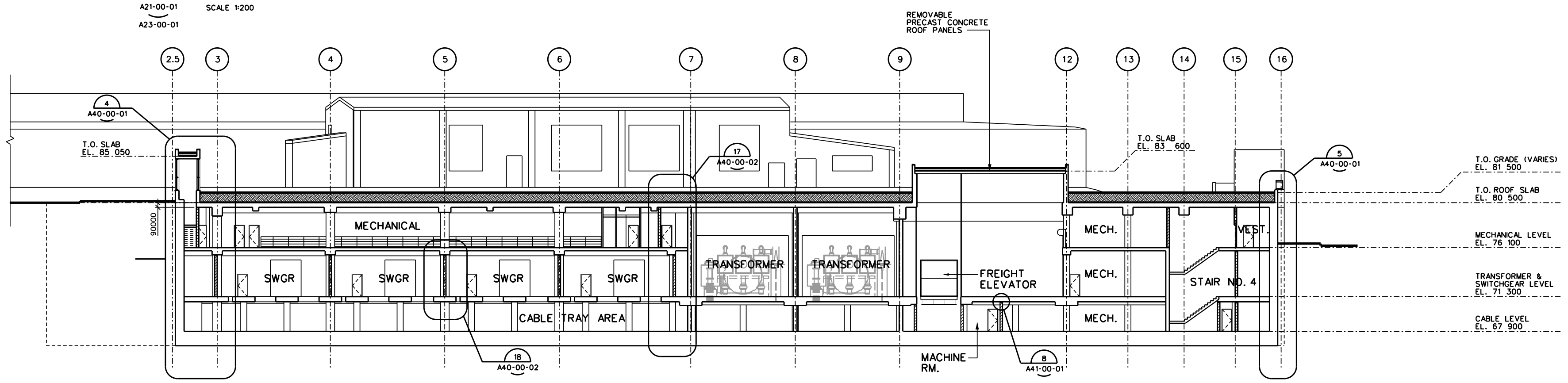

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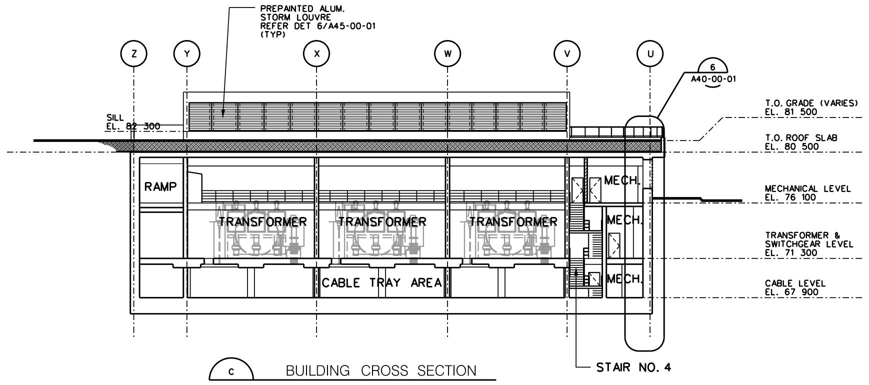

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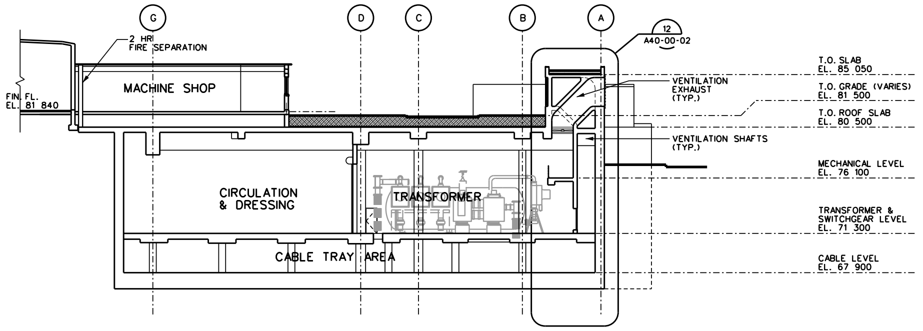

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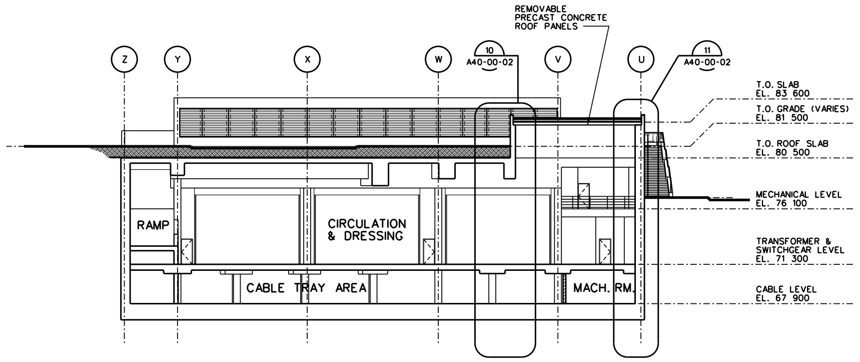

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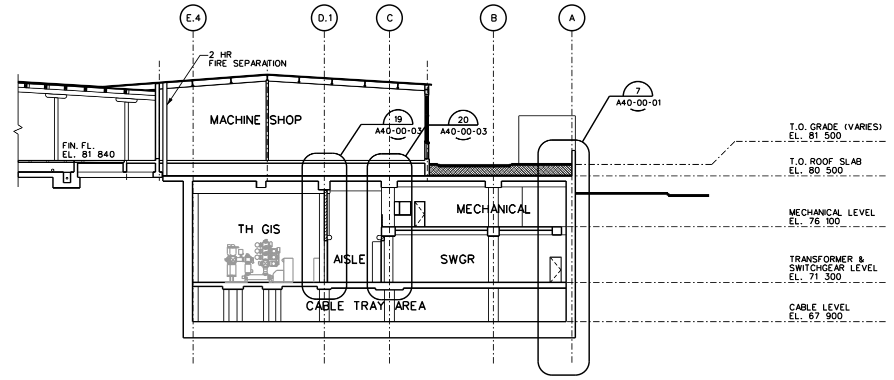

F
A21-00-01
A23-00-01
BUILDING CROSS SECTION
SCALE 1:200

KEY PLAN

IBI GROUP

IBI Group
IBI Group Architects
30 International Boulevard
Toronto ON M9W 5P3 Canada
tel 416 679 1930
fax 416 675 4620

IBI Group Project No.	IBI Group Drawing No.
AAR2090576	A31-00-01

Check Scale (may be photo-reduced)
0 1 Inch 0 10mm

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A. HADDAD	R. KUCHARCZYK	R. KRAWCHUK
Drawn	Checked	
J. PATAI, R. ZAHIROVIC		
Detail Symbol	North Arrow	Professional Seal
DETAIL NUMBER LOCATION OR DETAIL SHEET	True North	ONTARIO ASSOCIATION OF ARCHITECTS ROMAN W. KUCHARCZYK LICENCE 4189

DATE (mmm dd yyyy)	ISSUED FOR	REV
MAR 17 2011	PROJECT REVIEW REQUEST	A
MAR 30 2011	DESIGN PROGRESS REVIEW	B
APR 13 2011	DESIGN PROGRESS REVIEW	C
JUN 08 2011	PROJECT REVIEW REQUEST	D
JUN 24 2011	SITE PLAN APPROVAL	E
JUL 11 2011	30% REVIEW	F
JUL 29 2011	60% REVIEW	G
NOV 29 2011	TORONTO HYDRO FINAL REVIEW	H
DEC 02 2011	BUILDING PERMIT	I
JAN 19 2012	TENDER (NOT ISSUED)	0
FEB 03 2012	ADDENDUM 1	1
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Signature of Professional Engineer ____ Position ____

No.	DATE	STN PROJ No.	REVISION	MADE	CHECKED	APPROVED

REFERENCE DRAWING LIST	
DWG.No.	TITLE

ACTIVE DRAWING PLOTTING LEVELS TURNED ON

TORONTO HYDRO

REFERENCED CAD FILES

CAD FILE No.	LEVELS OFF
GEN6DS35	–

TORONTO HYDRO–ELECTRIC SYSTEM
STATIONS DEPARTMENT

STATION: BREMNER

ADDRESS
AREA
TYPE: TS
VOLTAGE
CLASSIFICATION
CATEGORY
DRAWING TITLE: BUILDING CROSS SECTIONS
TECHNICIAN
DESIGNER
CONSULTANT
TEAM LEADER
DATE
SCALE
PREVIOUS DWG No.: A31–00–01
CAD FILE No.
SIZE: A0
STATION CODE: BR_TO
DRAWING No.
REV
ISSUE
APPROVED

REFERENCE DWG # GEN6DS35

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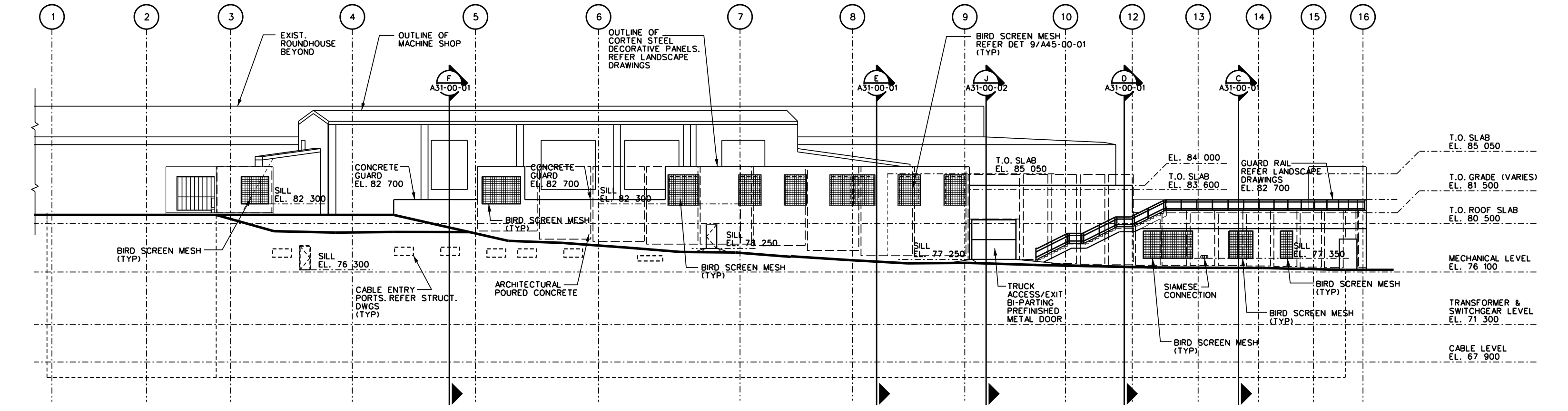

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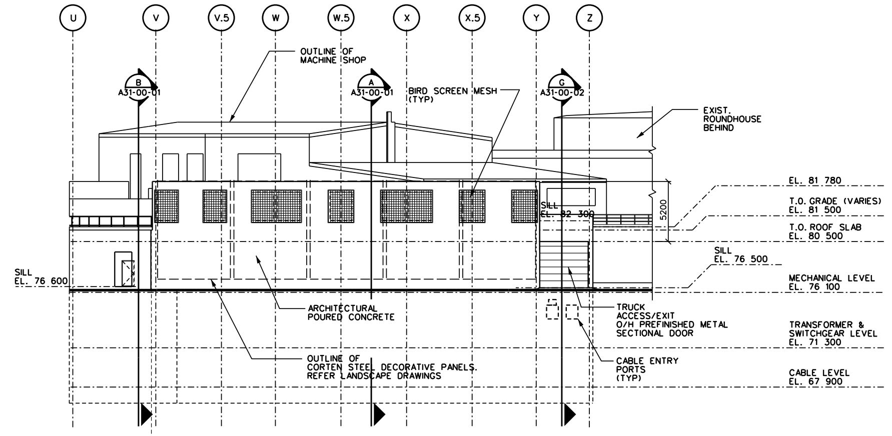

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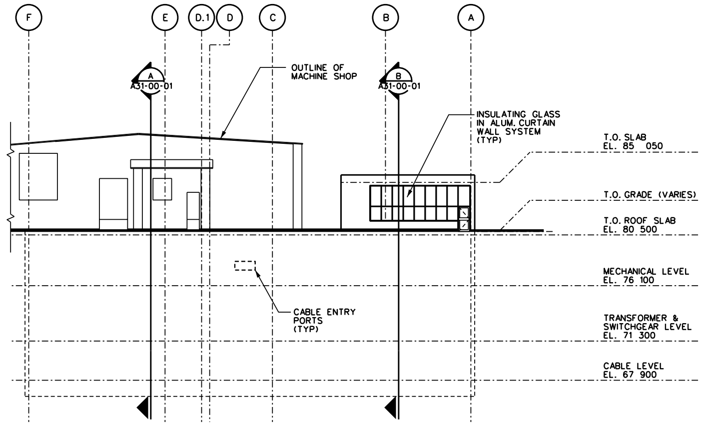
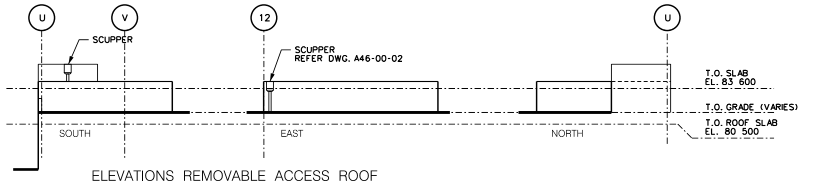


NORTH ELEVATION

SCALE 1:200



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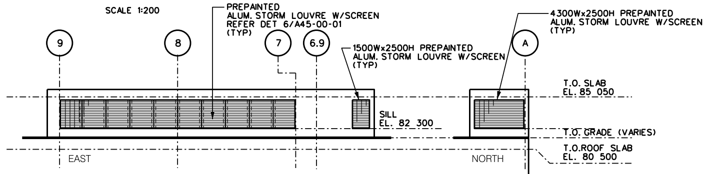
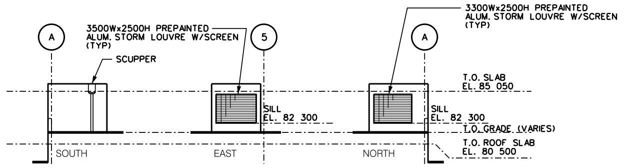
SCALE 1:200



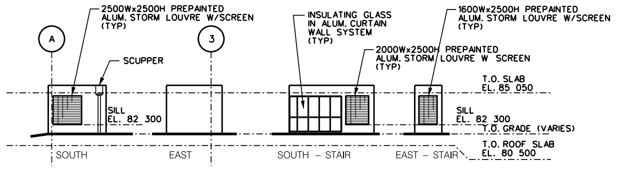
ELEVATIONS TRANSFORMER INTAKE & EXHAUST SHAFT

SCALE 1:200



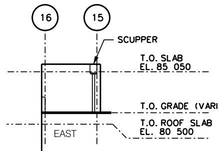
ELEVATIONS AIR INTAKE SHAFT @ CO. LINE 5 /A

SCALE 1:200



ELEVATIONS STAIR NO. 2A & AIR SHAFT

SCALE 1:200



ELEVATION AIR SHAFT @ COL. LINE 16 /Y

SCALE 1:200

KEY PLAN

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

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AAR2090576	A30-00-01

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Drawn J. PATAI, R. ZAHIROVIC	Checked	
Detail Symbol DETAIL NUMBER LOCATION OR DETAIL SHEET	North Arrow True North	Professional Seal ONTARIO ASSOCIATION OF ARCHITECTS ROMAN W.KUCHARCZYK LICENCE 4189

DATE (mmm dd yyyy)	ISSUED FOR	REV
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JUN 24 2011	SITE PLAN APPROVAL	B
JUL 11 2011	30% REVIEW	C
JUL 29 2011	60% REVIEW	D
NOV 29 2011	TORONTO HYDRO FINAL REVIEW	E
DEC 02 2011	BUILDING PERMIT	F
JAN 19 2012	TENDER (NOT ISSUED)	0
FEB 03 2012	ADDENDUM 1	1
FEB 24 2012	SITE PLAN REVISIONS	2
OCT 25 2012	RE-ISSUED FOR TENDER	3

CERTIFICATE OF APPROVAL

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Print Name
Date
Signature of Professional Engineer
Position

No.	DATE	STN PROJ No.	REVISION	MADE	CHECKED	APPROVED

TORONTO HYDRO-ELECTRIC SYSTEM
STATIONS DEPARTMENT

REFERENCE DRAWING LIST

DWG.No.	TITLE

ACTIVE DRAWING PLOTTING LEVELS TURNED ON

TORONTO HYDRO

REFERENCED CAD FILES

CAD FILE No.	LEVELS OFF
GEN6DS35	–

STATION
BREMNER

ADDRESS
AREA
TYPE TS
VOLTAGE

CLASSIFICATION

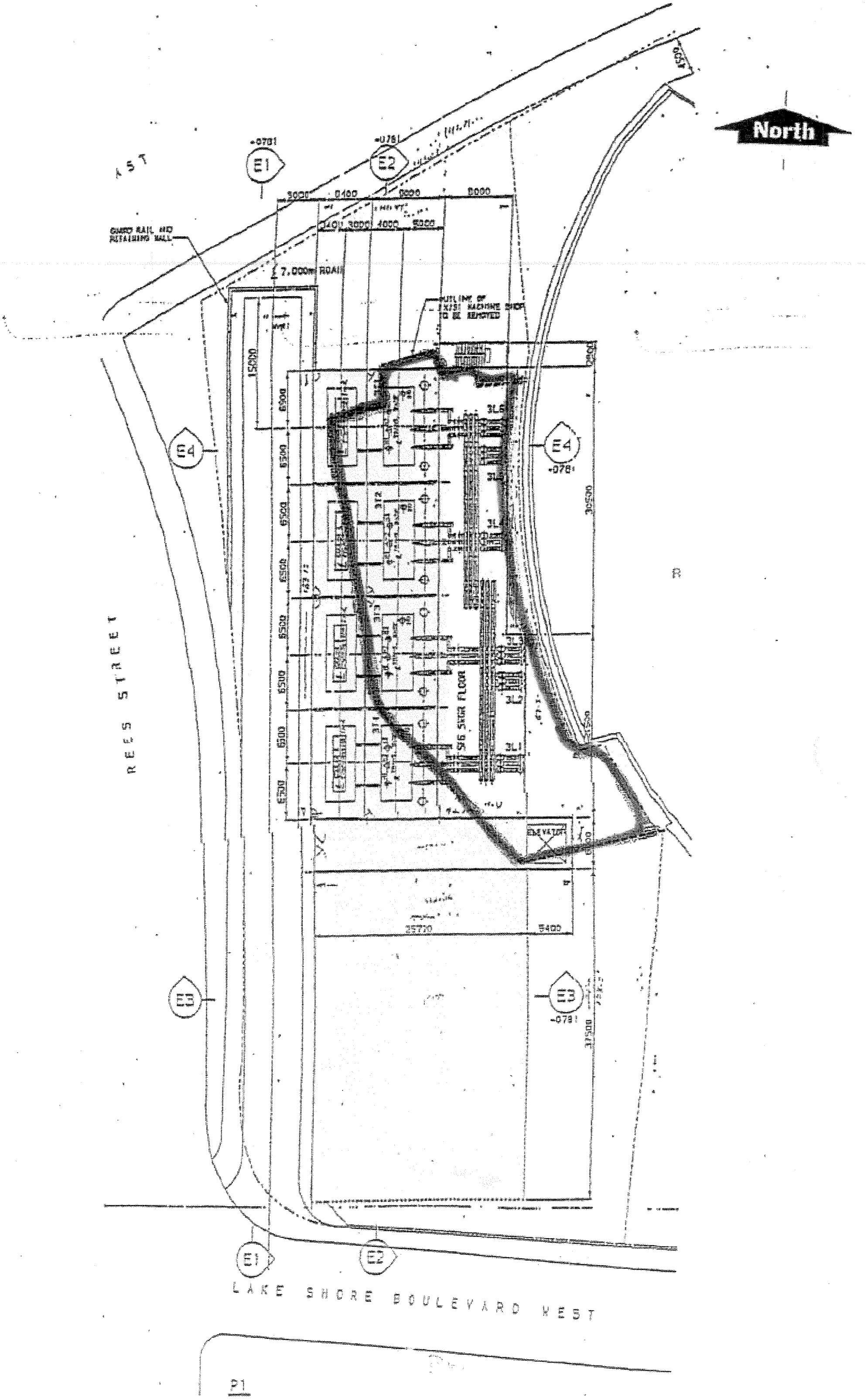
CATEGORY

DRAWING TITLE
BUILDING ELEVATIONS

TECHNICIAN
DESIGNER
CONSULTANT
TEAM LEADER
DATE
SCALE
PREVIOUS DWG No. A30-00-01
CAD FILE No.
SIZE A0
STATION CODE BR_TO
DRAWING No.
REV
ISSUE
APPROVED

PLOT DATE: 10/25/2012 TIME: 3:48:52 PM USER NAME: USERNAME FILE PATH: J:\AAR2090576_Toronto Hydro\5.9 Drawings\59arch\layouts\A30-00-01.dgn

Roundhouse - Hydro Option Lands



Machine Shop

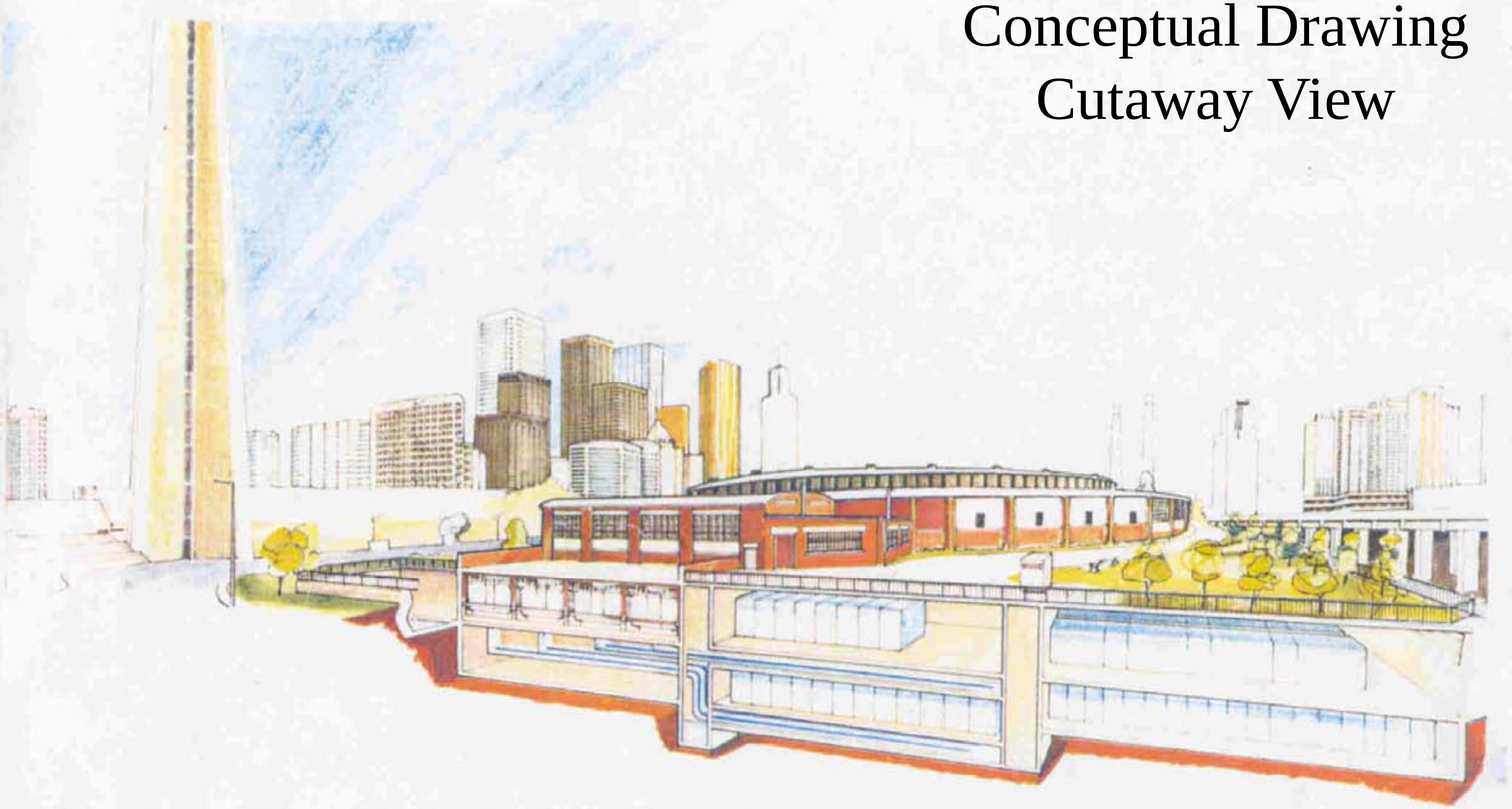
Hydro Transformer Stn.

Hydro Option Lands

Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7
Schedule 1-18
Appendix F
Filed: 2012 Nov 27 (2 pages)

Conceptual Drawing
Circa 1992

Conceptual Drawing
Cutaway View



TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.19:

Reference(s):

How many transformer facilities have Giffels and IBI designed? How many similar underground facilities have they designed?

RESPONSE:

IBI Group/Giffels has designed at least 14 transformer facilities. A summary of these is included inAppendix A.

IBI Group/Giffels has designed at least 11 facilities with major underground components. A summary of these is included in Appendix B.

Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7
Schedule 1-19
Appendix A
Filed: 2012 Nov 27
(3 pages)

GIFFELS ASSOCIATES LIMITED/IBI GROUP

COMPANY PROFILE

Giffels Associates Limited/IBI Group (GAL/IBI Group) is a member of the IBI Group, a leading international provider of a broad range of professional services in Transportation, Systems, Urban Land and Facilities. Ours is a multi-disciplined engineering and architectural consulting firm widely recognized for its capabilities in the planning, design and implementation of facilities and infrastructure projects requiring sophisticated business solutions. Since 1949, the firm has provided high quality professional services for public and private clients on a wide range of challenging projects across Canada, the United States and internationally.

GAL/IBI Group has the capacity to bring all the necessary engineering and architectural resources to any project as a single source provider of consulting services. The firm has unparalleled depth of resources and breadth of experience to undertake virtually any size and type of project anywhere. Our professionals have a broad range of academic backgrounds and experience in facilities design and planning, architecture, civil engineering, transportation engineering, traffic engineering, systems engineering, urban planning and geography, real estate analysis, landscape architecture, communications engineering, software development and many others.

GAL/IBI Group list of clients includes national, provincial, state and local government agencies, public institutions, as well as private companies. We are committed to having long term relationships with our clients by providing quality service and products on every project.

QUICK FACTS

Giffels Associates Limited &
IBI Group merger in 2008

IBI Group
Founded in 1974

Giffels Associates Limited
Founded in 1949

Over 2,300 employees

68 offices world-wide

AREAS OF PRACTICE

Facilities

Systems

Transportation

Urban Land

MARKET SECTORS

Automotive

Aviation

Commercial

Energy

Environmental

Government

Justice/Institutional

Leisure/Theme Parks/Hospitality

Logistics/Supply Chain

Manufacturing

Municipal

Transit

SERVICES

A/E Audits

Commissioning

Contract Administration

A/E Design

Environmental Assessments

Operations

Planning

Programming

Project/Program Management

IBI
GROUP

www.ibigroup.com

GIFFELS ASSOCIATES LIMITED/IBI GROUP

ENERGY

Giffels Associates Limited/IBI Group (GAL/IBI Group) has been providing consulting services to the energy sector for over 35 years. As a leading multi-disciplinary engineering company, our experience with the major power generation, renewable energy, transmission and distribution companies is complemented by our work in the automotive, aviation, manufacturing, government and commercial market sectors.

GAL/IBI Group has extensive experience in the design, project management and construction of medium and small size co-generation facilities, water power generating stations, central utilities plants, transformer stations, switchyards and substations.

Some of the services we provide include: architecture, structural, mechanical, electrical, civil siteworks, site development, infrastructure, process, industrial & controls engineering, energy modelling, permitting and approvals, communications infrastructure, program management, project management and project services including cost control, scheduling and estimating.

CLIENT LIST

Black and McDonald
Bombardier
Bracebridge Generation
Bruce Power
Cambridge & North Dumfries Hydro
Campbell Company of Canada
Daimler Chrysler Canada
Enbridge
EnWin Utilities
Ford Canada
General Electric
GTAA
Guelph Hydro
Honda Canada
Humber College
Hydro One
Hydrogenics Corporation
Kitchener Wilmot Hydro
Newmarket Hydro
NextEra Energy
North Bay Hydro
Ontario Power Generation
Peterborough Utilities
PowerStream
St. Catherines Hydro
Suncor
Toromont
Town of Markham
Toyota Canada
Waterloo North Hydro
Westcast Industries
Wikwemikong Unceeded Indian Reserve
Windsor Utilities Commission
York Region

GIFFELS ASSOCIATES LIMITED/IBI GROUP

ENERGY EXPERIENCE MATRIX

	CLIENTS													
	Hydro One Networks Inc. Vansicle Transformer Station Upgrade	Waterloo North Hydro Inc. Transformer Station Envrionmental Assessment	Halton Hills Switching Station Ground Potential Rise Study	Guelph Hydro Electric Systems Inc. Distribution Station	Cambridge & North Dumfries Hydro Inc. Municipal Transformer Station	Ford Motor Company (Annex)/Enwin Powerlines Ltd. - Transformer Station	Windsor Utilities Commission Transformer Station	Honda of Canada Manufacturing Plants 1&2, Main & Unit Substations	Enwin Powerlines, Ford Annex T.S. Transformer Protection System	Toyota Motor Manufacturing of Canada Substation Primary Parallel Operation	Wescast Industries Casting North Huron Main Substations & Unit Substations	Norfolk Power Municipal Distribution Station Upgrade	Humber College Transformer Replacement	Bombardier; Downsview Primary Switchgear Replacement
ACTIVITIES														
CLIENT, UTILITY & AUTHORITY INTERFACE	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PRELIMINARY INVESTIGATIONS & STUDIES (DESIGN CRITERIA DOCUMENTS)														
Evaluate & analyze existing design & installation conditions	●	●		●				●	●	●		●	●	●
Short circuit analysis				●	●	●	●	●		●	●			
Coordination analysis	●			●				●		●	●			
Grounding system reviews	●			●	●	●	●	●		●	●			
Grounding studies	●		●	●	●	●	●	●		●	●			
Code requirements	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Approvals & permits		●	●	●	●	●	●	●	●	●	●	●	●	●
Evaluate constructability & accuracy of site conditions	●	●		●				●				●	●	●
Contractor & equipment selection	●			●	●	●	●	●						●
Scheduling	●	●		●	●	●	●	●		●				●
Removal & installation procedures	●							●		●		●	●	●
POWER SYSTEMS ENGINEER/DESIGN														
Substation layouts	●	●		●	●	●	●	●		●	●	●		
Distribution underground/overhead feeders	●			●	●	●	●	●		●	●	●		
P&C and SCADA logic diagrams	●			●	●	●	●	●	●	●				●
Remote/transfer trip	●			●	●	●	●	●		●				
Single line diagrams	●	●		●	●	●	●	●	●	●	●	●	●	●
EQUIPMENT SELECTION														
Switchgear (low & high voltage)	●			●	●	●	●	●		●	●			●
Transformers	●			●	●	●	●	●			●		●	
Cables & trays	●			●	●	●	●	●			●			
Grounding transformers & resistors	●			●	●	●	●			●				
P&C and SCADA panels	●			●	●	●	●	●		●	●			
RELATED SERVICES														
Architectural	●	●		●	●	●	●	●			●		●	
Structural	●	●		●	●	●	●	●			●			
Mechanical	●				●	●	●	●			●			
Controls	●			●	●	●	●	●		●	●			
Project Management	●	●	●	●	●	●	●	●		●	●			
AUXILIARY SYSTEMS														
Station battery	●			●	●	●	●	●		●	●			●
Standby generators					●			●						
Uninterruptible power supply					●	●	●							
Life safety					●	●	●	●						
Security (door access & CCTV)					●	●		●						
Metering & alarms	●			●	●	●	●	●						
DISMANTLE & DISPOSAL														
Transformer substation equipment	●			●				●				●	●	
Outdoor/indoor switchgear				●				●				●		●
Contaminated equipment													●	
FACTORY & SITE INSPECTION														
Factory acceptance tests				●	●	●	●	●		●	●			
Site inspections	●			●	●	●	●	●		●	●	●		●
CONTRACT DOCUMENTATION														
Preparation, Bid Evaluation, Recommendations				●	●	●	●	●		●	●	●	●	●
CONSTRUCTION MANAGEMENT & CONTRACT ADMINISTRATION				●	●									
TESTING & COMMISSIONING SUPERVISION	●			●	●			●						
TRAINING & START-UP SUPPORT & COORDINATION				●	●			●		●	●			●
RECORD DOCUMENTATION PREPARATION														
Drawings, operation & maintenance manuals	●		●	●	●	●	●	●	●	●	●	●	●	●
POST CONSTRUCTION SERVICES														
Warranty review			●	●	●	●	●	●		●	●			●

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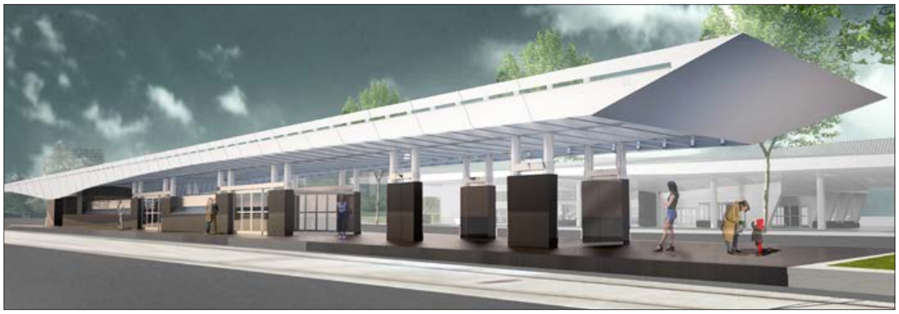
Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7
Schedule 1-19
Appendix B
Filed: 2012 Nov 27
(12 pages)

IBI GROUP REPRESENTATIVE PROJECT

SGA/IBI Group Architects
SGA/IBI Group Architects is a division of IBI Group Architects, affiliated with IBI Group

FACILITIES

TRANSPORTATION TERMINALS



Sheppard East Station Design

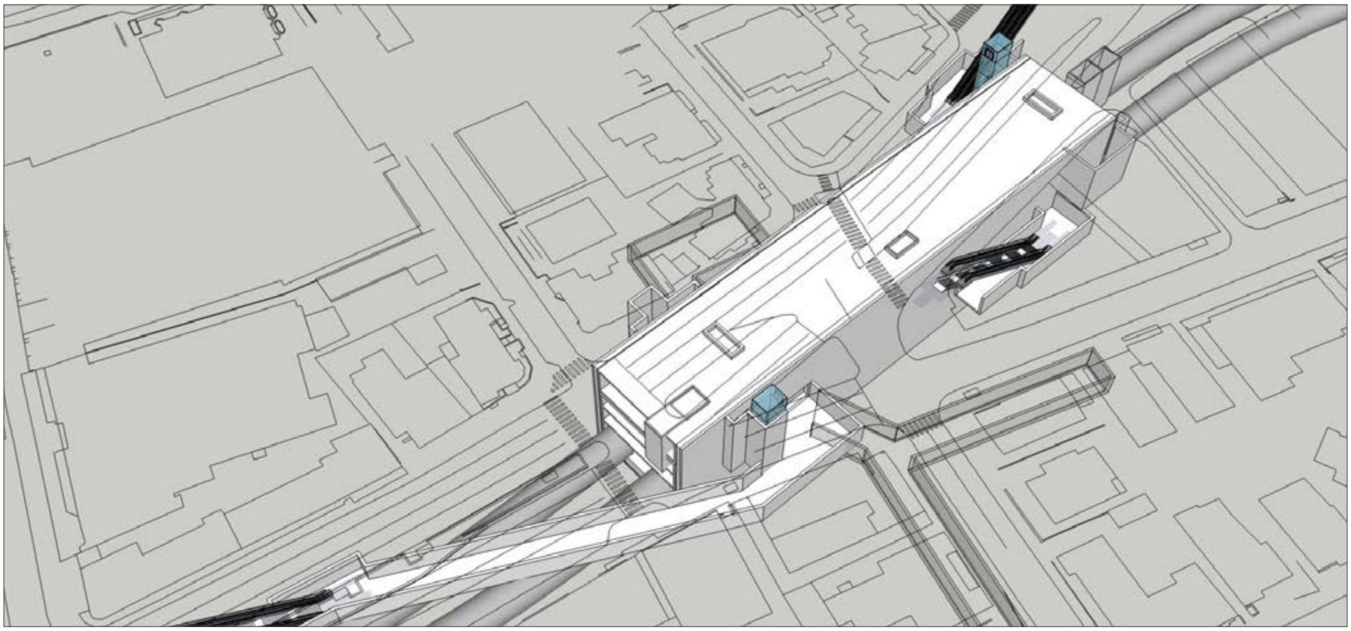
Transit City is the proposed expansion of the Toronto transit network beyond the city core with modern, rapid light-rail vehicles. Sheppard East Station will serve as a key interchange station between the Sheppard East LRT line and the extension of the Scarborough Rapid Transit (SRT) and also serve as the terminus for the local bus network.

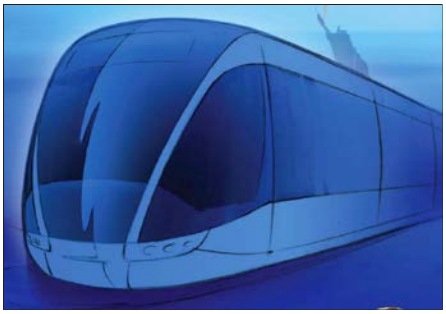
IBI Group is overseeing the design of the 9,000 m^2 station to meet the latest Transit City standards as well as the new Toronto Green Standard with station construction planned to commence in 2015. The passenger facilities of the project feature: an architecturally distinctive main entrance building with seven-bay bus terminal; 2nd entrance building and PPUDO; street level LRT platform; underground SRT platform; and all the connections to create a smooth flow between these facilities. Support and service facilities include an extended tail track; cross-over track; combined LRT+SRT traction power substation; and fire ventilation design to the latest safety engineering requirements.

Areas of Practice
- Architecture
- Programming
- Interior Design
- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Landscape Architecture

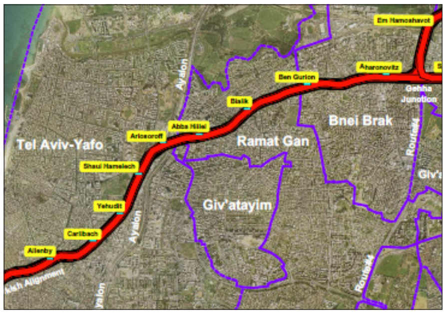
Services
- Research
- Design and Contract Documents
- Approvals

Client: Toronto Transit Commission
Location: Toronto, Ontario
Status: Preliminary Design





The
Red
Line
Tel Aviv Metropolitan



Red Line LRT Project

NTA – Metropolitan Mass Transit Systems Ltd in Israel, a government company, is undertaking the implementation of the Red Line LRT project in Tel Aviv, the first in a planned network of LRT lines that will cross and connect the Tel Aviv metropolitan region. The IBI Group was chosen in a public tender process to design the ten underground stations of the Red Line project. The expanded IBI Group team is utilizing manpower and knowledge from the offices of IBI Group in Toronto, SGA/IBI Group in Toronto, Gruzen Samton ▪ IBI Group Architects in New York, Irvine, Portland, and IBIB Group Consultants in Israel.

IBI Group is the prime contractor; is responsible for the architecture of all ten stations, the urban planning, landscape design, traffic and transportation planning and utility relocations around and between the stations. IBI Group is as well the lead consultant overall on five stations and has assigned the role of lead consultant for the other five stations to DHV of Holland. This is a very high profile and significant project to the city of Tel Aviv, as it is the first LRT project to be implemented in the city, and first underground transit system in Israel, and one of the largest architectural assignments awarded in Israel and in fact to IBI Group. The project is following an ambitious time schedule and is targeted to be completed within one year.

Areas of Practice

- Architecture
- Programming
- Interior Design
- Civil Engineering
- Structural Engineering
- Mechanical Engineering
- Electrical Engineering
- Landscape Architecture
- Systems Engineering (AV, IT, Security)

Services

- Planning and Environmental Assessment
- Design and Contract Documents
- Approvals
- Implementation/Construction Phase Services
- Program Management

Client: NTA Metropolitan Mass Transit System Limited
Location: Tel Aviv, Israel

Etobicoke Hydro

Toronto Hydro Vault

IBI Group was retained by Etobicoke Hydro to carry out a visual review of the Toronto Hydro vault at 330 Dixon Road. The vault is located underground at the entrance of a high rise condominium building and connects directly to the lower level of an underground parking garage. The garage services this building and two similar buildings in the complex. Both the vault and garage are of conventional reinforced concrete construction.

Extensive water penetration at the exhaust shaft, together with freeze-thaw action, had resulted in structural failure of the shaft walls. Review of the building found that the deterioration was caused by leakage through the east-west expansion joint, leakage at the removable panels, together with some leakage at slab cracks.

Project Information

Location
Toronto, ON

Completion Date
1998

Services Provided
Structural Assessment

Reference
Mr. C. A. Macdonald
T 416 394 3622

Ford Motor Company of Canada

Canadian Headquarters Office Building

IBI Group was invited to provide engineering services for a new office building for Ford Canada to replace their existing Canadian Headquarters in Oakville. The new building was constructed only 30 m away from the existing 40 year old building and was completed and made fully operational before transferring staff from the old building.

Scope of work included a complex relocation and demolition strategy delivered under a construction management contract. The building features a cylindrical tower at the entrance, curtain wall on the north and south sides and white aluminum panel siding on the east and west ends. IBI Group provided project management, civil, structural, mechanical and electrical engineering services. The design was intended to provide technology infrastructure and environmentally sensitive solutions representing Ford's business policies for the 21st century. The building consists of a steel frame, including steel elevator shafts. This approach was selected to avoid a possible strike by the concrete trade and to advance the project schedule.

The facility includes learning studios, paint shop, receiving dock and archives in the basement. The ground floor provides all employee amenities including a full cafeteria, fitness centre, games room and corporate services. The main entrance features a showroom with a vertical folding wall opening into the cafeteria to facilitate large gatherings for company functions. General office areas include widefloor plates with a 42' clear span to facilitate maximum flexibility in furniture layout allowing Ford to reconfigure interior spaces to suit changing business needs. Other facilities include classrooms and computer labs for training, a boardroom with video conferencing and multi-media presentation capabilities. A computer room was built to handle Ford's requirement of 24/7 data hosting for their dealershop network. Data wiring and telephone infrastructure were designed for flexibility with minimized cost.

Project Information

Location
Oakville, ON

Gross Area
210,000 sf (19,519 sm)

Completion Date
2003

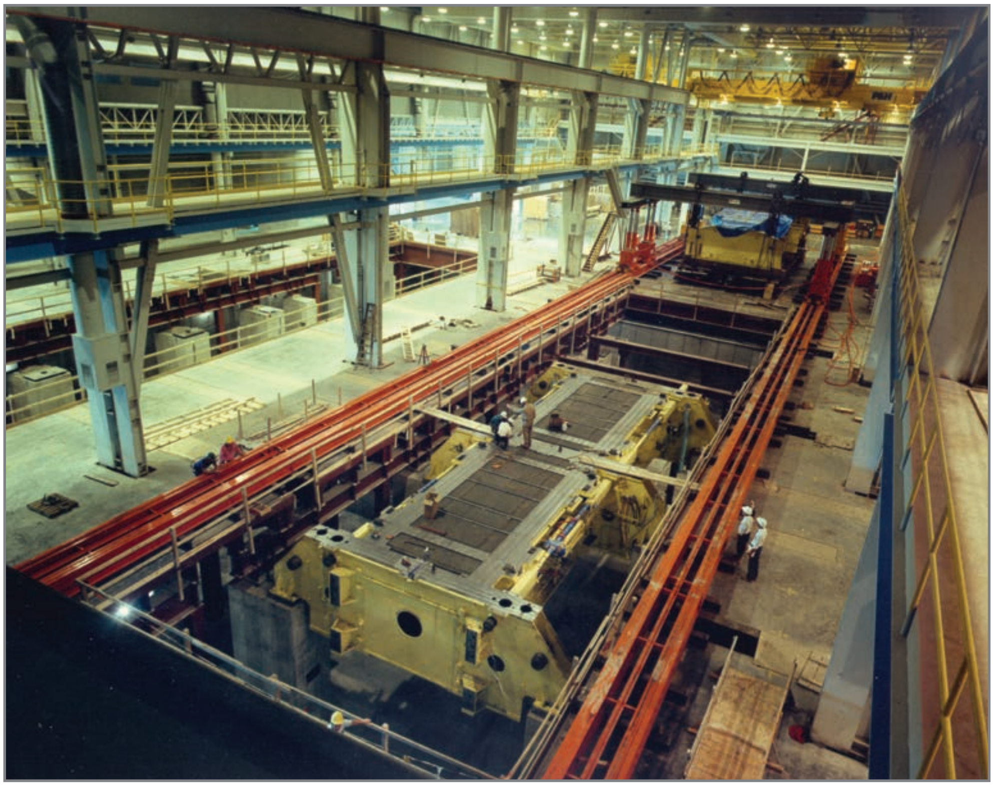
Cost
$31,500,000 (Base Building)

Services Provided
Program Management
Structural
Mechanical
Electrical
Civil
Communications
Master Planning

Reference
James Oloman
T 905 845 2511 ext 1376

Awards
2004
Town of Oakville
Urban Design Award

General Motors of Canada



Stamping Plant

The Stamping Plant was added as a major part of the modernization of the Autoplex facilities. The new presses produce the large roof, fender and door components. The plant houses 9 state-of-the-art tri-axis transfer presses weighing up to 3,500 tons each. Each press bay provides foundations for an individual press as well as for a 60 ton overhead crane.

The building is 65 ft. high and contains a 25 ft. deep basement of about 140,000 sf to accommodate the massive press foundations and the scrap handling system. An adjacent 85 ft. high structure houses an automated storage and retrieval system for stamped parts.

This 70,000 sf building is entirely supported by the steel storage racks. Each of the 10 aisles contains an automated stacker crane which interfaces with the storage racks and a system of automated monorails. The entire building is air conditioned, using a stratified concept. A sophisticated building management system automatically monitors and controls a number of points within the building services system to ensure the ideal working environment.

The construction program extended over several years and required continuous and precise scheduling to accommodate ongoing vehicle production at all times.

Project Information

Location
Oshawa, ON

Gross Area
400,000 sf (37,160 sm)

Completion Date
1986

Services Provided
Architecture
Structural
Mechanical
Electrical
Civil Siteworks
Presses & Materials Handling

GO Transit

Ajax Station West Tunnel Preliminary Design, Shoring Detailed Design and Field Review

Growing demand for rail services and increased traffic at the Ajax Train Station created a need to expand existing passenger handling capacity and improve patron service. One of the station improvements was a West Tunnel that increased the pedestrian handling capacity and relieve congestion at the station. The pedestrian tunnel connects the centre platform with existing parking lot and support barrier free access with a new elevator. The underground structure crosses multiple sets of GO and CN tracks and dead-end at the existing platform.

The purpose of this assignment was to identify the site location which can accommodate the new tunnel, develop general arrangement layout for the underground sections, prepare detailed design of precast and shoring elements and review field installation during construction.

Construction challenges included coordination of train traffic with shoring and excavation activities, maintaining a safe passage for pedestrian traffic at the platform and completion of construction during off-peak or weekend hours.

Project Information

Location
Ajax, ON

Completion Date
2009

Cost
$4,400,000

Services Provided
Project Management
Architecture
Civil Siteworks
Cost Estimation
Structural
Electrical

Reference
Claudio Teixeira
T 416 869 3600 ext 5378

Greater Toronto Airports Authority

North Deicing Facility
Toronto Pearson International Airport

IBI Group provided consulting engineering services for the design of the North Deicing Facility (NDF) at Toronto Pearson International Airport. The design comprised of three deicing pads, each capable of handling two narrow-body or one wide bodied aircraft. The project also included a 950 sm three level control tower with control rooms and staff areas.

The total tank design capacity for fresh glycol storage, type I and IV was 370,000 litres. Total storage capacity for spent glycol storage was 1,000,000 gallons for high concentrate and 4,300,000 gallons for low concentrate. All tank storage was designed below grade.

The design included an underground connection with the Central Deicing Facility (CDF) for added flexibility of fluids management. The NDF operation models the CDF System with aircraft detection sensors, variable message signboards and electronic flightstrip software.

Project Information

Location
Toronto, ON

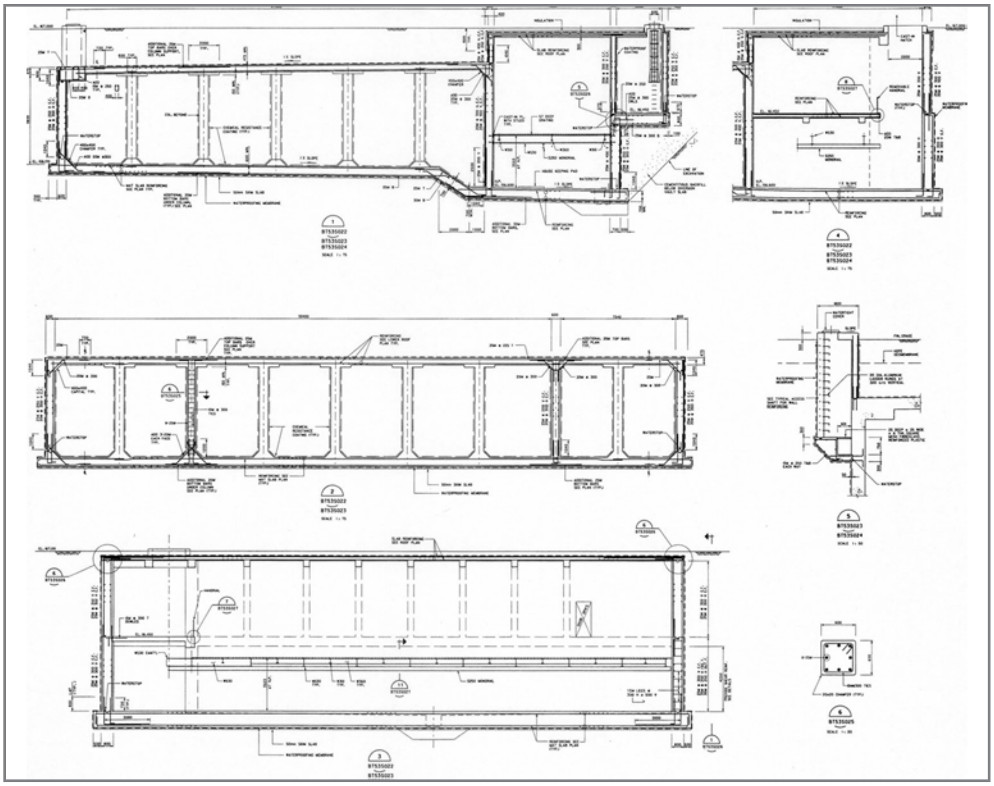
Completion Date
2001

Cost
$45,000,000

Services Provided
Architecture
Structural
Mechanical
Electrical
Controls Engineering
Process
Water & Wastewater

Reference
Derrek Gray
T 416 879 1541

Greater Toronto Airports Authority



North Deicing Waste Glycol Equalization Tank
Toronto Pearson International Airport

IBI Group, in joint venture with Acres International, was retained by Greater Toronto Airport Authority for the detail design of the North Deicing in-ground Waste Glycol Equalization Tank at Toronto Pearson International Airport as part of the North Deicing Facility Project.

Sizing of the waste glycol storage tank was based on the requirements of providing a sufficient storage volume to accommodate the runoff from a 25 mm rainfall event. The parameters required to determine the runoff volume include drainage area, runoff coefficient and total rainfall. A runoff volume of 4,300 cubic metres was calculated based on these parameters.

The 4.3 ML underground concrete equalization tank is approximately 30.3 m wide by 51 m long and 5.2 m deep. The bottom of the tank would be approximately 12 m below grade, based on the invert of the incoming storm drainage pipes.

Project Information

Location
Toronto, ON

Completion Date
2001

Cost
$4,000,000

Services Provided
Structural
Mechanical
Electrical
Process
Controls Engineering

Reference
Derrek Gray
T 416 879 1541

Inn on the Park

Parking Garage

Development on the property adjacent to the Inn on the Park Hotel formerly utilized as hotel parking necessitated the construction of a parking garage to replace the lost stalls.

Pre-cast concrete was selected as the most cost effective solution for the primary structure with cast in place foundations and basement walls. The parking deck levels were alternately sloping and level in order to efficiently provide the required floor area with in the available foot print and height restrictions of the adjacent development. The basement areas required mechanical ventilation and sprinkler systems in accordance with code requirements, while the upper levels complied to the requirements of open storey design.

- The completed garage provides parking for and will include elevator access to all levels.
- Pre-cast elements and cast in place basement and foundations
- Preliminary design
- Illumination
- Mechanical systems (ventilation) and drainage design
- Structural design
- Fire protection
- Preparation of contract documents
- Periodic site review

Project Information

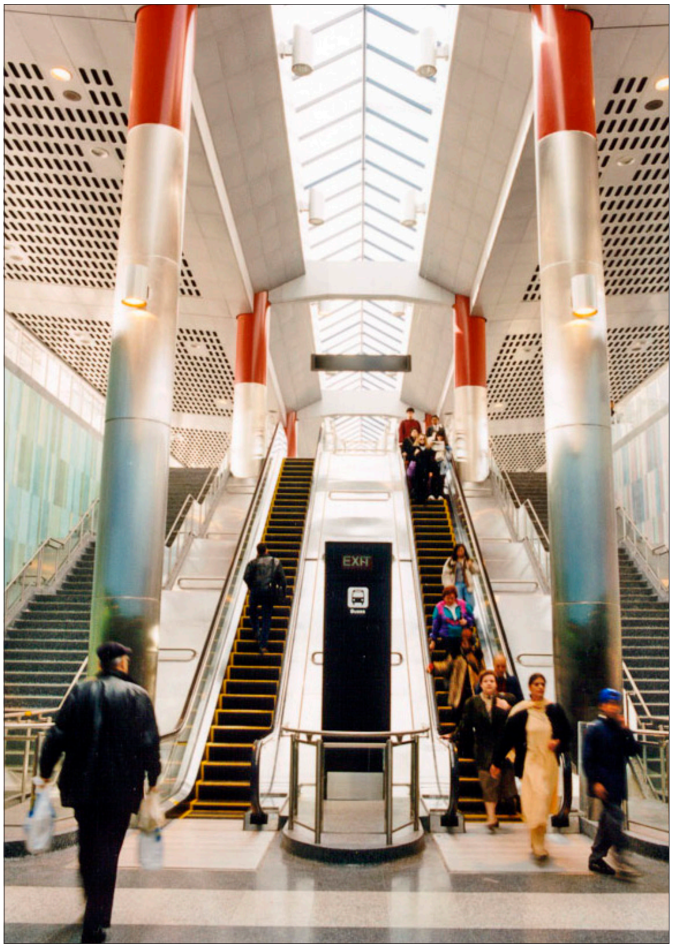
Location
Toronto, ON

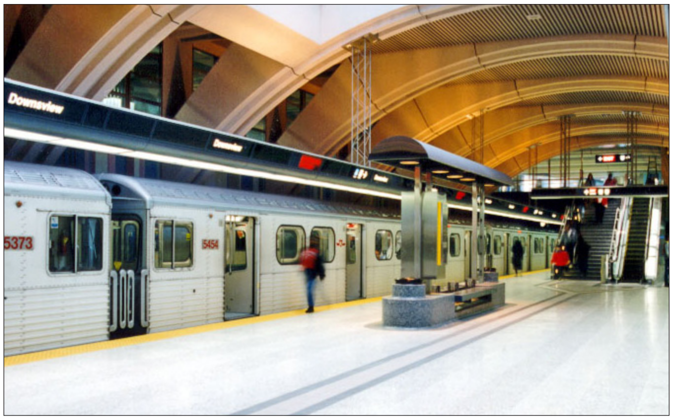
Gross Area
100,000 sf (9,300 sm)

Completion Date
1999

Cost
$3,000,000

Services Provided
Structural
Electrical
Architecture





Downsview Subway Station

Downsview Station is the northern terminus of the TTC Spadina subway line and was the first new subway station built in Toronto in over 15 years. The station currently serves as a transit hub for 30,000 subway passengers daily and incorporates the York regional bus terminal.

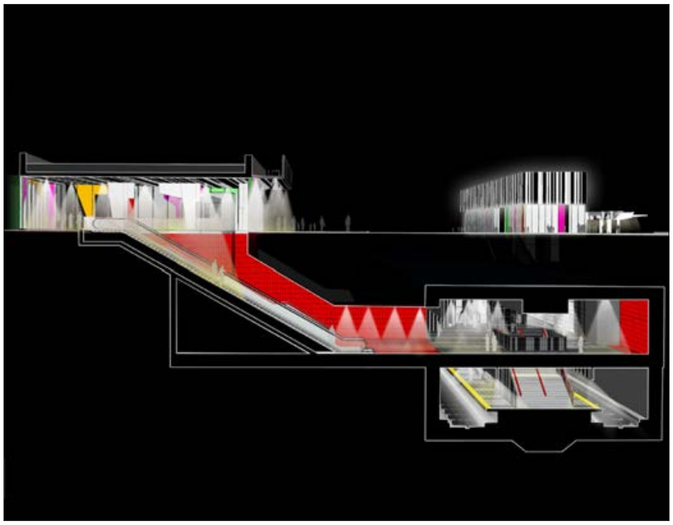
At Downsview, SGA/IBI Group Architects were responsible for the below-ground areas of the station. An emphasis was made on the design of the train hall to create a large, bright open space to improve the passenger experience. A knee-brace buttress structural system creates column-free arched space over the platform, offering clear open views and easy wayfinding through the station. A large skylight floods the space in natural daylight. Working with artist Arlene Stamp, the design team installed extensive mosaic tile artwork in the key areas, capturing the light penetrating the station to create a vibrant and colourful backdrop to the passengers moving through the station.

Areas of Practice
- Architecture
- Programming

Services
- Design and Contract Documents
- Approvals
- Implementation/Construction Phase Services

Client: Toronto Transit Commission
Location: Toronto, Ontario

SGA/IBI Group Architects
SGA/IBI Group Architects is a division of IBI Group Architects, affiliated with IBI Group



Finch West Subway Station

One of the key design principles of Finch West Station is to integrate architecture, engineering and art. SGA/IBI Group Architects as part of the TSGA Joint Venture and in association with Will Alsop in the UK, have been engaged with the artist Bruce McLean to create one of the six new subway stations that extend the TTC Spadina line.

The artist has been challenged to be fully engaged with the design team to create a concept that is at one with the architecture and the engineering. The bus terminal on the east side of Keele Street, includes a pedestrian entrance and a “flying beam” that encloses the substation and the transformer yard on a second floor level. Across the street is the main entrance providing an immediate connection to the major intersection of Finch and Keele. The artwork is continued into the underground where a double height space achieves a heightened passenger experience.

Areas of Practice
- Architecture

Services
- Design and Contract Documents

Client: Toronto Transit Commission
Location: Toronto, Ontario

Toronto Transit Commission

Sheppard East Station LRT

The Scarborough Rapid Transit (SRT) system began operation in 1985. It currently serves 6 stations over a 6.4 km route and is operating at over capacity. A northeasterly extension of the line for four new stations, including the Sheppard East Station, is proposed utilizing LRT technology and vehicles. In 2007, the Toronto Transit City Light Rail Transit Plan was announced for 7 new LRT lines, including the Sheppard East LRT which will connect with the SRT extension at the Sheppard East Station.

Features of the proposed passenger station include a below-grade station with a centre platform under Sheppard Avenue, underground passenger connections, a substation building, and an interface with the at-grade LRT stop on the Sheppard East LRT line along Sheppard Avenue.

IBI Group has been retained by the Toronto Transit Commission to provide Preliminary Design consulting services for the new underground Sheppard East Station. The design services and scope of work includes project and stakeholder management, topographic, legal and utility surveys, noise, vibration and air quality studies, traffic analysis, geotechnical investigations, architectural and urban design, civil and structural engineering, mechanical and electrical engineering, communications systems design, landscape design, cost estimation and scheduling, Station Needs Analysis and Spatial Programming, passenger flow modeling, Stormwater Management Report, building code and standards review, fire/life safety report, risk management report, and a constructability review analysis.

Project Information

Location
Toronto, ON

Completion Date
2011

Services Provided
Architecture
Civil Siteworks
Contractibility Review
Cost Estimation
Electrical
Engineering Study
Feasibility Study
Interior Design
Landscaping
Mechanical
Programming
Project Management
Railway Design
Scheduling
Stormwater Management
Structural
Topographical Survey
Traffic Planning
Transit Systems
Value Engineering

Reference
Rick Thompson
T 416 393 4870

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.20:

Reference(s): Tab 6F, Schedule 1-46, 48

Confirm that the 4 oil circuit breakers that do have auto-reclosure problems are included in THESL's updated 2012/2013 capital plan (see OEB Staff IRR 46c).

RESPONSE:

Three of the four MS switchgear with oil circuit breakers and auto re-closure problems are included in THESL's 2012-2013 capital program (Thornton MS, Porterfield MS, Neilson MS). The remaining MS switchgear with oil circuit breakers and auto re-closure problems was originally included in THESL's application as a 2014 job, and thus is not included in the updated 2012-2013 capital program.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT1.21:

Reference(s): Tab 6F, Schedule 1-62

To confirm that correct Appendix A was filed for Board Staff IRR 62; file correct document if incorrect version had been filed.

RESPONSE:

The correct documents were filed as appendices to THESL's response to OEB Staff interrogatory 62. However, the appendices were incorrectly referenced in THESL's response.

The correct references for the appendices are as follows:

Appendix A – Gas and Electricity Inspection Act
Appendix B – IESO Market Rules
Appendix C – IESO Wholesale Revenue Metering Standards - Hardware
Appendix D – THESL's IESO Approved Upgrade Proposal

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT2.1:

Reference(s):

Provide cost impact of all new jobs added during the Oct 31, 2012 update in each of the three affected segments.

RESPONSE:

The cost impacts are as follows:

Segment	Added Job Title	2012 Cost ($000)	2013 Cost ($000)
Underground Infrastructure	26034 - Cable replacement at Lodestar - Civil		135.0
	26035 - Cable replacement at Lodestar - Electrical		198.0
	22319 - Arrow Rd. U/G loop replacement		1,513.0
Feeder Automation	W13483 - Etobicoke Repeater Radio Survey/Install		195.1
	W13485 - Etobicoke SAT		162.9
	W13484 - Fairchild TS - Survey/Repeater Radio Installation		189.2
	W13486 - Fairchild TS SAT		162.8
	E12679 - FA Repeater Radio Installation		282.0
HONI Contributions	Strachan TS A3-4 Switchgear Replacement Capital Contribution	3,270.0	
	Glengrove TS A5-6 Switchgear Replacement Capital Contribution	2,200.0	
Total		5,470.0	2,838.0

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT2.2:

Reference(s):

Provide studies comparing THESL against other cities that THESL considers itself to be reasonably benchmarked against in respect of reliability.

RESPONSE:

Please see attached the Reliability Eligibility Peer Group Cities Comparison by Capgemini (Appendix A). This study had previously been submitted as part of the EB-2010-0142 proceeding.

This undertaking was provided in the context of a line of questioning regarding reliability indicators such as SAIDI, SAIFI and CAIDI, as well as other bases for THESL's assessment of its own reliability. In that context, THESL notes that system average numbers such as these indicators mask area-specific and customer-specific problems. For example, THESL provides as Appendix B to this undertaking response letters received from certain key customer accounts which detail, among other things, these customers' experiences and concerns in respect of reliability.

Toronto Hydro-Electric System Limited
EB-2012-0064
Schedule 2-2
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Appendix A
(60 pages)

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RELIABILITY PEER GROUP CITIES COMPARISON

FINAL REPORT

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1. EXECUTIVE SUMMARY

Maintaining and enhancing the electrical network reliability is a critical element of Toronto Hydro's efforts to provide both quality and dependable electrical service to its customers. It is also a key element in meeting the challenges of environmental sustainability through the development and addition of renewable and distributed generation sources. The province of Ontario has been very aggressive, both legislatively and regulatory, on providing for environmental sustainability. Improving reliability is typically an asset/infrastructure-intensive effort, requiring significant capital investment. The success of these investments and related efforts are primarily measured through the System Average Interruption Duration Index (SAIDI), the average electrical outage time experienced by each customer served and System Average Interruption Frequency Index (SAIFI) the average number of interruptions that each customer served, experiences. Toronto Hydro's 2008 SAIDI and SAIFI are 74.5 minutes and 1.76, respectively.

There is a balance between the amount of capital investment made and the achievement of lower SAIDI and SAIFI numbers that Toronto Hydro must achieve. There are examples, like for the city of Tokyo, that has an annual SAIDI of under two minutes, but that was achieved through almost a complete rebuild of their electrical network in the early- to mid-1980's at a cost of about $3000 US per customer account (that is more than $6000 in today's value). This initiative was undertaken primarily by the Japanese government as a means to recover from the 1980's economic recession. Clearly, the capital investment needed to achieve this SAIDI is outside the norm expected of a Utility or the level of reliability expected by most customers. As is identified in this report, for several of the other cities to which reliability comparisons were made, the initial design or redesign of their electrical networks was driven by factors that allowed for massive amounts of capital infrastructure investment, resulting in high reliability.

Toronto Hydro, however, can benefit from evaluating electrical network reliability improvement efforts undertaken in similar (peer group) cities. It's an opportunity to evaluate the reliability improvement decisions made by Utilities, and in some cases, be able to access the results. It also provides an opportunity to evaluate the impact on reliability resulting from various electric network designs. This effort identifies "like" cities (not utilities) for Toronto Hydro to compare against using mutually agreed upon parameters. The results can be used to establish achievable reliability targets and identify the potential required projects/investments to achieve performance consistent with the selected peer group cities reliability. Toronto Hydro's current 10-year reliability plan was evaluated against the selected peer group cities to identify gaps and determine potential projects/investment areas.

The objective of this study was to compare SAIDI, SAIFI and electrical network design of Toronto to a peer group of major global cities. We started with a larger set of peer cities – the list was reduced to twelve peer cities based on several criteria for which city demographics, electrical network, climate, etc., characteristics were collected. Key to this effort was to select cities that had a mixed overhead and underground electrical network and had a similar cold climate (ice and snow) in a normal year. Out of the twelve identified, reliability data was available for eight of the peer cities – see Table 1. Two separate methods, ultimately massaged into one, were used to short list five peer cities to analyze their electric grid designs with Toronto's. The five cities are: New York, London, Paris, Montreal and Vancouver. Montreal and Vancouver were included because of the detailed reliability data available, that allowed us to do some additional analyses, outside the original scope of this effort, to compare the three major Canadian cities.

City	City Type	SAIDI (Min)	SAIFI
Toronto	Mix – Cold	74.5	1.76
Hong Kong	UG – Warm	5.37	0.093
New York	Mix – Cold	16.6	0.139
Paris	Mix – Cold	17	0.3
London	Mix – Cold	34.44	0.32
Tokyo	UG – Warm	2	0.05
Miami	Mix – Warm	67.8	
Vancouver	Mix – Warm	102.6	0.54
Montreal	Mix – Cold	147.14	2.44

Table 1: SAIDI and SAIFI for the Selected Peer Group Cities

Except for Montreal and Vancouver, all other peer group cities SAIDI is better than Toronto. Except Montreal all other peer group cities SAIFI is better than Toronto.

In all the peer cities there are at least three (3) independent transmission links into the cities, and at peak load, loss of any one of these links would not have a major impact on the city. This is not true of Toronto, which relies on two major substations to provide the bulk of the power to the city and loss of either one at peak load would have a major impact on the city. Toronto is designed to N-1 standards and does not have a clear ability to truly provide N-2 or N-3 reliability without local back up generation. Toronto electrical network was designed for very different conditions than it faces today.

But, for an N-1 network, Toronto reliability is very good. Against the peer group, made up mostly of N-2 and N-3 grids, Toronto lags. Add the fact that historically compared to the peer group, Toronto has been a low density city (except Montreal) and Toronto has a network that was designed for very different conditions than it faces today.

Based on the peer group cities analysis results and reviewing related efforts underway or planned at Toronto Hydro, a reliability transformation map was developed that takes a holistic approach to the issues Toronto Hydro is facing. The reliability improvement at Toronto Hydro will have to be a multi-year journey that will address multiple areas: people & process, renewable & embedded generation, physical grid upgrades and smart grid. This program will require executive commitment and communication through Toronto Hydro.

The map – see Figure 1 – is grouped into three waves over the next ten years: Planning (2009 to 2010), Foundation (2011 to 2013), and Steady State (2014 to 2018).

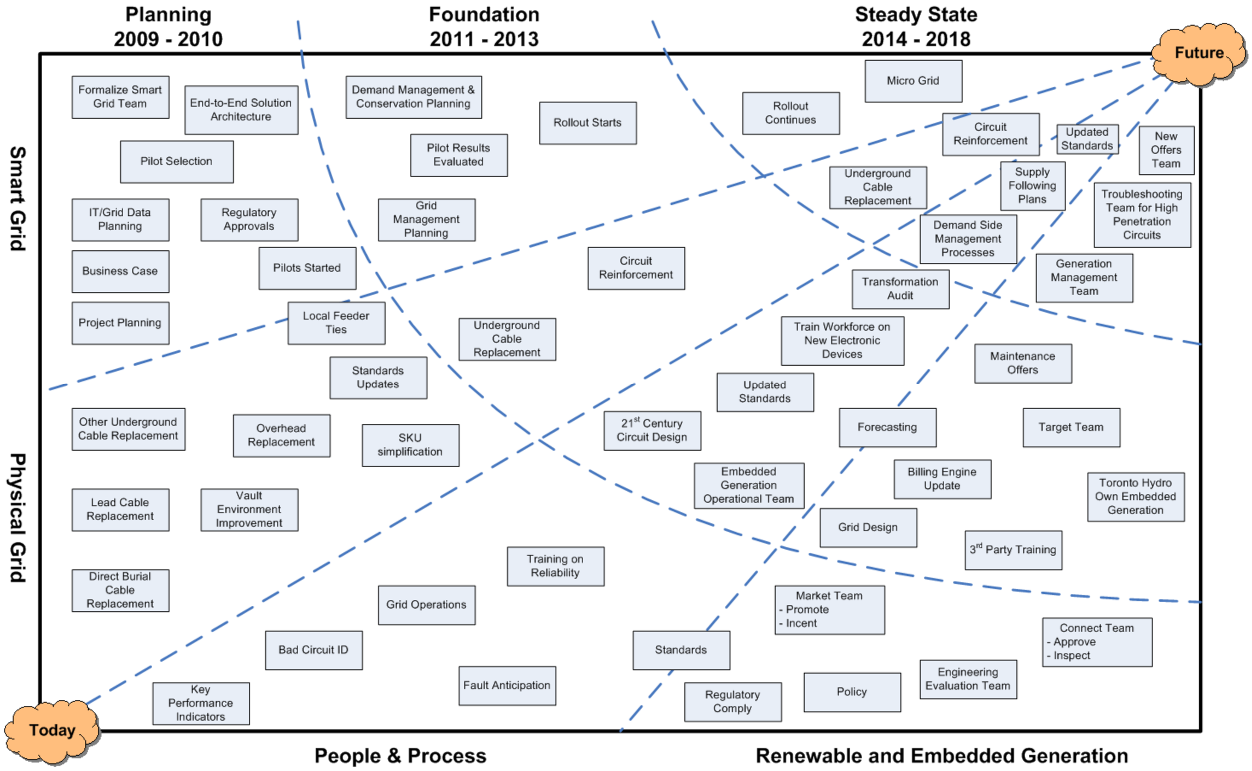


Figure 1: Toronto Hydro Reliability Transformation Map

During this study it became obvious that one of the limits to improved reliability in Toronto is the fact that there really are only two independent sources of power to the city that are large enough to support the daily needs of the city and that any work done below this level was still subject to these limits in the long run. This limit has driven the design philosophy in the city of Toronto over the last fifty years and has limited the options for the engineers to develop high reliability grid design. Because there is only two independent sources of power to Toronto and the resulting grid design philosophy the smart grid program will have to address a lot more issues than in other cities to deliver the same results. Building in demand side management, embedded generation, more redundancy and network automation will be core parts of the smart grid program and critical to not only improving reliability, but maintaining current levels in the interim. As the province of Ontario and Toronto are on an aggressive path to embed distributed generation and energy storage, the network must become “smarter” to respond and adjust to these complexities. Toronto Hydro has already began to make significant changes in the design philosophy for the electric grid this changes provide a strong directional change in grid design that in the long run will provide a much improved electrical network.

This report provides additional details to the recommendations (projects) identified on the reliability transformation map.

2. RELIABILITY PEER GROUP CITIES COMPARISON OVERVIEW

The objectives of the reliability peer group cities study is to:

- Compare Toronto Hydro to their peer group of major global cities for mutually agreed upon reliability parameters using the standard IEEE Reliability indices. The primary index used is SAIDI. All others are considered secondary.
- Compare and contrast Toronto Hydro's grid design to the three (3) mutually agreed upon best-in-class cities from reliability standpoint based on their SAIDI scores.
- Determine a range of activities based on the peer cities reliability indices and electric network designs that Toronto Hydro could undertake to improve reliability.

SAIDI was selected as the primary index because out of the 25 IEEE Standard indices for reliability, it is the most reported and used by utilities. From a regulatory standpoint, more than 70 percent of the regulators in North America use SAIDI as a primary index.

Capgemini worked with Toronto Hydro to determine the peer group of global cities from which to get reliability data. Capgemini used public domain information first and then worked directly with the peer group to obtain more information. The goal was to get like data from 75% of the peer group. The study was limited to12 cities potentially being designated as peer cities.

Once the data was collected, an analysis was conducted to determine what process / factors were applied by the peer cities/utilities to the raw data. For example, regulators for each Utility may have different criteria (e.g., interruption duration, # of customers affected) for what's included in SAIDI for customer outages resulting from a storm. This allowed us to normalize the reliability data so that it's comparable from city to city and to understand the differences in the raw and processed data.

Capgemini then worked with Toronto Hydro to examine the zones in their grid and identify the different levels of electric source redundancy (contingency) that are in-place in each major zone. This information was used to determine whether the zone is N (single source), N-1(two sources) or higher contingency and how that compares with the utilities in the peer group cities. The result is documented in high level peer group city electrical circuit maps that are used to compare the cities financial and commercial districts. These maps were created for several peer group cities and for Toronto to analyse the physical electrical circuit design differences. The maps address the core financial district, a mixed business district and a residential district. The maps include basic power flow, how the N, N-1 or higher contingency is created, and the segmentation and self healing capability of the network. The differences were identified and a summary of the key points related to each difference and its impact on the overall reliability, documented. The maps are primarily intended to help understand the differences between the way the networks are designed and configured, and are not intended to be engineering documents.

Once the peer group cities maps were reviewed and accepted by Toronto Hydro, a workshop was held to understand the key differences between the best in class cities and Toronto Hydro to determine potential changes / improvements that could be applied by Toronto Hydro. These potential changes/improvements were used to develop the list of possible projects that can be applied by Toronto Hydro to improve reliability.

3. PEER GROUP CITIES SELECTION

From a list of the major cities around the world, a session was held to reduce the list to a reasonable size for peer group cities comparison. The criteria agreed to for this reduction were focused on:

(1) City size, population had to be more than 1 million people in the core city and more than 3 million people in the metropolitan area.

(2) City reputation, the city had to have a name that was recognizable to everyone in the room and be an attractive place to visit and/or live.

(3) Industry reputation, the cities had to have an active electric utility, they needed to be known to the various industry technical societies, whether it was CEATI, EPRI, IEC, IEA, or IEEE, etc. and the utilities had to participate in one or more of these societies in a noticeable way. (e.g. papers, presentations, major meeting attendance)

(4) No large population of transient people living in temporary housing in the margins of the city with makeshift (temporary) utilities.

These criteria provided what was felt to be a peer group for Toronto Hydro, a city that is internationally recognized, more than 1 million people living in the core city and the utility serve the city is active in the different standards committees. This peer group was discussed between the Toronto Hydro and Capgemini personnel participating in the reliability study to make sure everyone agreed that the cities fit the criteria. All of work at this level was done based on reputation and people's own knowledge, not on research. The path going from a list of potential cities to the peer group cities and the cities we end up doing a circuit design analysis in describe in Figure 2, numbers in circle denote the number of peer cities being considered in that stage of the Peer Cities Selection Process.

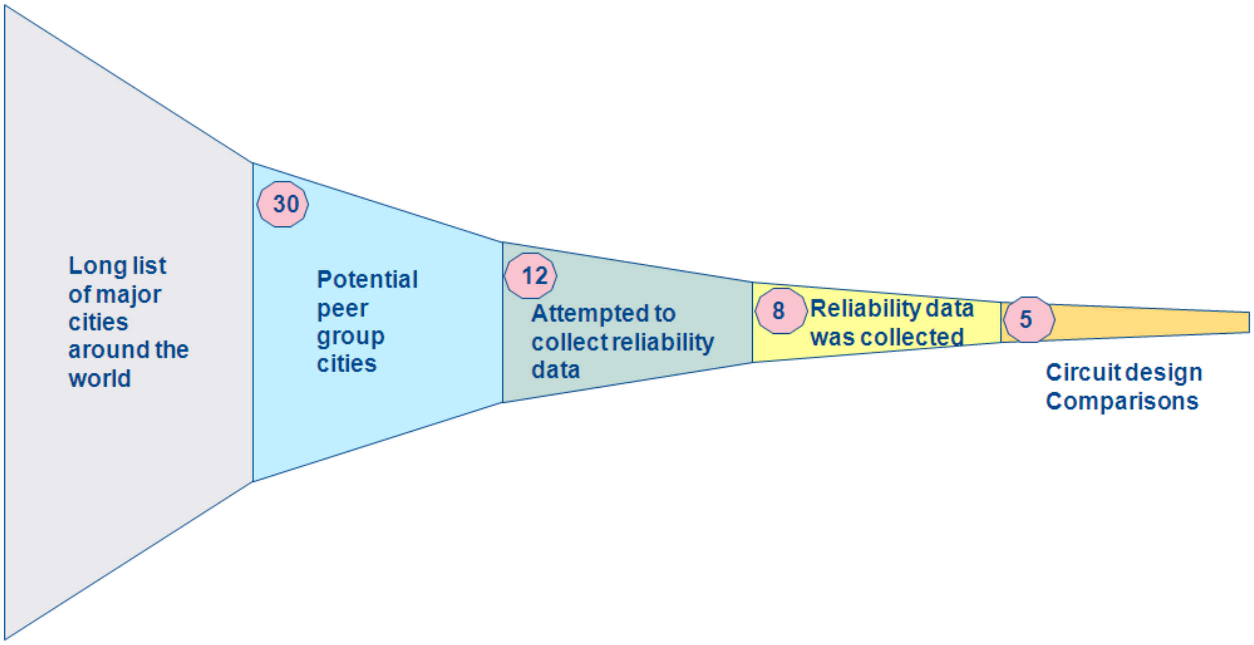


Figure 2: Peer Cities Selection Process

These criteria were used to cut the initial cities list to approximately 30 potential peer group cities. Once this list was assembled, demographics were collected about each of the cities. Analysis was conducted to validate the initial impressions of the team and validate that the cities in the peer group did indeed belong in the peer group. This information is documented in Appendix 2. At this point in the project there was no visibility by the reliability study team into the reliability in any city. The characteristics collected included:

(1) City size – population density and growth rate.

(2) Industry Mix – Mix of industrial, included type when available, and residential usage.

(3) Geography & Topology – Vegetation in the city in a qualitative fashion. Was the city flat or hilly or were there other natural characteristics that made it unique.

(4) Mix of Electrical Networks – Overhead and Underground distribution mix.

(5) Climate/Weather – Storm patterns; Cold vs. Warm climate.

(6) Estimated Peak Load.

(7) Projected Load Growth.

(8) Utility Type – Investment Own Utility (IOU) vs. Municipal, Government, etc.

(9) The ability to collect the reliability information from the cities, how available was it?

3.1. Peer Group Cities Selections for SAIDI and SAIFI Analysis

The next step was to select no more than 12 cities from this list as potential peer group cities for which we would attempt to collect reliability data and related information. From this complete collected data on the 30 potential peer group cities a set of five key criteria were developed and prioritized. A workshop with the team was conducted during which a criteria selection and prioritization process was applied to the city characteristics documented in Appendix 2 to determine the list of 12 cities. The top five criteria are documented in Appendix 1 and summarized below:

(1) **Industry Mix**: First consideration is the mix of commercial, industrial and residential usage. A secondary consideration is the type of industry. For example, does the industrial segment include a large inductive load component? The industry mix can drive different network design and reliability requirements.

(2) **Mix of Electrical Networks**: The mix of electrical supply arrangements, operation voltages, overhead or underground infrastructure, loop feeders, SCADA switching, etc. can have large effect on the reliability.

(3) **Climate**: Climate has a direct effect on the reliability. In an overhead infrastructure, cold weather conditions will often cause more outages than warm weather. Similar warm and humid areas can also cause outages in an underground infrastructure.

(4) **Geography**: Specifically, vegetation contacts with overhead electrical infrastructures are common cause for outages. The situation worsens during extreme weather conditions such as wind and ice storms. The City of Toronto actively maintains the urban forest as a means of protecting and enhancing the City's natural heritage.

(5) **Population Density**: This can drive electricity demand and present more challenging situations in operating the electrical network.

These five criteria were used to make a second pass through the cities and further narrow the list. This narrowing allowed the team to focus on the cities that were most relevant to the study, providing a peer group not based on subjective judgement, but supported through quantification. There was an agreement when this list was compiled, that getting reliability data on 8 of the 12 cities would be considered a success.

One of the keys was picking cities that had a mixed overhead and underground network. To this end a small table was created that used two criteria to rank the cities. The first criteria were whether the city saw ice and snow in a normal year. Cities that did not were labelled "warm". The other criteria were whether cities provided power to at least 10 percent of their customers or 10 percent of the load from an overhead system. Cities that met these criteria were labelled "Mixed". No city in the peer group was a pure overhead system.

With these two criteria, as well as the remaining three, the initial list of 30 potential peer group cities was narrowed to the following twelve (12) cities that were agreed to by all the participants:

Asia:

1. **Hong, Kong, China**: Large metropolitan area with large residential centers in the city. Although climate is not similar the area does get some heavy storms.
   - 60% residential in the city
   - Primarily underground infrastructure – lot of overhead on the edges of the cities and in the hills
   - Tropical monsoon. Cool and humid in winter, hot and rainy from spring through summer, warm and sunny in fall. Some times can get typhoons, flooding, and minor earthquakes
   - Very little vegetation in the core city, lots on the edges - it goes from high-rise buildings to farms in less than 500 meters
   - Population: 7,000,000 People, Area: 1,104 km^2 = Density of 6,340 People/km^2
2. **Tokyo, Japan**: Very populated area with different climate than Toronto. Downtown has a mix of residential and C&I districts with a diverse set of buildings. Outside of downtown Tokyo has similar overhead and underground infrastructure mix to Toronto.
   - 50% residential in the city
   - 100% underground infrastructure in the city, when you get outside of the core downtown you see more overhead infrastructure
   - Climate is warmer than Toronto, but there is a winter season that brings some minor storms
   - Very little vegetation in the core city, some parks and trees
   - Population: 33,200,000 People, Area: 6,993 km^2 = Density of 4,750 People/km^2
3. **Singapore**: City has similar mix of residential and commercial customers, and similar mix of businesses.

- 30% residential in the city
- Electric infrastructure is mostly underground in the core downtown.
- Climate is tropical
- Heavy vegetation in some areas – mostly residential trees
- Population: 4,590,000 People, Area 704 km^2 = Density of 6,520 People/km^2

North America:

4. **Chicago, IL**: Large metropolitan area, with similar climate and stormy weather. Downtown is mostly commercial.
    - 30% residential in the city
    - Mix of underground and overhead electric infrastructure (as density goes down - overhead increases).
    - Named the "windy city" for the strong wind and storms during the winter. Winter is cold and can frequently get ice storms.
    - Most residential neighborhoods have heavy vegetation
    - Population 2,842,518 People, Area: 588 km^2 = Density of 4834 People/km^2
5. **New York, NY**: Large metropolitan area, similar concentration of financial industry in downtown area. Similar climate since it is also on the coast, although conditions are less severe in Toronto since the water is fresh water as oppose to saltwater in New York.
    - 60% residential in the city
    - Manhattan is all underground the rest of the city is about a 60/40 mix of overhead and underground
    - Coastal city gets a lot of storms – some hurricanes, and flooding. Sometimes it has ice storms
    - Most residential neighborhoods have heavy vegetation
    - Population 8,143,197 People, Area: 785 km^2 = Density of 10,373 People/km^2
6. **Dallas, TX**: Financial hub of TX, downtown is mostly business, rapid residential growth in downtown.
    - 25% residential in the city
    - Electrical infrastructure is 40% underground
    - Warm winters with some ice storms, hot summers (humidity is similar to Toronto in the Summer) - some storms
    - Lightly wooded in most of the downtown areas
    - Population 1,213,825 People, Area: 888 km^2 = Density of 1,367 People/km^2
7. **Miami, FL**: Frequent storms, floods, and similar industry mix.

- 50% residential in the city
- Mixed overhead and underground electrical infrastructure
- Many storms during the hurricane season
- Residential trees
- Population: 386,417 People, Area: 94 km^2 = Density of 4,110 People/km^2

<u>Canada:</u>

8. **<u>Vancouver, Canada</u>**: Canadian city that is recognized globally.
    - 35% residential in the city
    - Mixed overhead and underground electrical infrastructure
    - Warmer than Toronto, but there is a winter season
    - City is light on vegetation, gets heavier as you move outside of the downtown
    - Population: 1,830,000 People , Area: 1,120 km^2 = 1650 People/km^2
9. **<u>Montreal, Canada</u>**: Canadian city that are recognized globally. Much heavier snow and storm patterns.
    - 50% residential in the city
    - Mixed overhead and underground electrical infrastructure
    - Cold winter, strong snow storms
    - City is light on vegetation, gets heavier as you move outside of the downtown
    - Population: 3,216,000 People, Area: 1,740 km^2 = Density of 1,850 People/km^2

<u>Europe:</u>

10. **<u>Paris, France</u>**: Large metropolitan area, similar concentration of C&I in the downtown area.
    - 35% residential in the city
    - Financial and business district is all underground, the rest of the city is about a 60/40 mix of overhead and underground
    - The city is not in any storm pattern paths, but still get some heavy storms, and snow storms in the winter
    - Most residential neighborhoods have heavy vegetation
    - Population: 9,645,000 People, Area: 2,723 km^2 = Density of 3,550 People/km^2
11. **<u>London, England</u>**: Large metropolitan area, similar concentration of C&I in the downtown area. Climate is also very similar.
    - 40% residential in the city
    - Electrical infrastructure is 90% underground

- Rainy and cloudy, city is in-land but still get some weather form the coast. In the winter city can get heavy snow storms
- Most residential neighborhoods have heavy vegetation
- Population: 8,278,000 People, Area: 1,623 km^2 = Density of 5,100 People/km^2

12. **Amsterdam, Nederland**: Major European metro area with similar industry mix.
    - 40% residential in the city
    - Mixed overhead and underground electrical infrastructure
    - Strongly influenced by the North Sea. Mild winter temperature seldom goes below 0℃.
    - Heavy vegetation in the city and outside
    - Population: 758,000 People, Area: 219 km^2 = Density of 4,459 People/km^2

Toronto, Canada: The subject of this study.

- Base on the 2007 Annual Report Toronto Hydro has 601,515 Residential customers out of 679,913 (88% Residential)
- Mixed overhead and underground electrical infrastructure
- Cold weather conditions in the winter. Often suffer extreme condition such as wind storms, ice storms and lightning
- The City of Toronto maintains the urban forest as a means of protecting and enhancing the City’s natural heritage. Contact with overhead electrical infrastructure is common.
- Population: 4,367,000 People, Area: 1,655 km^2 = Density of 2,650 People/km^2

This information is also included in Appendix 2.

At this point the team worked to collect reliability information for the peer group cities. As mentioned earlier, up to this point, no one on the team had access to the reliability information for the cities in the study. The next step in the process was to collect the reliability information and from that further narrow the list to a set of cities that would be used for detailed analysis of what the differences were between the cities for reliability. Data was collected from the target peer group cities over a period of several weeks via direct contact with each of the cities/utilities. In some cases summary data was provided and, in others, we received detailed information. For the next step in the process, the summary data was used.

The data collection focused on SAIDI – the most used of the IEEE reliability indices. We were able to obtain reliability data for eight (8) of the twelve (12) cities. They are:

1) New York
2) Paris
3) London
4) Montreal

5) Vancouver
6) Tokyo
7) Hong Kong
8) Miami

3.2. Peer Group Cities Selection for Detailed Electrical Network Design Analysis

Once the data was collected and reviewed, two methods were identified to select the three (3) peer group cities (from the 8 potential) for which detailed electrical network design analysis was conducted. The methods and resulting recommendations for the three peer group cities are provided below.

Method 1: Select the cities with the lowest SAIDI and the best comparison of city type to Toronto (Mix – Cold).

The cities recommended are New York, Paris and London.

Summary comments resulting from the use of this method and the three (3) cities recommended include:

- Cities have lower SAIDI than Toronto
- Cities, overall, are very similar to Toronto
- Will allow for comparison across two continents, North America and Europe
- Cities contain financial centers/districts, similar to Toronto

Method 2: Select one city from each continent to allow for continent-specific Utility Industry, Legislative, and Regulatory practices to be evaluated. Note: this results in four (4) cities being selected.

The cities recommended are Tokyo, New York, Paris and, Montreal or Vancouver.

Summary comments resulting from the use of this method and the four (4) cities recommended include:

- An additional city requires detailed network design analysis.
- Montreal and Vancouver have worse SAIDI and SAIFI than Toronto, however, it may be interesting to evaluate what major reliability improvements have been made and resulted in limited success.
- Will provide for broader continent-specific Utility Industry, Legislative and Regulatory practices to be considered.
- Tokyo is very different from Toronto, plus the Japanese government made a significant capital investment in reliability improvements in the mid-1980’s, which may limit the comparison value.

Based on team discussions, a blended methodology was ultimately used, taking the three suggested cities from method one and adding Montreal and Vancouver for a total of five cities.

This selection was made because the cities better fit the profile of Toronto with similar reasons for outage and very different network designs. This allowed for a wider range of network designs in looking for what made the largest difference in reliability. It also allowed the team to look at very active cities (Montreal and Vancouver) where several reliability improvement projects have been carried out and yet the reliability is still not to the level of Toronto.

4. TORONTO HYDRO RELIABILITY DATA

4.1. Facts and Characteristics

According to the 2007 Annual Report Toronto Hydro service territory covers downtown Toronto and suburbs for a total of 679,913 customers the total population is 2,503,281. Customer mix is:

Type	Count
Residential	601,515
General Service <50kW	66,245
General Service 50kW to 1000kW	11,591
General Service 1mW to 5mW	513
Larger Users > 5mW	49

Table 2: Toronto Hydro Customer Mix (2007 Annual Report)

Following, are some other facts:

Fact	Value
System Area (km^2)	650
Estimated Peak Load System (MW)	5,050
Installed In-City Generation (including dedicated transmission lines from generators outside urban area)	Fuel Cell/CoGen Facility in Toronto operated by Enbridge feeding into the Grid – see note.
Transmission Design LOLE	800,087,663 kWh (in 2007) - 3% of electricity delivered. Generally losses are between 3% - 3.2%
Use of Secondary Networks (km) - Low Voltage Meshed Grids	2881.645
Use of GITs	62,909 transformers owned by Toronto Hydro. 60,871 in service which 1950 are Network transformers.
Building underground / over-built substations	TS (Transformer Stations): 35 MS (Municipal Stations): 173 CS (Customer Stations): 13
Design Criteria (urban)	N, in some areas N-1 contingency

Table 3: Toronto Hydro Electric Network Characteristics

****** NOTE: Cell CoGen owned and operated by Enbridge Gas ******

The Unit consists of a 1.2 MW Fuel Cell and a 1 MW Turbo Expander (Heat Extraction Generation) giving the unit a 2.2 MW full electrical generation capacity. The Fuel Cell is cycled at 0.6 MW and the Turbo Expander is cycled from 0-0.8 MW. The Unit is load following. They operate it by following the loading/demand on the Grid. The unit is 100% hooked into the Grid and does not electrically supply the building it sits close to. It is operated at ~73% Capacity and it has better than 90% Availability. The life expectancy is better than 20 yrs.

4.2. Reliability Metrics and Targets

The system wide reliability values for SAIFI and SAIDI are based on 2008 data:

SAIFI	1.80
SAIFI Targets	2.0

Table 4: Toronto Hydro SAIFI

SAIDI	74.5
SAIDI Targets	80

Table 5: Toronto Hydro SAIDI

These targets are self imposed or driven by Ontario Energy Board.

SAIDI and SAIFI Criteria:

1. Excludes Major Event Days (there were no MED in 2008). MED is calculated using the 2.5 beta method; it was 6.09 minutes for 2008.
2. Excludes momentary outages. Momentary outages are those outages which last less than a minute.
3. Toronto Hydro does not have any reliability thresholds penalties for major outages.

4.3. SAIDI Adjustments to Allow for Like-to-Like Comparison

Raw reliability data that listed all the outages for 2008 was provided for both the Toronto metro area and the downtown area. This has been included in Appendix 3. From the Toronto Hydro (Toronto metro area) reliability data, a total of 3,094 outages (customer interruptions) were recorded in 2008.

In order to compare Toronto metro area reliability to the other cities we selected, a decision was made to compare like-to-like. To do this, it was important to remove incidents from the overall raw reliability data for Toronto that would not have happened in the other cities. For instance, in the tropical cities, ice and snow would not have interrupted the service. In cities where the whole infrastructure is underground, adverse weather would have a limited effect. To do this the, outage records were sorted by cause and each of the causes were added up. The primary cause codes used by Toronto Hydro are listed below. The results of this sorting by cause code are provided in Appendix 4.

A customer interruption has been defined in terms of primary and secondary causes of the interruption. The primary causes of interruption have been assigned the following codes (The codes and definition are base on the Distribution Service Continuity Committee of CEA):

1. **Unknown/Other:** Customer interruptions with no apparent cause or reason which could have contributed to the outage.
2. **Scheduled Outage:** Customer interruption due to the disconnection at a selected time for purpose of construction or preventive maintenance.
3. **Loss of Supply:** Customer interruption due to problems in the Bulk Electricity System (BES) such as: Under frequency load shedding, transmission system transients, or system frequency excursions. All interruptions up stream of the Delivery Point from the BES (Transmission system) are to be classified as “Loss of Supply” outages.
4. **Tree Contacts:** Customer interruptions caused by faults due to trees or tree limbs contacting energized circuits.
5. **Lightning:** Customer interruptions due to lightning striking the distribution system resulting in an insulation breakdown and/or flashovers.
6. **Defective Equipment:** Customer interruptions resulting from equipment failures such as deterioration due to age, inadequate maintenance, or imminent failures detected by maintenance.
7. **Adverse Weather:** Customer interruptions resulting from rain, ice storms, snow, winds, extreme ambient temperatures, freezing fog, or frost and other extreme conditions.
8. **Adverse Environment:** Customer interruptions due to equipment being subjected to abnormal environment such as salt spray, industrial contamination, humidity, corrosion, vibration, fire or flooding.
9. **Human Element:** Customer interruptions due to the interface of utility staff with the system such as incorrect records, incorrect use of equipment, incorrect construction or maintenance, switching errors, commissioning errors, deliberate damage, or sabotage.
10. **Foreign Interference:** Customer interruptions beyond the control of the utility such as birds, animals, vehicles, dig-ins and foreign objects.

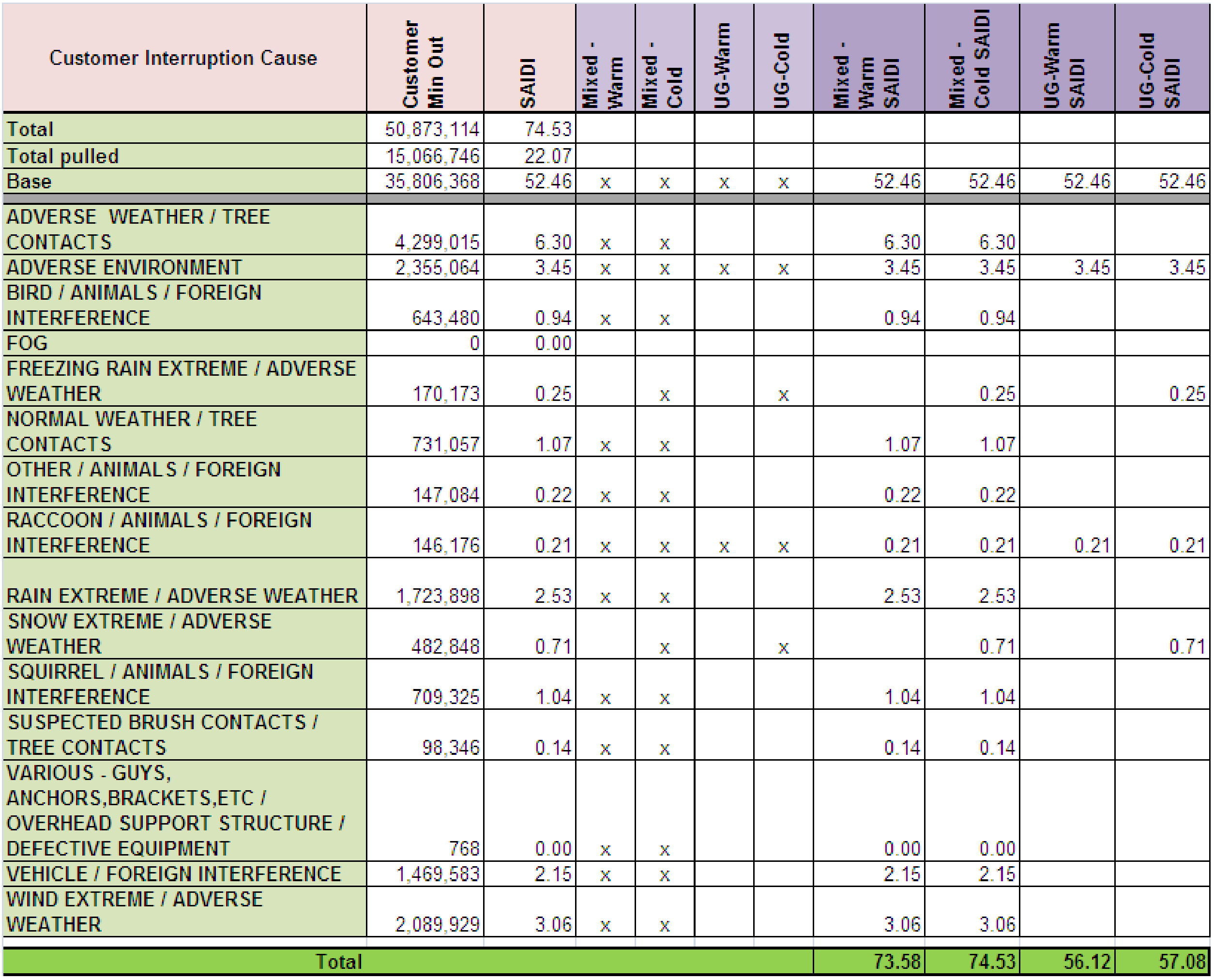
During the analysis of the interruption cause codes it was clear that the interruption causes fall into two main categories: (1) type of electrical network (underground vs. mix – underground and overhead) and, (2) type of climate. We created four different combination sets (referred to as city type combinations) based on these predominate categories:

1. **Mix-Warm**: Mix overhead and underground electrical infrastructure in a warm climate.
2. **Mix-Cold**: Mix overhead and underground electrical infrastructure in a cold climate.
3. **UG-Warm**: Underground electrical infrastructure in a warm climate.
4. **UG-Cold**: Underground electrical infrastructure in a cold climate.

To calculate SAIDI and SAIFI from Toronto Hydro reliability data for each of those city types, we pulled a subset of the interruption cause codes that would be affected by the electrical network type or type of climate. This created a base customer minute of outage number and Customer Interruption. Once we assigned the pulled interruption cause codes to each of the four city types we were able to calculate SAIDI and SAIFI for each city type to provide a baseline for comparison. The results are provided in Table 6 – SAIDI and Table 7 – SAIFI.

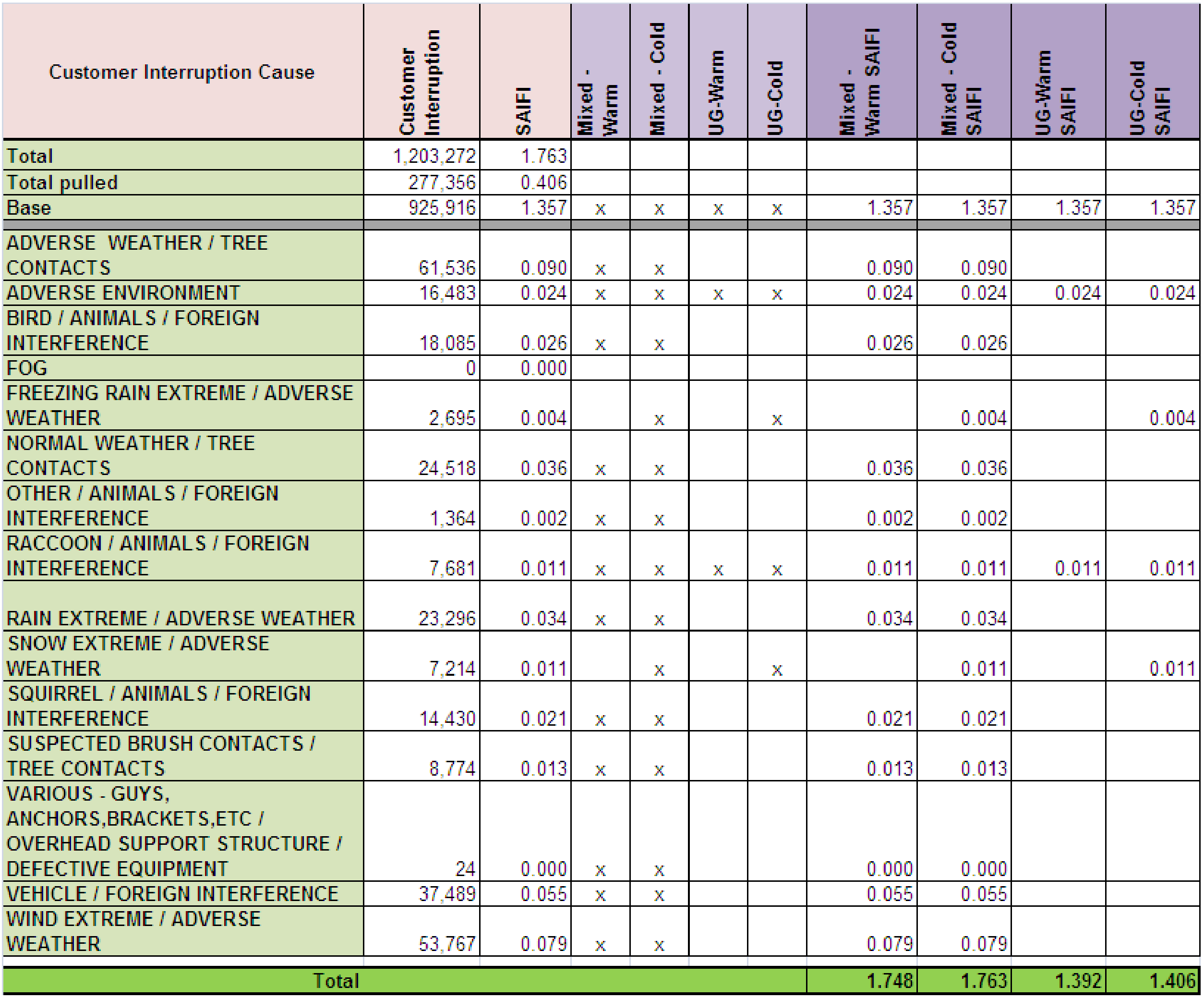
The first column in those tables list all the primary customer interruption causes that we pulled out from Toronto Hydro's reliability data. That allowed us to calculate the customer minute of outage and customer interruptions that we pulled out, leaving the baseline. Once we cross-referenced the customer interruption causes to the four city type combinations we were able to calculate SAIDI and SAFI for each of the city type combinations. The complete analysis spreadsheet is attached as part of Appendix 4.

With these analysis results, we now have SAIDI and SAIFI numbers for each of the city type combinations based on Toronto Hydro reliability data that we considered to be comparable on a like-to-like basis (based on the specific city type combination assigned earlier to the peer group city) to the SAIDI and SAIFI numbers for the potential comparison cities.



Customer Interruption Cause	Customer Min Out	SAIDI	Mixed - Warm	Mixed - Cold	UG-Warm	UG-Cold	Mixed - Warm SAIDI	Mixed - Cold SAIDI	UG-Warm SAIDI	UG-Cold SAIDI
Total	50,873,114	74.53								
Total pulled	15,066,746	22.07								
Base	35,806,368	52.46	x	x	x	x	52.46	52.46	52.46	52.46
ADVERSE WEATHER / TREE CONTACTS	4,299,015	6.30	x	x			6.30	6.30		
ADVERSE ENVIRONMENT	2,355,064	3.45	x	x	x	x	3.45	3.45	3.45	3.45
BIRD / ANIMALS / FOREIGN INTERFERENCE	643,480	0.94	x	x			0.94	0.94		
FOG	0	0.00								
FREEZING RAIN EXTREME / ADVERSE WEATHER	170,173	0.25		x		x		0.25		0.25
NORMAL WEATHER / TREE CONTACTS	731,057	1.07	x	x			1.07	1.07		
OTHER / ANIMALS / FOREIGN INTERFERENCE	147,084	0.22	x	x			0.22	0.22		
RACCOON / ANIMALS / FOREIGN INTERFERENCE	146,176	0.21	x	x	x	x	0.21	0.21	0.21	0.21
RAIN EXTREME / ADVERSE WEATHER	1,723,898	2.53	x	x			2.53	2.53		
SNOW EXTREME / ADVERSE WEATHER	482,848	0.71		x		x		0.71		0.71
SQUIRREL / ANIMALS / FOREIGN INTERFERENCE	709,325	1.04	x	x			1.04	1.04		
SUSPECTED BRUSH CONTACTS / TREE CONTACTS	98,346	0.14	x	x			0.14	0.14		
VARIOUS - GUYS, ANCHORS,BRACKETS,ETC / OVERHEAD SUPPORT STRUCTURE / DEFECTIVE EQUIPMENT	768	0.00	x	x			0.00	0.00		
VEHICLE / FOREIGN INTERFERENCE	1,469,583	2.15	x	x			2.15	2.15		
WIND EXTREME / ADVERSE WEATHER	2,089,929	3.06	x	x			3.06	3.06		
Total							73.58	74.53	56.12	57.08

Table 6: Toronto Hydro Customer Interruptions Cause Analysis (SAIDI)



Customer Interruption Cause	Customer Interruption	SAIFI	Mixed - Warm	Mixed - Cold	UG-Warm	UG-Cold	Mixed - Warm SAIFI	Mixed - Cold SAIFI	UG-Warm SAIFI	UG-Cold SAIFI
Total	1,203,272	1.763								
Total pulled	277,356	0.406								
Base	925,916	1.357	x	x	x	x	1.357	1.357	1.357	1.357
ADVERSE WEATHER / TREE CONTACTS	61,536	0.090	x	x			0.090	0.090		
ADVERSE ENVIRONMENT	16,483	0.024	x	x	x	x	0.024	0.024	0.024	0.024
BIRD / ANIMALS / FOREIGN INTERFERENCE	18,085	0.026	x	x			0.026	0.026		
FOG	0	0.000								
FREEZING RAIN EXTREME / ADVERSE WEATHER	2,695	0.004		x		x		0.004		0.004
NORMAL WEATHER / TREE CONTACTS	24,518	0.036	x	x			0.036	0.036		
OTHER / ANIMALS / FOREIGN INTERFERENCE	1,364	0.002	x	x			0.002	0.002		
RACCOON / ANIMALS / FOREIGN INTERFERENCE	7,681	0.011	x	x	x	x	0.011	0.011	0.011	0.011
RAIN EXTREME / ADVERSE WEATHER	23,296	0.034	x	x			0.034	0.034		
SNOW EXTREME / ADVERSE WEATHER	7,214	0.011		x		x		0.011		0.011
SQUIRREL / ANIMALS / FOREIGN INTERFERENCE	14,430	0.021	x	x			0.021	0.021		
SUSPECTED BRUSH CONTACTS / TREE CONTACTS	8,774	0.013	x	x			0.013	0.013		
VARIOUS - GUYS, ANCHORS,BRACKETS,ETC / OVERHEAD SUPPORT STRUCTURE / DEFECTIVE EQUIPMENT	24	0.000	x	x			0.000	0.000		
VEHICLE / FOREIGN INTERFERENCE	37,489	0.055	x	x			0.055	0.055		
WIND EXTREME / ADVERSE WEATHER	53,767	0.079	x	x			0.079	0.079		
Total							1.748	1.763	1.392	1.406

Table 7: Toronto Hydro Customer Interruptions Cause Analysis (SAIFI)

5. POTENTIAL PEER GROUP CITIES RELIABILITY DATA

Capgemini initially leveraged the International Urban Utilities Survey that is commissioned by IEEE, with the latest data available from Nov 2006. We also reached out to our global network of contacts in different utilities to obtain more recent data. The data we received from each of the sources was in varied levels of detail. Appendix 5 has the complete spreadsheets we received from all sources.

- IEEE International Urban Utilities Survey: Summary data on the city facts and characteristics, and reliability data.
- Montreal and Vancouver: Detail data categorized by primary causes of interruption for metro and downtown areas.
- Rest of the cities: SAIDI and SAIFI numbers

Based on the information collected on the peer group cities, a city type combination assignment was made for each city to allow for comparison of a city's SAIDI and SAIFI numbers to the similar Toronto city type combination that was calculated in Section 4. The results are provided in Table 8 – SAIDI and Table 9 – SAIFI.

City	City Type	SAIDI (Min)	Toronto SAIDI (Min)
Hong Kong, China	UG – Warm	5.37	56.12
Chicago, IL	Mix – Cold		74.53
New York, NY	Mix – Cold	16.6	74.53
Paris, France	Mix – Cold	17	74.53
London, England	Mix – Cold	34.44	74.53
Tokyo, Japan	UG – Warm	2	56.12
Dallas, TX	Mix – Warm		73.58
Miami, FL	Mix – Warm	67.8	73.58
Singapore	UG – Warm		56.12
Vancouver, Canada	Mix – Warm	102.6	73.58
Montreal, Canada	Mix – Cold	147.14	74.53
Amsterdam, NL	Mix – Warm		73.58

Table 8: Peer Group Cities – City Type Combination Assignments and SAIDI

City	City Type	SAIFI	Toronto SAIFI
Hong Kong, China	UG – Warm	0.093	1.392
Chicago, IL	Mix – Cold		1.763
New York, NY	Mix – Cold	0.139	1.763
Paris, France	Mix – Cold	0.3	1.763
London, England	Mix – Cold	0.32	1.763
Tokyo, Japan	UG – Warm	0.05	1.392
Dallas, TX	Mix – Warm		1.748
Miami, FL	Mix – Warm		1.748
Singapore	UG – Warm		1.392
Vancouver, Canada	Mix – Warm	0.54	1.748
Montreal, Canada	Mix – Cold	2.44	1.763
Amsterdam, NL	Mix – Warm		1.748

Table 9: Peer Group Cities – City Type Combination Assignments and SAIFI

6. RELIABILITY DATA ANALYSES

We received reliability data for eight (8) of the twelve (12) potential peer group cities we initially short-listed. The detail of the data was varied by city.

Most sent us facts on the city/utility, high level characteristics of the electric network and reliability IEEE indexes. Some cities, Vancouver and Montreal, for example, sent us detailed reliability records with the interruption causes.

Based on the level of reliability data received, several different analyses have been conducted. These analyses were used to support the selection of the three (3) peer group cities for which detailed electrical network design analysis was conducted as well as comparing the major Canadian cities, etc. These analyses include:

- Potential Peer Group Cities SAIDI Comparison with Toronto.
- Potential Peer Group Cities SAIFI Comparison with Toronto.
- Vancouver / Montreal / Toronto (Metro Area) – Canadian Cities Reliability Data Comparison – including customer min out and customer interruptions.
- Vancouver / Montreal / Toronto (Downtown Area) – Canadian Cities Reliability Data Comparison including customer min out and customer interruptions.
- Vancouver / Montreal / Toronto SAIDI and SAIFI - Metro and Downtown comparison
- Toronto metro / Toronto downtown Reliability Data Comparison including customer min out and customer interruption.
- Electrical network design analysis for New York, Paris, London and Montreal.

The results of each of these analyses are provided in the subsections below.

6.1. Potential Peer Group Cities SAIDI Comparison with Toronto

Figure 3, below, is a plot of the SAIDI of the potential peer group cities against the adjusted (see results from Section 4) Toronto Hydro SAIDI based on the city type.

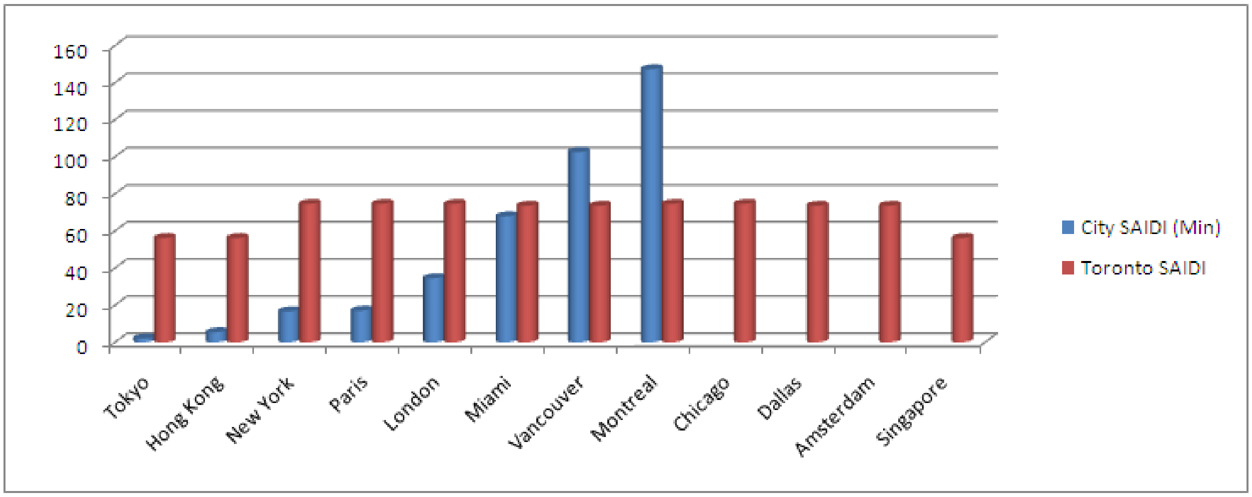


Figure 3: Peer Group Cities SAIDI Analysis

Observations:

1. Toronto SAIDI is better than the other two Canadian cities.
2. The rest of the peer group cities SAIDI are better than Toronto.
3. Miami SAIDI is very similar to Toronto although Miami is Mix – Warm city type.
4. The Mix-Cold cities SAIDI except Montreal are better than Toronto.

6.2. Potential Peer Group Cities SAIFI Comparison with Toronto

Figure 4 below, is a plot of the SAIFI of the potential peer group cities against the adjusted (see Section 4 results) Toronto Hydro SAIFI based on the city type.

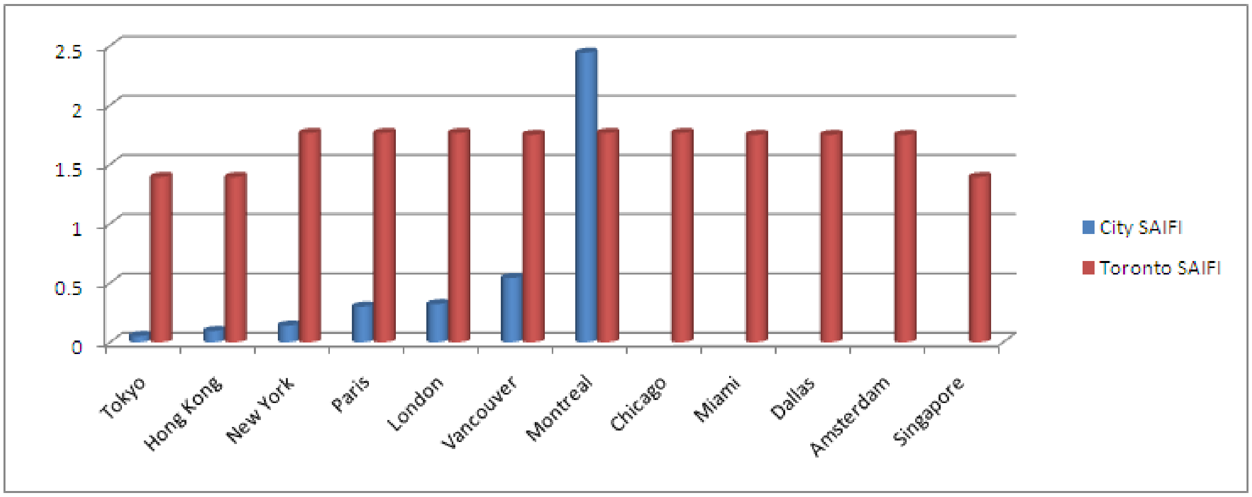


Figure 4: Peer Group Cities SAIFI Analysis

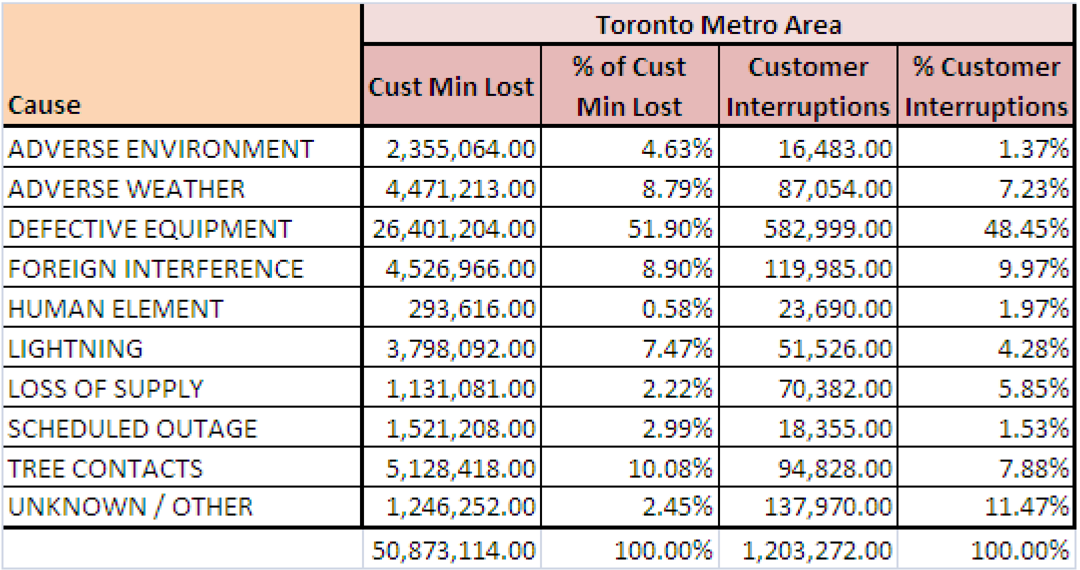
Observations:

1. Toronto Hydro SAIFI is better than Montreal.
2. Toronto Hydro has considerably more frequent outages per customer than Vancouver, but Vancouver outages are of longer duration than Toronto since Toronto SAIDI is better than Vancouver.
3. The rest of the peer group cities SAIFI are better than Toronto.
4. The Mix-Cold cities SAIFI except Montreal are better than Toronto.

6.3. Vancouver/Montreal/Toronto (Metro Area) – Canadian Cities Reliability Data Comparison

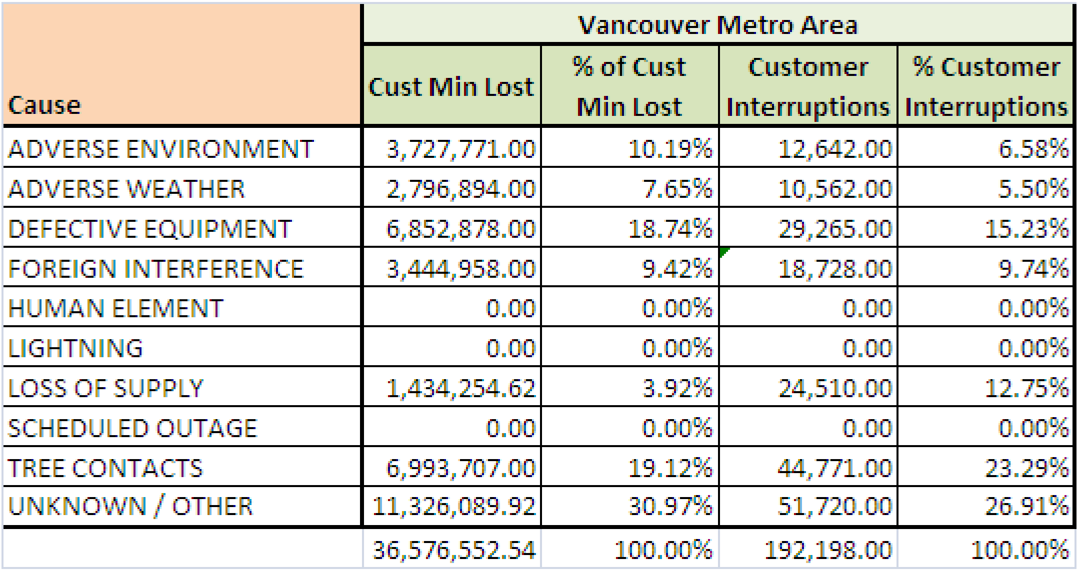
The fact that we received detailed outage data with outage coding from all three major Canadian cities allowed us to do detail analysis at the outage coding level. Because all three cities are members of CEATI they agreed to the CEATI definitions and coding of outage causes – that made the compression very easy, no mapping was needed. Similar analysis with US or European cities would have required mapping between the outage codes – we did not have to do this since we did not received detail data from those cities.

The next three Tables group the customer minutes out and customer interruptions for Toronto, Vancouver, and Montreal based on the interruption causes.



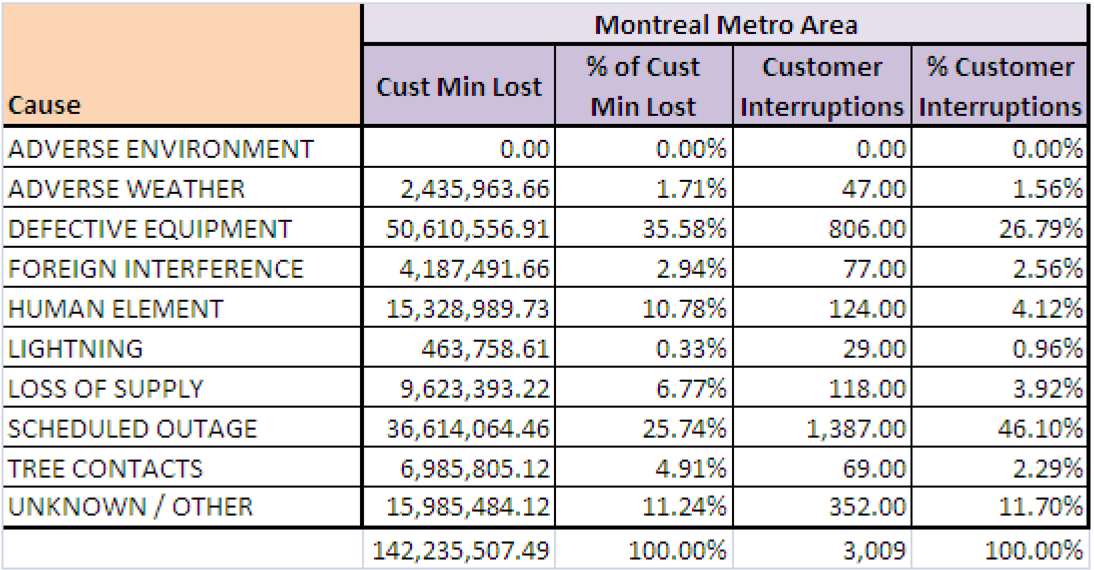
Cause	Toronto Metro Area			
	Cust Min Lost	% of Cust Min Lost	Customer Interruptions	% Customer Interruptions
ADVERSE ENVIRONMENT	2,355,064.00	4.63%	16,483.00	1.37%
ADVERSE WEATHER	4,471,213.00	8.79%	87,054.00	7.23%
DEFECTIVE EQUIPMENT	26,401,204.00	51.90%	582,999.00	48.45%
FOREIGN INTERFERENCE	4,526,966.00	8.90%	119,985.00	9.97%
HUMAN ELEMENT	293,616.00	0.58%	23,690.00	1.97%
LIGHTNING	3,798,092.00	7.47%	51,526.00	4.28%
LOSS OF SUPPLY	1,131,081.00	2.22%	70,382.00	5.85%
SCHEDULED OUTAGE	1,521,208.00	2.99%	18,355.00	1.53%
TREE CONTACTS	5,128,418.00	10.08%	94,828.00	7.88%
UNKNOWN / OTHER	1,246,252.00	2.45%	137,970.00	11.47%
	50,873,114.00	100.00%	1,203,272.00	100.00%

Table 10: Toronto Metro Area Interruption Data Mapped to the Causes



Cause	Vancouver Metro Area			
	Cust Min Lost	% of Cust Min Lost	Customer Interruptions	% Customer Interruptions
ADVERSE ENVIRONMENT	3,727,771.00	10.19%	12,642.00	6.58%
ADVERSE WEATHER	2,796,894.00	7.65%	10,562.00	5.50%
DEFECTIVE EQUIPMENT	6,852,878.00	18.74%	29,265.00	15.23%
FOREIGN INTERFERENCE	3,444,958.00	9.42%	18,728.00	9.74%
HUMAN ELEMENT	0.00	0.00%	0.00	0.00%
LIGHTNING	0.00	0.00%	0.00	0.00%
LOSS OF SUPPLY	1,434,254.62	3.92%	24,510.00	12.75%
SCHEDULED OUTAGE	0.00	0.00%	0.00	0.00%
TREE CONTACTS	6,993,707.00	19.12%	44,771.00	23.29%
UNKNOWN / OTHER	11,326,089.92	30.97%	51,720.00	26.91%
	36,576,552.54	100.00%	192,198.00	100.00%

Table 11: Vancouver Metro Area Interruption Data Mapped to the Causes



Cause	Montreal Metro Area			
	Cust Min Lost	% of Cust Min Lost	Customer Interruptions	% Customer Interruptions
ADVERSE ENVIRONMENT	0.00	0.00%	0.00	0.00%
ADVERSE WEATHER	2,435,963.66	1.71%	47.00	1.56%
DEFECTIVE EQUIPMENT	50,610,556.91	35.58%	806.00	26.79%
FOREIGN INTERFERENCE	4,187,491.66	2.94%	77.00	2.56%
HUMAN ELEMENT	15,328,989.73	10.78%	124.00	4.12%
LIGHTNING	463,758.61	0.33%	29.00	0.96%
LOSS OF SUPPLY	9,623,393.22	6.77%	118.00	3.92%
SCHEDULED OUTAGE	36,614,064.46	25.74%	1,387.00	46.10%
TREE CONTACTS	6,985,805.12	4.91%	69.00	2.29%
UNKNOWN / OTHER	15,985,484.12	11.24%	352.00	11.70%
	142,235,507.49	100.00%	3,009	100.00%

Table 12: Montreal Metro Area Interruption Data Mapped to the Causes

To compare the three cities, we've plotted the % customer minutes out and % customer interruptions as shown on the following two graphs.

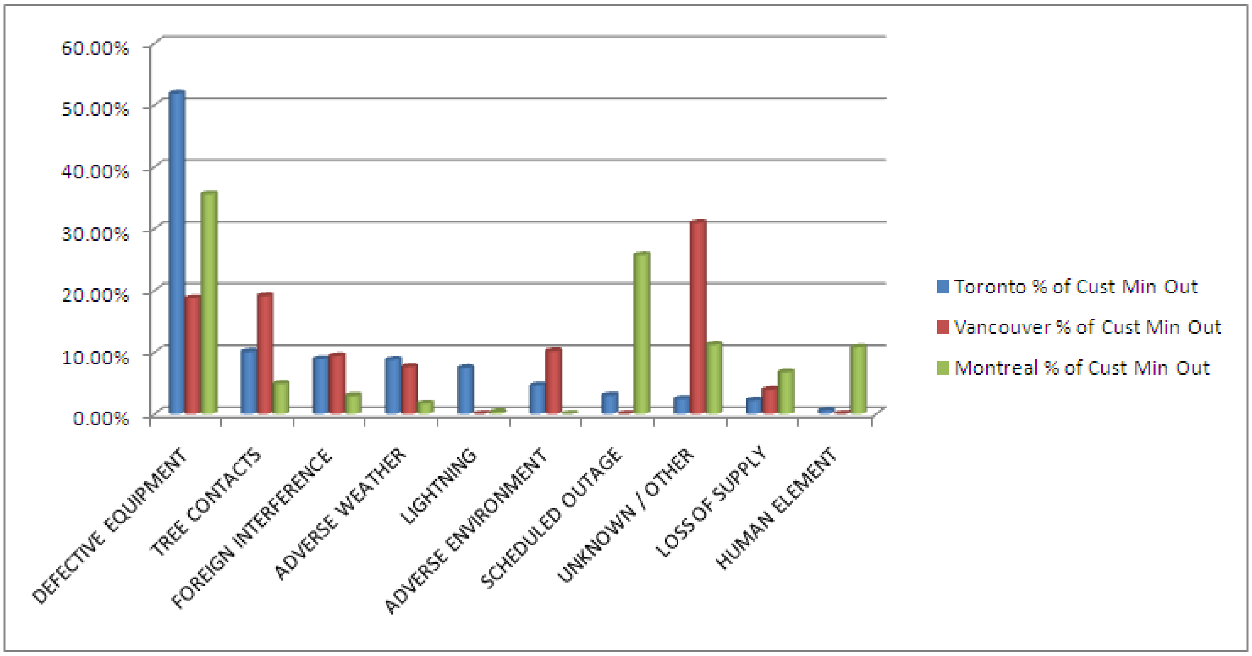


Figure 5: Canadian Cities Metro Areas - % Customer Minutes Out Comparison

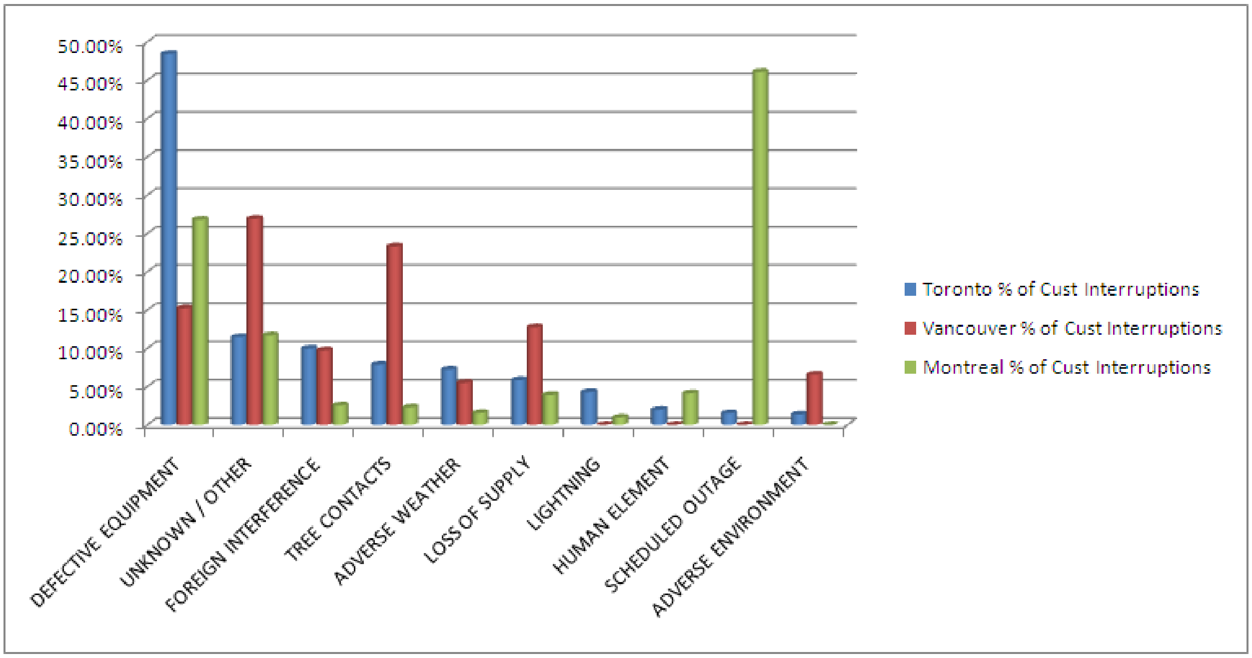


Figure 6: Canadian Cities Metro Areas - % Customer Interruptions Comparison

Observations:

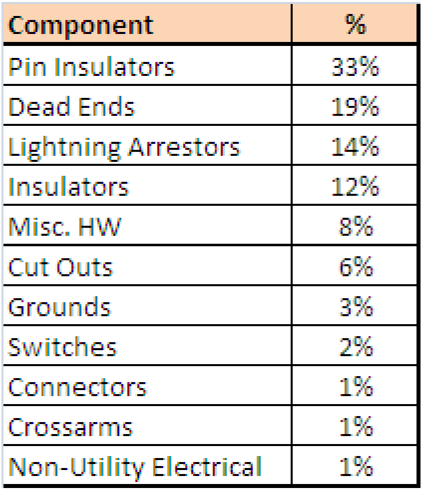
1. Even with common definitions it is possible to classify outages in different ways, for example equipment that is defective, but actually failed because of a lightning strike might be classified as defective equipment in one case and lightning in another, depending on when the equipment actually failed and when it was actually replaced. In the midst of a storm recovery it is likely the equipment would be classified as lightning related. In cases of smaller storms with few outages, it seems to be classified as defective equipment.
2. 51.9% of Toronto Hydro interruptions are caused by defective equipment. Those interruptions are not affected by the electrical network infrastructure (underground or overhead) or climate.
3. Toronto Hydro's second largest interruption cause (10%) is Tree Contacts.
4. Similar to Toronto, large percentage of Vancouver and Montreal interruptions are cause by defective equipment – 18.75% and 35.58% respectively.
5. Montreal does not have problems with tree contacts as Vancouver and Toronto. 19.12% of Vancouver interruptions are caused by tree contacts and they are much more frequent than Toronto.
6. Vancouver data has 30% of the events categorized as Unknown/Other. We may want to consider normalizing this consistent with Toronto and Montreal, and recalculate the interruption cause percentages.
7. Montreal has a large percentage (46%) of interruptions for Scheduled Outages. If these outages are for maintenance, it appears that based on Defective Equipment (35%), it's ineffective. In Montreal, work rules are such that it is easier to do work on de-energized

equipment than on energized equipment, and at the lowest levels of the network enough protective devices do not exist to allow re-routing of power to all customers.

8. Vancouver does not record any Scheduled Outages, under the agreed to regulations scheduled outages are not counted against SAIDI.
9. Lightning outages are much more frequent in Toronto compared to Vancouver and Montreal. It makes sense for Vancouver but it is questionable that Montreal does not record more outages as a result of lightning. Some of the defective equipment issues probably could be traced to the lightning strikes.

According to a Lawrence Berkeley National Laboratory (LBNL) study, “Understanding the Cost of Power Interruptions to U.S. Electricity Consumers,” funded by the U.S. Department of Energy (DOE) after the August 2003’s blackout in the United States and Canada – 32% of the outages caused by vegetation/trees, 31% by equipment failure, 19% by miscellaneous causes and 18% by animals. Based on this study Toronto is doing well in comparison to vegetation (10.08% of Toronto outages are cause by tree contacts), but when it come to equipment failure Toronto Hydro is more than 20% higher than the average (51.9% of Toronto outages are caused by equipment failure)

The study also looked at the overhead components failure rate, see Table 13.



Component	%
Pin Insulators	33%
Dead Ends	19%
Lightning Arrestors	14%
Insulators	12%
Misc. HW	8%
Cut Outs	6%
Grounds	3%
Switches	2%
Connectors	1%
Crossarms	1%
Non-Utility Electrical	1%

Table 13: Overhead Component Failures

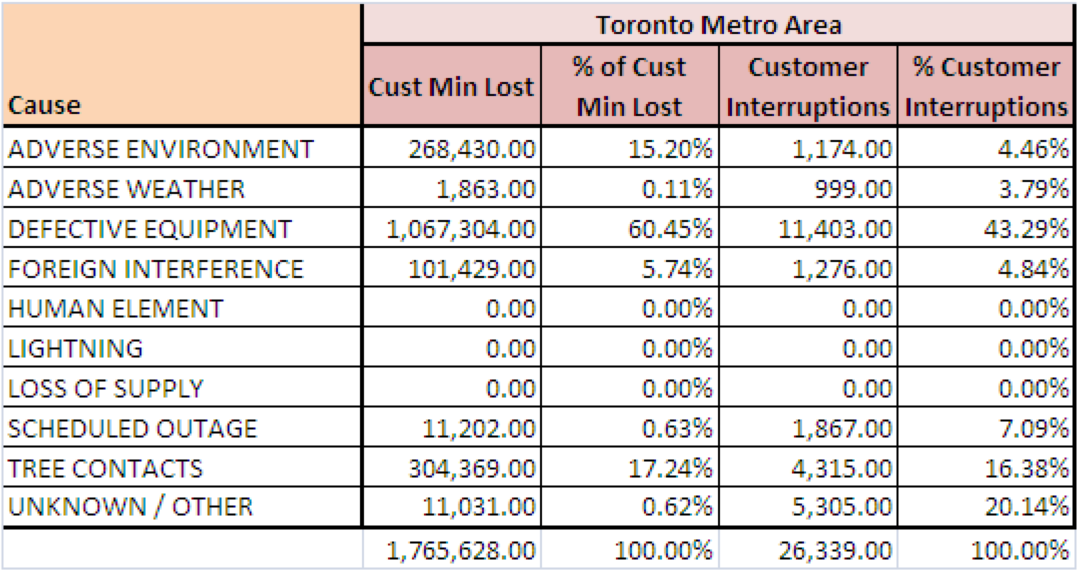
Toronto Hydro has done a very similar analysis – see Appendix 3 “Five-Year Historical Reliability Performance Indicators”. Toronto Hydro Electric System Limited (THESL) farther categorizes the Defective Equipment cause code by the system type: Overhead Equipment, Underground Equipment, and Station Equipment. The top contributors to for defective equipment in 2008 were: Underground Cable (18%); Overhead Switches (9%); Overhead Lighting Arrestors and Insulators (6%); Elbows, Terminators and Potheads (4%).

Chart 5 and 6 in “Five-Year Historical Reliability Performance Indicators” document (see Appendix 3) shows the performance of the Overhead Equipment for 2004-2008, and Chart 7 and 8 shows the performance of the Underground Equipment for 2004-2008.

6.4. Vancouver/Montreal/Toronto (Downtown Area) – Canadian Cities Reliability Data Comparison

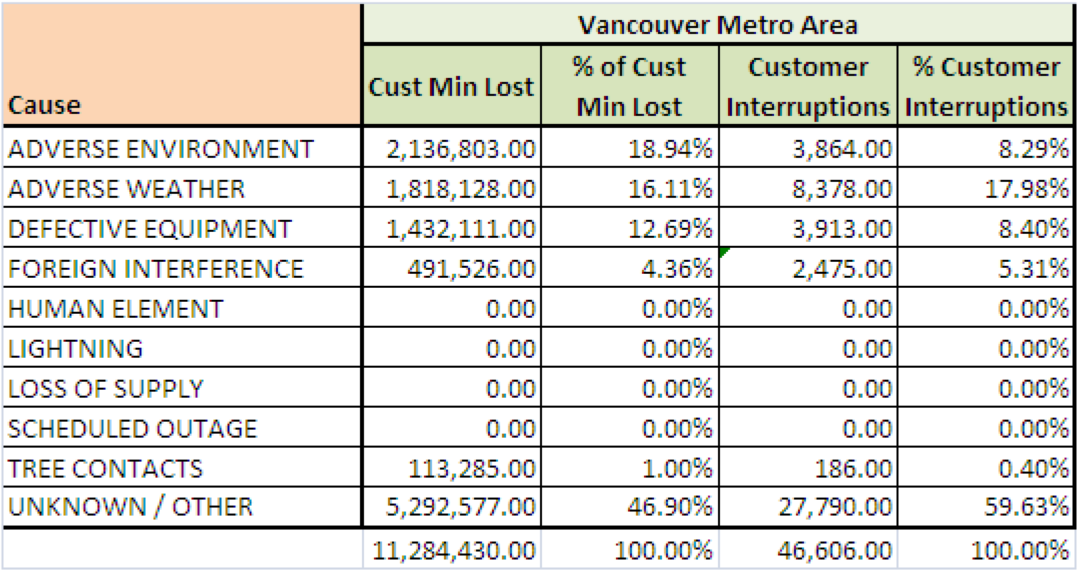
Because of the level of detail available in the data provided it was possible to segment the business district in each of the three cities and compare only the core downtown area – the circuits that serve the banking, financial and business area in each city. This is a key indicator that many large businesses look at when they are looking to locate major new offices or when they are looking to move their headquarters. In all three cases, the circuits serving this area are almost entirely underground and have a different design than most of the rest of the city. Because of the critical need for power (including major hospitals) in these areas, the networks have a tendency to have a design that provides a higher level of reliability.

Based on the detailed data we received for Vancouver and Montreal, we compared the reliability data at the interruption causes level for Vancouver, Montreal, and Toronto downtown areas (The codes and definitions are based on the Distribution Service Continuity Committee of CEA, same as Toronto Hydro data). The next three Tables group the customer minutes out and customer interruptions for Toronto, Vancouver, and Montreal based on the interruption causes.



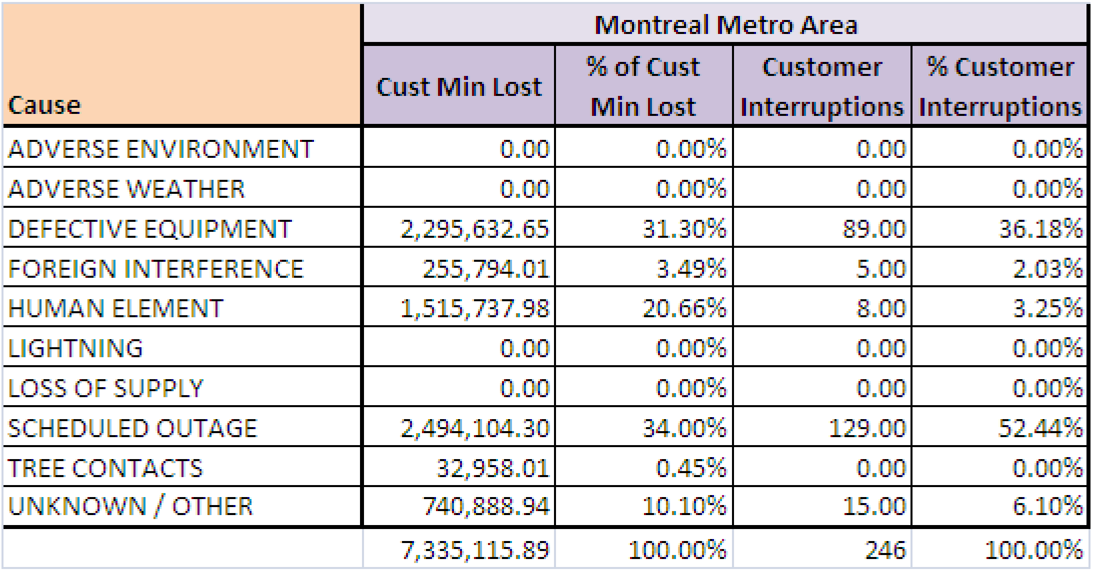
Cause	Toronto Metro Area			
	Cust Min Lost	% of Cust Min Lost	Customer Interruptions	% Customer Interruptions
ADVERSE ENVIRONMENT	268,430.00	15.20%	1,174.00	4.46%
ADVERSE WEATHER	1,863.00	0.11%	999.00	3.79%
DEFECTIVE EQUIPMENT	1,067,304.00	60.45%	11,403.00	43.29%
FOREIGN INTERFERENCE	101,429.00	5.74%	1,276.00	4.84%
HUMAN ELEMENT	0.00	0.00%	0.00	0.00%
LIGHTNING	0.00	0.00%	0.00	0.00%
LOSS OF SUPPLY	0.00	0.00%	0.00	0.00%
SCHEDULED OUTAGE	11,202.00	0.63%	1,867.00	7.09%
TREE CONTACTS	304,369.00	17.24%	4,315.00	16.38%
UNKNOWN / OTHER	11,031.00	0.62%	5,305.00	20.14%
	1,765,628.00	100.00%	26,339.00	100.00%

Table 14: Toronto Downtown Area Interruption Data Mapped to the Causes



Cause	Vancouver Metro Area			
	Cust Min Lost	% of Cust Min Lost	Customer Interruptions	% Customer Interruptions
ADVERSE ENVIRONMENT	2,136,803.00	18.94%	3,864.00	8.29%
ADVERSE WEATHER	1,818,128.00	16.11%	8,378.00	17.98%
DEFECTIVE EQUIPMENT	1,432,111.00	12.69%	3,913.00	8.40%
FOREIGN INTERFERENCE	491,526.00	4.36%	2,475.00	5.31%
HUMAN ELEMENT	0.00	0.00%	0.00	0.00%
LIGHTNING	0.00	0.00%	0.00	0.00%
LOSS OF SUPPLY	0.00	0.00%	0.00	0.00%
SCHEDULED OUTAGE	0.00	0.00%	0.00	0.00%
TREE CONTACTS	113,285.00	1.00%	186.00	0.40%
UNKNOWN / OTHER	5,292,577.00	46.90%	27,790.00	59.63%
	11,284,430.00	100.00%	46,606.00	100.00%

Table 15: Vancouver Downtown Area Interruption Data Mapped to the Causes



Cause	Montreal Metro Area			
	Cust Min Lost	% of Cust Min Lost	Customer Interruptions	% Customer Interruptions
ADVERSE ENVIRONMENT	0.00	0.00%	0.00	0.00%
ADVERSE WEATHER	0.00	0.00%	0.00	0.00%
DEFECTIVE EQUIPMENT	2,295,632.65	31.30%	89.00	36.18%
FOREIGN INTERFERENCE	255,794.01	3.49%	5.00	2.03%
HUMAN ELEMENT	1,515,737.98	20.66%	8.00	3.25%
LIGHTNING	0.00	0.00%	0.00	0.00%
LOSS OF SUPPLY	0.00	0.00%	0.00	0.00%
SCHEDULED OUTAGE	2,494,104.30	34.00%	129.00	52.44%
TREE CONTACTS	32,958.01	0.45%	0.00	0.00%
UNKNOWN / OTHER	740,888.94	10.10%	15.00	6.10%
	7,335,115.89	100.00%	246	100.00%

Table 16: Montreal Downtown Area Interruption Data Mapped to the Causes

To compare the three cities, we’ve plotted the % customer minutes out and % customer interruptions as shown on the following two graphs.

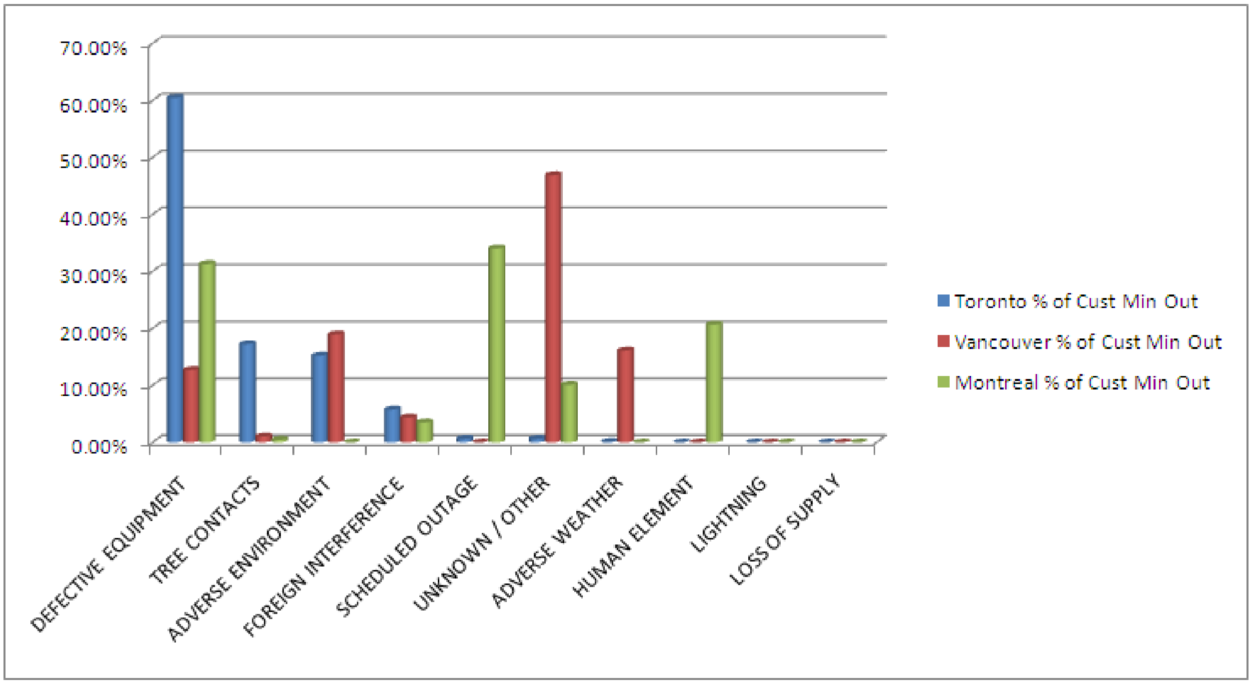


Figure 7: Canadian Cities Downtown Areas - % Customer Minutes Out Comparison

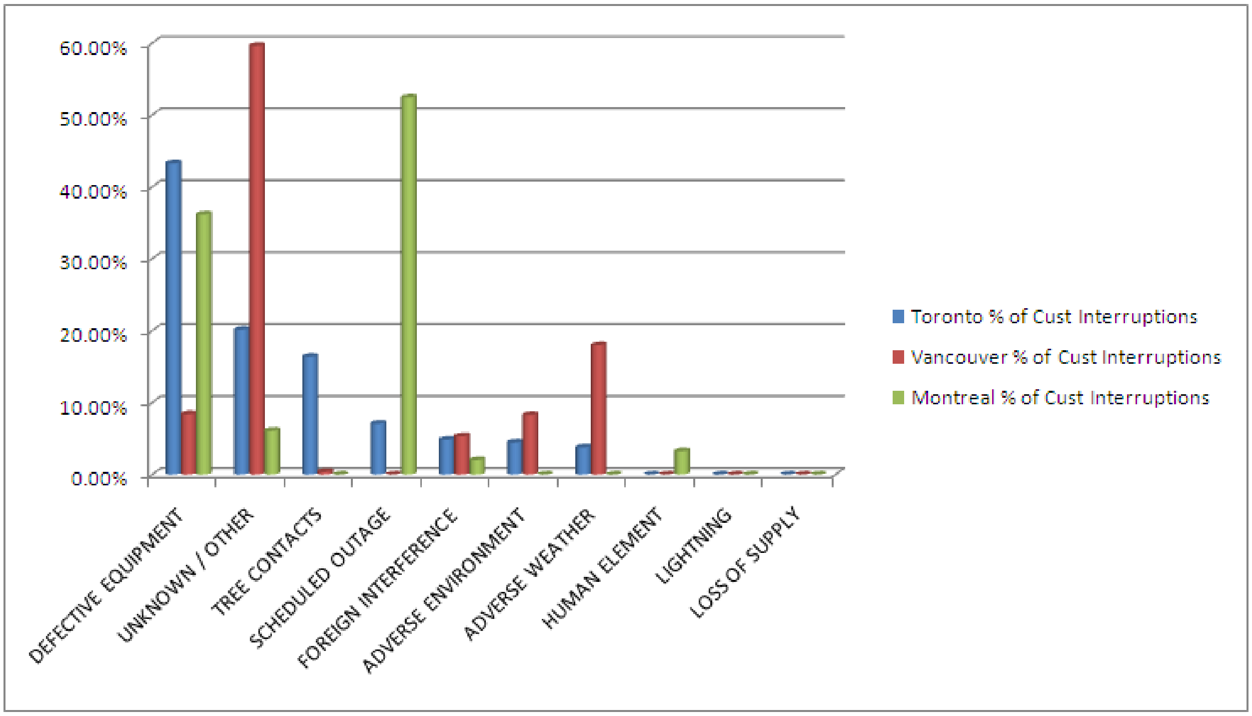


Figure 8: Canadian Cities Downtown Areas - % Customer Interruptions Comparison

Observations:

1. 40% of the customer interruptions in downtown Toronto are caused by defective equipment that translates into 60% of the customer min out. That is higher than the metro Toronto.
2. Defective equipment is still a large percentage of the interruptions in downtown Montreal and Vancouver – 31.30% and 12.69% respectively.
3. Tree contacts are still an issue in downtown Toronto, but in downtown Montreal and Vancouver, tree contacts issues disappear. This is due to the fact that both Vancouver and Montreal have almost no overhead in their downtown areas.

6.5. Vancouver/Montreal/Toronto SAIDI and SAIFI – Metro and Downtown Comparison

This analysis looks at the SAIDI and SAIFI for Toronto, Montreal and Vancouver, and compares the Metro area to downtown. The results are in Table 17.

City	SAIDI (Min)		SAIFI	
	Metro	Downtown	Metro	Downtown
Toronto	74.53	54.41	1.79	0.81
Montreal	147.14	124.48	2.44	1.29
Vancouver	102.6	120.6	0.54	0.5

Table 17: Vancouver / Montreal / Toronto SAIDI and SAIFI - Metro and Downtown Comparison

Looking at the table it is interesting to note that downtown Vancouver SAIDI is worse than metro Vancouver, but downtown has fewer interruptions. This means that the outages in downtown Vancouver are longer.

Toronto and Montreal show large improvements in SAIDI and SAIFI in downtown compare to the metro area.

6.6. Toronto Metro/Downtown – Reliability Data Comparison

To complete the analysis, we compared the reliability data at the interruption causes level for Toronto metro area and Toronto downtown area. We plotted the % customer minutes out and % customer interruptions as shown on the following two graphs.

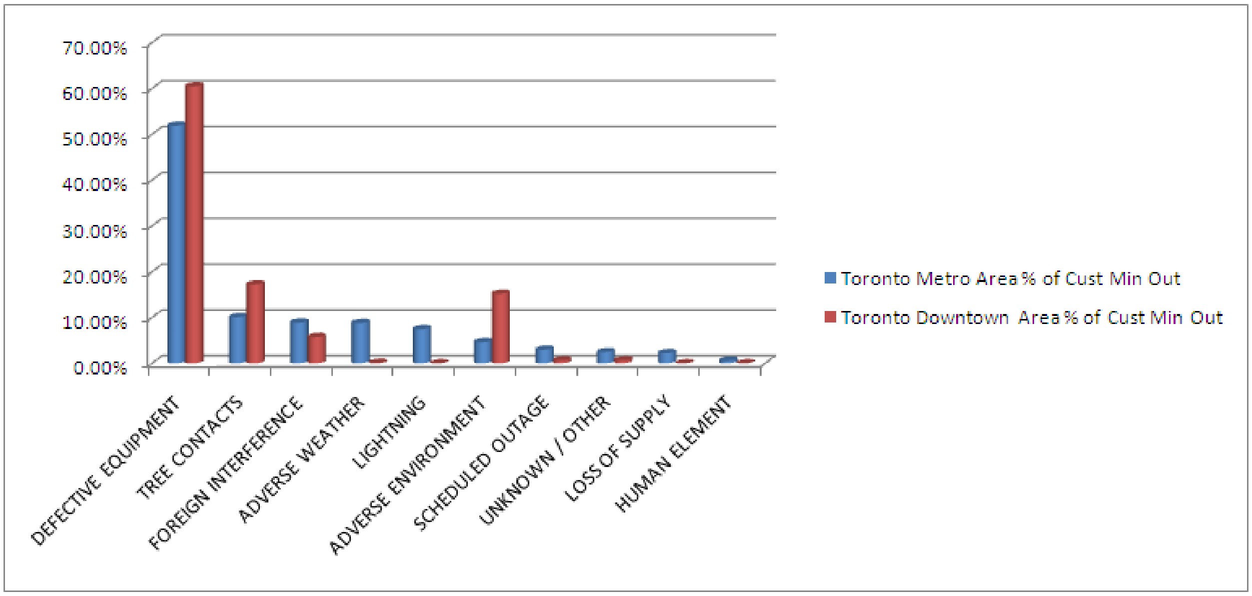


Figure 9: Toronto Metro/Downtown Areas - % Customer Minute Out Comparison

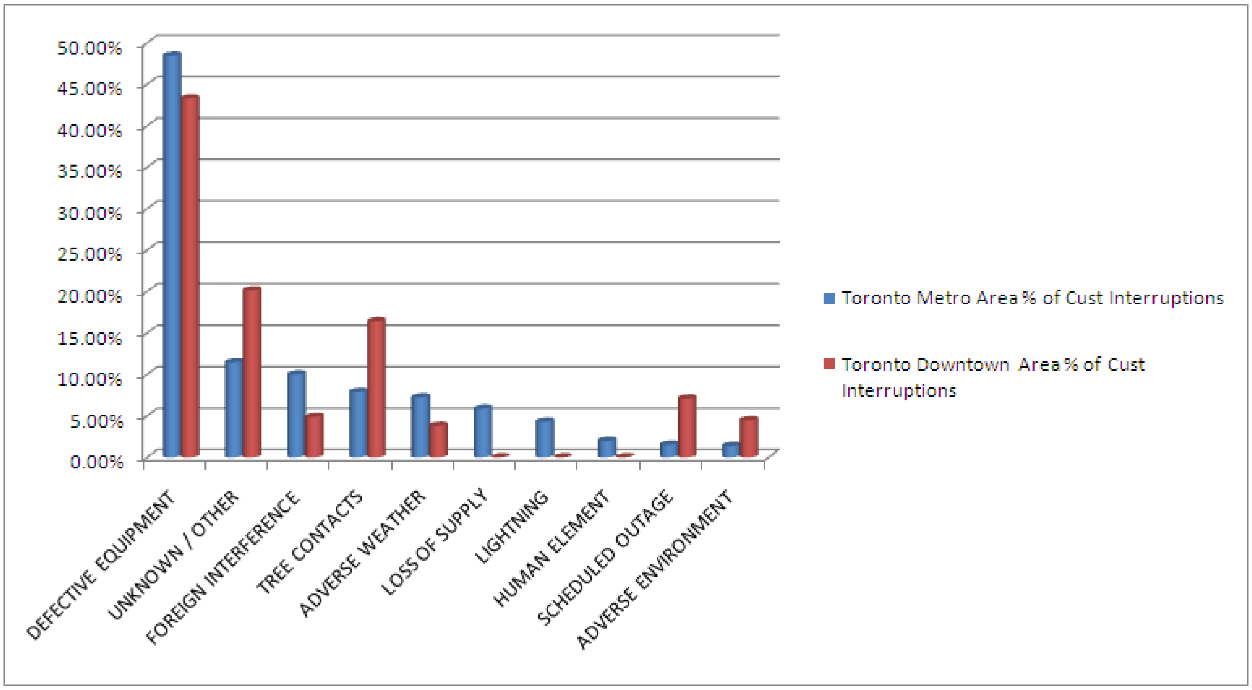


Figure 10: Toronto Metro/Downtown Areas - % Customer Interruptions Comparison

Observations:

1. Defective equipment is a bigger problem in downtown Toronto than in metro Toronto – customer minute out is 10% higher in downtown, but the outages are less frequent.

2. Tree contacts are a bigger issue in downtown Toronto, also the frequency of outages as a result of trees are higher.

3. In downtown Toronto adverse environment is responsible for about 12% of the customer minute out.

4. We could not conclude any specific reasons, but the overall SAIDI and SAIFI is better in downtown Toronto

	SAIDI (Min)	SAIFI
Metro Toronto	74.53	1.79
Downtown Toronto	54.41	0.80

Table 18: Toronto Metro/Downtown SAIDI and SAIFI

6.7. Electrical Network Design Analysis

To understand the differences between the electrical networks designs in the peer group cities, and how the design drives N, N-1 or higher redundancy we selected five cities – New-York, Paris, London Montreal and Vancouver for detailed comparison. Electrical network designs (same as circuit schematics) were developed that include basic power flow, how the N, N-1 or higher reliability is created and the segmentation and self healing capability of the grid. The circuit schematics where developed to help understand the differences between the way things are done and are not intended to be engineering documents.

Figure 11 is the circuit schematic for Manhattan, New-York – each feeder ring covers about 20 Sq Blocks (roughly 4 blocks by 5 blocks). Four transmission sources and distribution substations supply each of the feeders that make it N-3 redundancy. The secondary network in each of the rings is N-1 redundancy – each one of the buildings is being supplied via two different lines from different side of the ring. Critical buildings are N-2 redundancy and most of them also have backup generation like diesels or gas turbines. Some like the Empire State Building have major generation plants built into the basement and are capable of feeding power to surrounding buildings. .

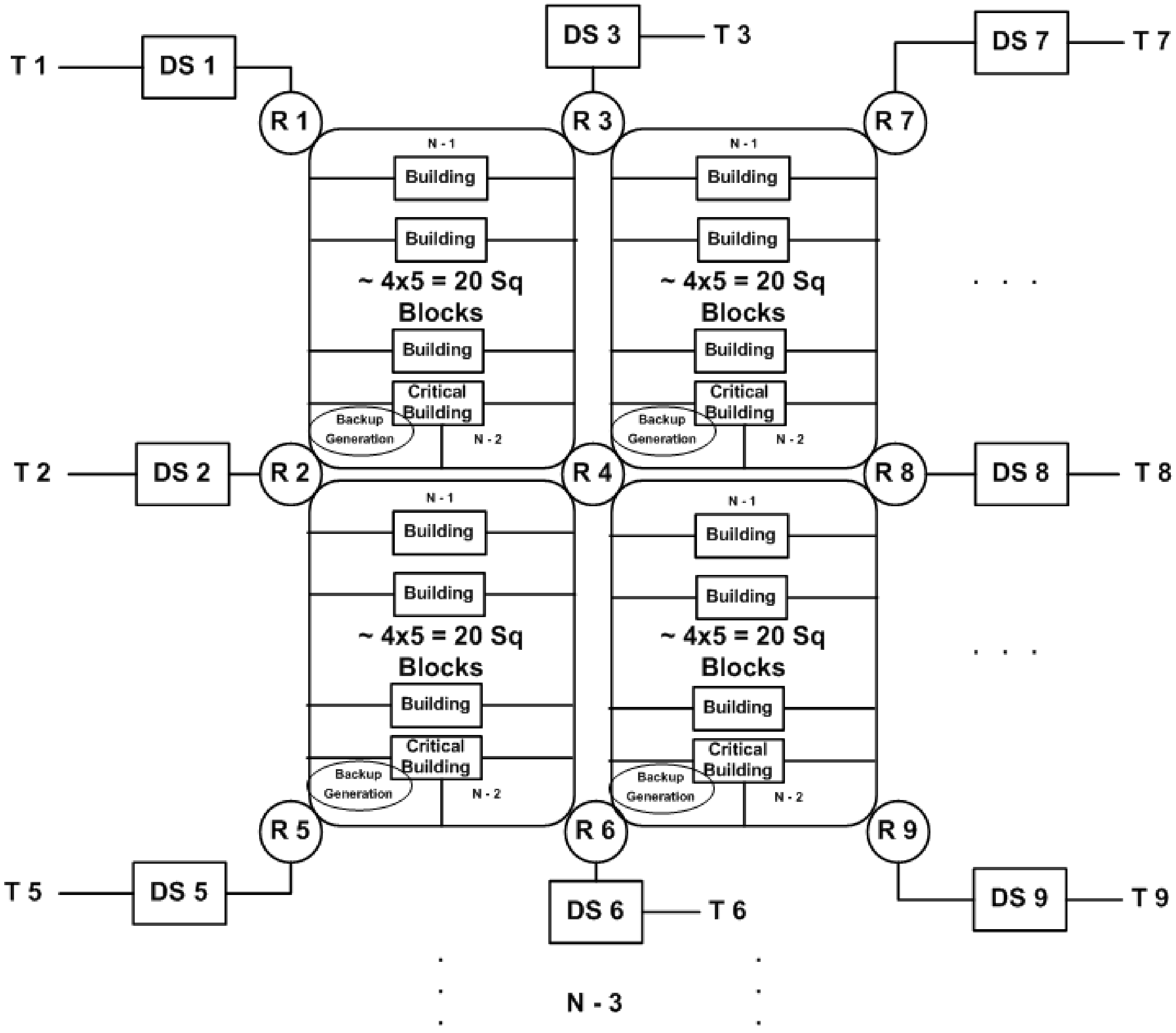


Figure 11: New-York Circuit Design

In Europe, there is a requirement (regulation) that cities be N-2 for almost all customers. Only the final step of providing power can be less then N-2. In almost every case, that final wire feeds between 1 and 40 customers and is the connection beyond the final voltage step down, but prior to the meter. Since most building wiring is also only N, this does not seem to have a major impact on the reliability of individual customers.

Figure 12 is the circuit schematics for Paris and London – both have very similar circuit design and if we look at most of the European cities we will find similar designs. Transformers in those cities supply electricity to about 200 customers (in Europe the average transformer supplies 40 customers, in cities the average is closer to 200, compared to the average in North America of 4-5 customers) and can be supplied from four different transmission lines and two distribution substations. At the Transmission level (66 kV) the circuit has N-3 redundancy level. Between the distribution substation and the transformer the redundancy level is N-1, each transformer has two feeders and each comes from different distribution substation. At the transformer level the redundancy is N, but each transformer supplies just 200 customers, so the impact is minimal. From the transformer there are about 10 lines with each feeding about 20 customers. Some customers at this level will have backup generation specifically for the critical buildings. London has a lot more backup generation than Paris.

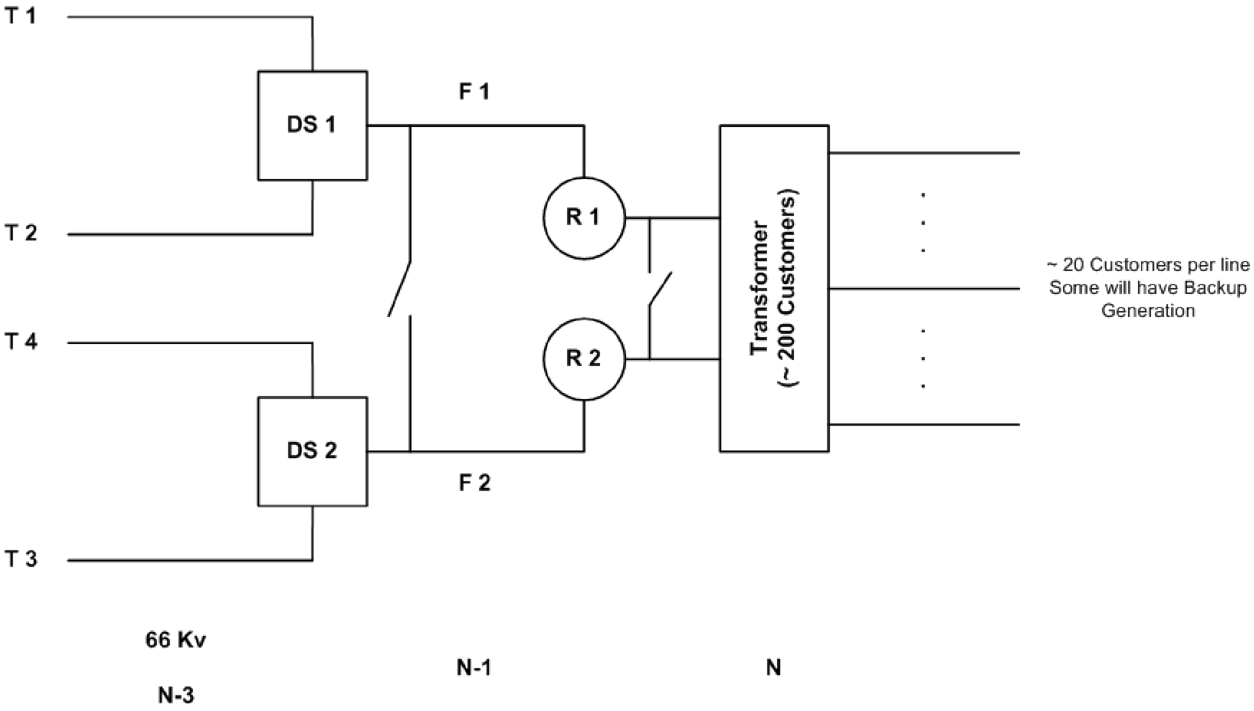


Figure 12: Paris/London Circuit Design

Vancouver uses a combination of different dual radial circuit configurations. There are a few places where an auto transfer switch is being used, but very infrequently. The following four Figures (13 to 16) are the different circuit configurations used at Vancouver.

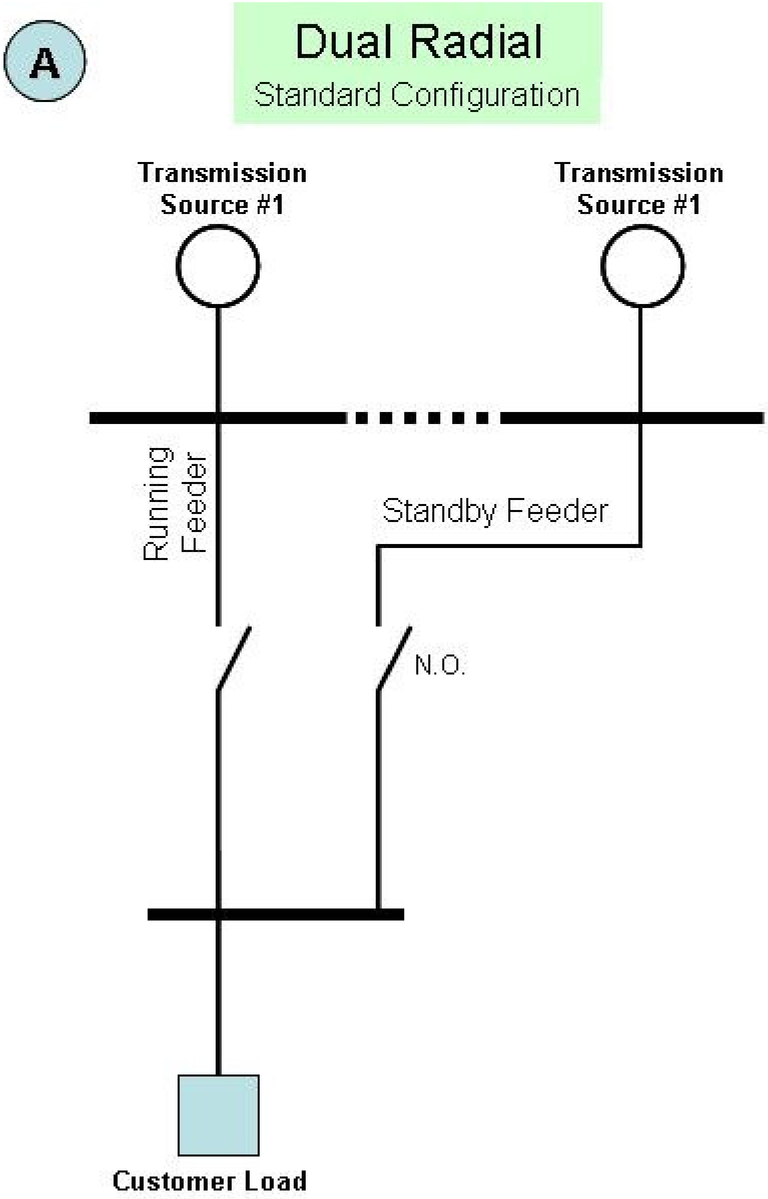


Figure 13: Vancouver Circuit Design – Dual Radial Standard Configuration

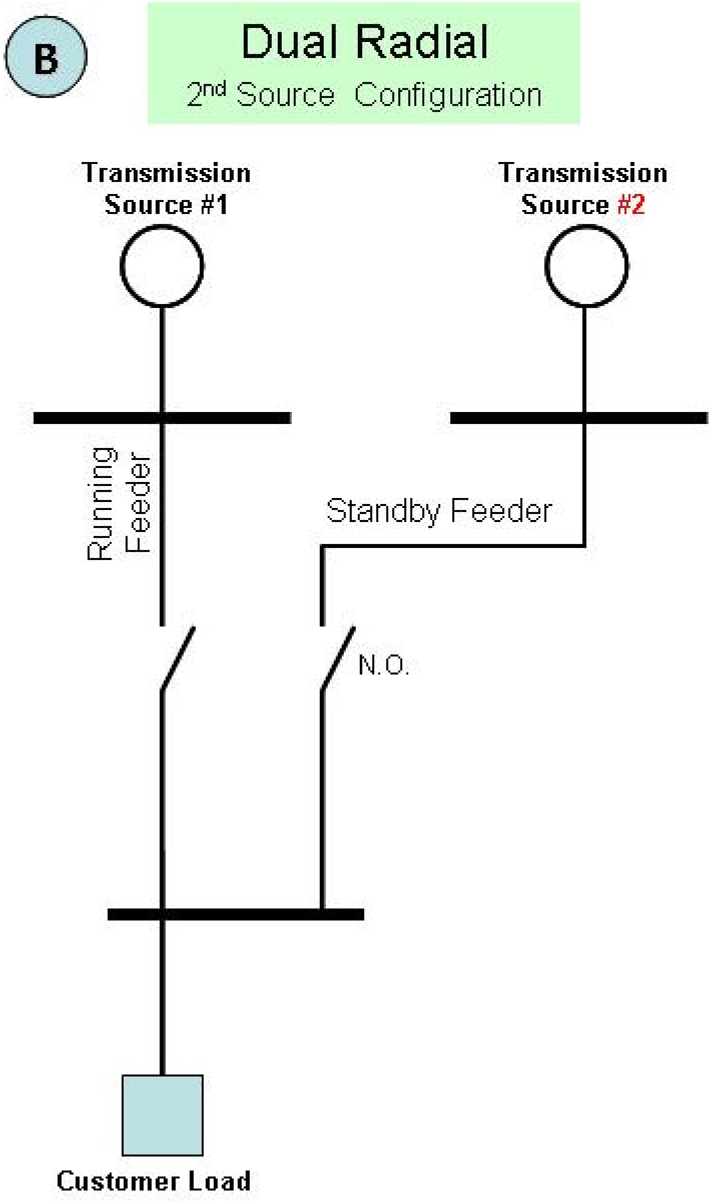


Figure 14: Vancouver Circuit Design – Dual Radial 2nd Source Configuration

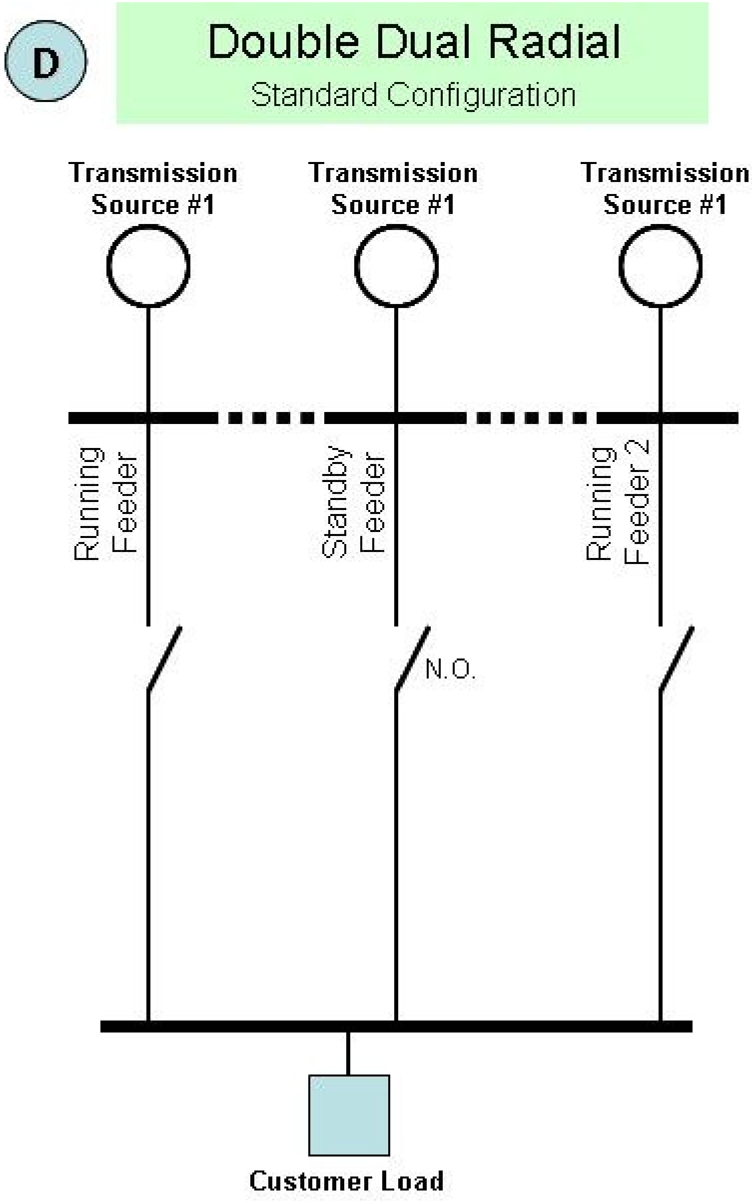


Figure 15: Vancouver Circuit Design – Double Dual Radial Standard Configuration

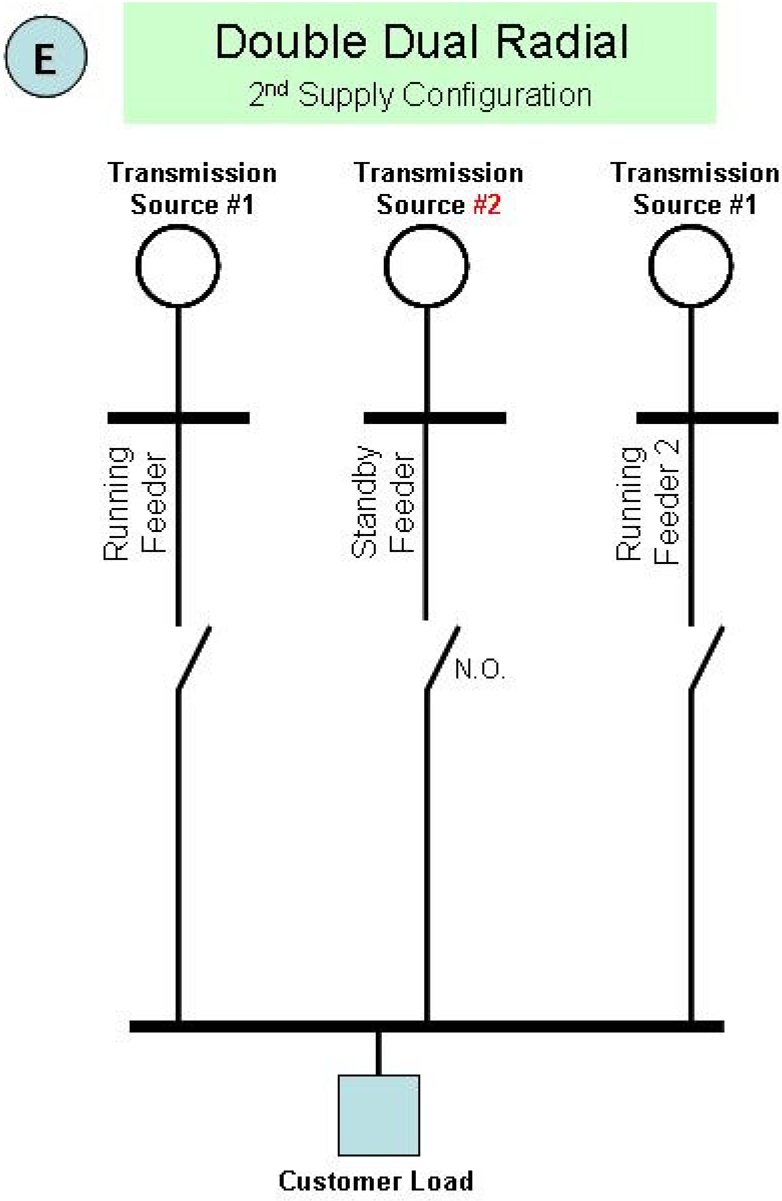


Figure 16: Vancouver Circuit Design – Double Dual Radial 2nd Supply Configuration

Figure 17 is the circuit schematic for Montreal. Hydro Quebec circuit design has four active feeders from different substations (~15 MVA / feeder @ 25 kV) and three load blocks per active feeder (~4 to 6 MVA / Block). Each block is backed up by one of the three other feeders through another load block. In emergency, the three remaining feeders can supply the total load of the four feeders. Ties between blocks must have the same load capacity as the main cable. No LV network is installed on Hydro Quebec urban network.

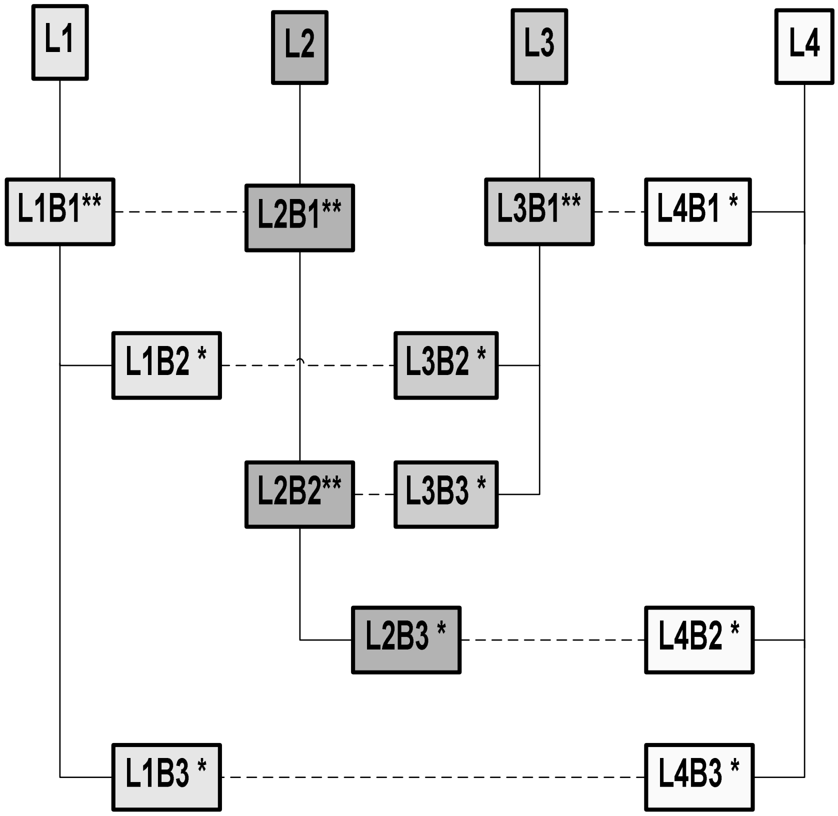


Figure 17: Montreal Circuit Design

Figure 18 and 19 are the circuit schematics for Toronto. Figure 18 is simplified to match the circuit schematics from the other cities and enable the comparison. Figure 19 is a detailed view of the Toronto electrical network.

In Toronto, each transmission station is fed by two different 230 kV or 115 kV transmission lines that are not necessarily from different generation facilities. The transmission station reduces the voltage to 27.6 kV or 13.8 kV which is at the distribution level that goes to the end consumer after going though another reduction at the distribution substation level. That provides at best N-2 reliability, but in most areas in Toronto it is N or N-1.

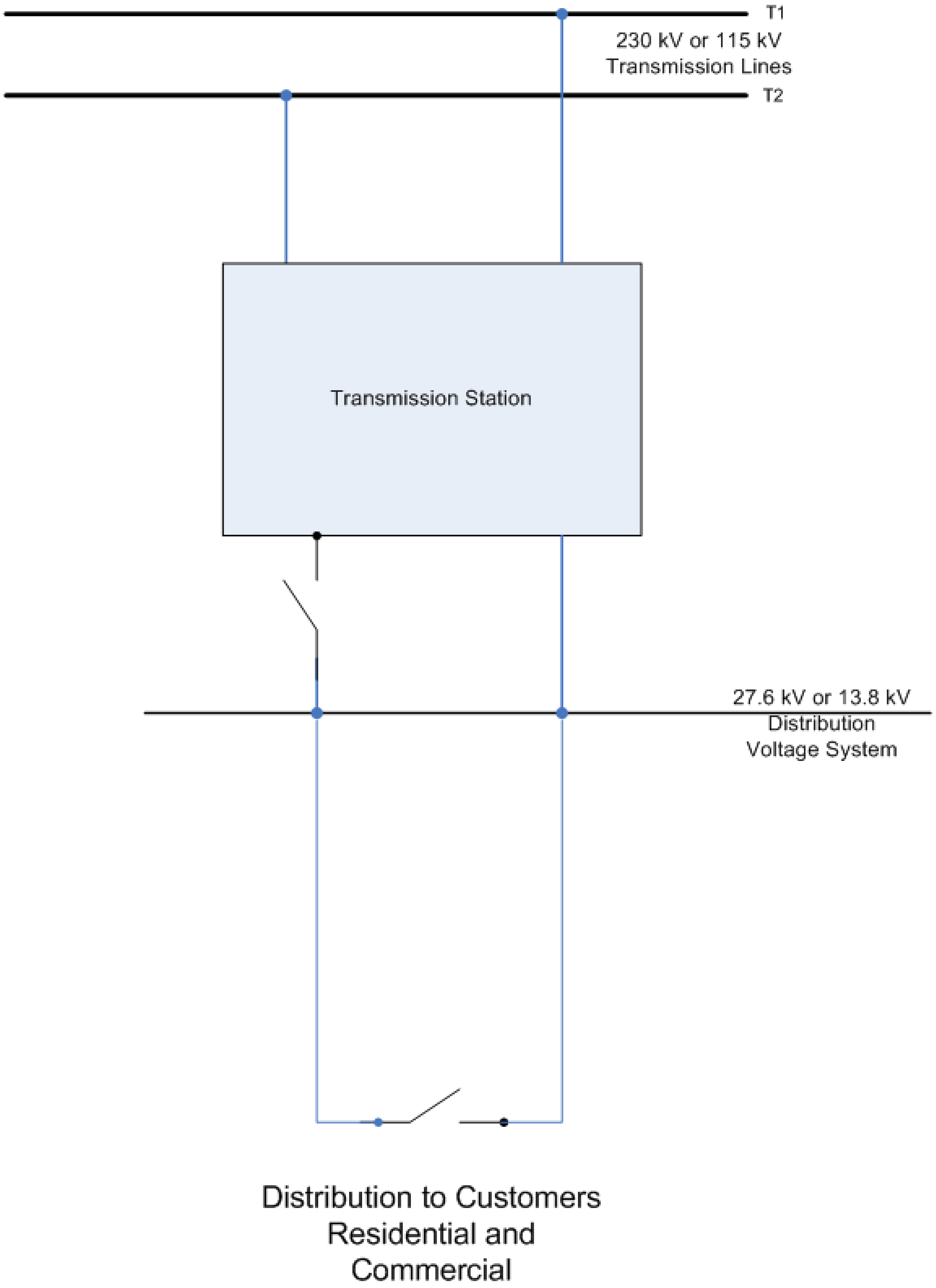


Figure 18: Toronto Circuit Design (Simplified)

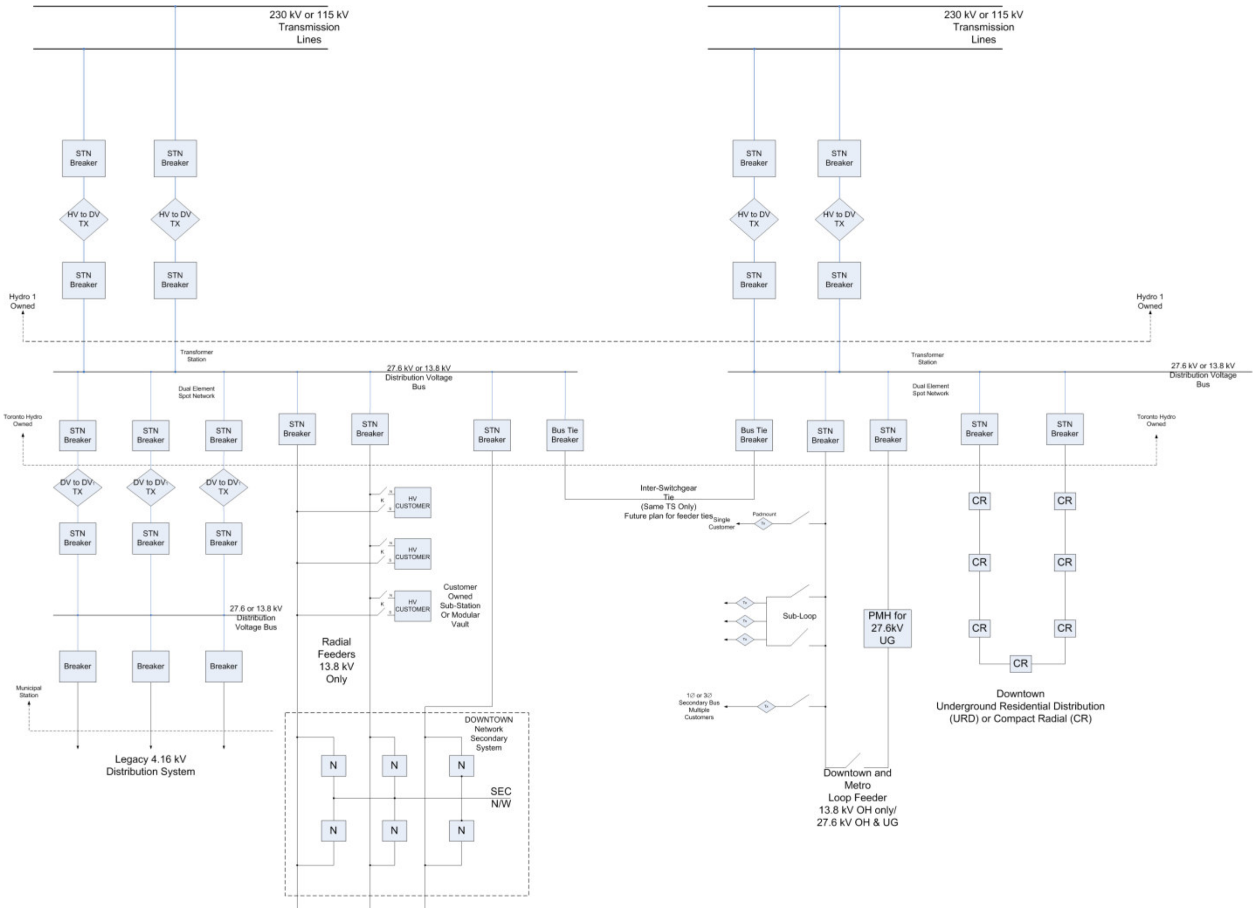


Figure 19: Toronto Circuit Design (Complex)

6.8. Electrical Network Design History

In each city, legacy had a big impact on the overall design. A short discussion of the history of the electric grid in each city is important to understand its electrical network design.

In Vancouver, during the late 1990s and early this decade, the growth rate caused BC Hydro to have to do a voltage upgrade in the city. As part of that upgrade and the density of the power consumption on the south end of Vancouver, a number of improvements were made in the overall redundancy in the system. Major substation re-design was done as part of this voltage upgrade. The process is about 99 percent complete now and will be finalized prior to the Olympics early next year. Vancouver is power constrained like Toronto, but unlike Toronto it can offer true N-3 reliability from generation source to end customer.

In Toronto, at best, it is possible today to provide N-2 reliability from generation source to end customer. With only two major transmission links into the city and very limited generation in the city itself, any higher level of reliability would require significant design effort. To this end, the overall design reflects the limits of reliability that is available at the higher levels in the electrical system. Within those limits, the design in Toronto as taken on an N-2 design. The Toronto network was not designed initially to support the density of the downtown area. Many changes to the network have been undertaken to deal with the growth in power consumption and the increase in density in the core city. Most of these changes where made to support specific new construction and while there where highly effective there where to a large extent patches on to existing infrastructure the new underground cable combine with the temporary slow down in growth in Toronto provide an opportunity to do a longer range review of the downtown grid design. This longer term review of the grid design should give Toronto Hydro the chance to do a significant redesign of the downtown network with the eye toward two way power flow and ever increasing demand for power.

In Europe, the regulatory requirement for providing N-3 reliability comes mainly from the complete rebuild of the network after World War II by military engineers as part of the Marshall plan. In addition, as the network was expanded and improved in the 1960s and 1970s, it was the height of the Cold War and there was a high expectation that infrastructure would be a primary attack path. Both the generations of engineers in Europe were trained to design and build infrastructure that would survive a war, not just natural disasters.

Much of this high level of redundancy has masked the fact that much of the equipment is aging and facing replacement in London and Paris. Because of the strong government backing in Paris of EdF, equipment replacement and high redundancy in the network are core values in the city and equipment is being replaced. In London where the network is now owned by a foreign company and the strong regulatory drive by OFGEM (the utility regulator) to the lowest cost of power to the end customer, the reliability of the network is beginning to wane, and the end customers are finally feeling the effects. On most mornings at least one train line in London suffers a power outage. London is struggling within their budget to make equipment replacement. Like Vancouver, London is also preparing for the Olympics and has asked for regulatory support for improving the grid and replacing aging equipment, the results of this request will be known in October of this year.

In Montreal, the city has grown outward more than upward, there were few constraints to the spread of the metro area, in addition the growth rate in Montreal has been far less than it has been in the other major cities. Vancouver has become a major gateway to Asia, Paris the gateway to Middle Eastern business, London the financial center of the European Union, and Toronto a major alternative to Wall Street. New York is the financial center of the world and still serves as a major immigration center. New York, London and Paris are all older high rise cities than Toronto, meaning that more of the infrastructure was designed to support a higher power density when it was installed.

New York was designed as a networked system under Manhattan from the beginning. No other choice was available at the time the system was designed; only distribution networks could provide the density of power that was required. In the 1930’s when most of the tunnels were built and the initial network installed, modern equipment did not exist.

So Toronto does not have the long history of high density, nor the military design drive that its peers endured.

6.9. Design Impacts

In each case, the cities chose designs that made sense to their needs, In Paris and London after World War II; the cost of installing the network was secondary and paid for out of different accounts. Maintaining that network is less costly than building it. Neither city could afford to build the same network today and pay for it out of current rates. Double digit percentage rate increases would be required to support building these networks now. The current generation of engineers are working to maintain and extend the existing network designs, which are very well done. There will be a struggle in London when there is a requirement to increase power density, to do so like Vancouver did with a voltage increase, will be a very complex dance. To run new circuits will also be a very complex dance. London has a major advantage that Toronto lacks – the subway system runs almost everywhere and makes a great corridor for new primary circuits. Both cities currently are working on distribution automation and smart grid programs that will allow demand side management to play a larger role in the energy supply.

Vancouver made clear decisions to improve their network based on the best engineering design practices in the mid-1990s. This long term program to improve both the ability to deliver more power to the dense downtown and improve reliability were core to this program and both the provincial government and the management of BC Hydro made commitments to this improvement. It was a key part of the presentation to the Olympic committee on why Vancouver should be selected. Use of equipment that did not exist prior to the 1990s has allowed them to have a highly automated system that can provide immediate switching of power sources to many customers to improve reliability. This system will continue to be improved under their current smart grid plan. The current design did not take into account large amounts of embedded generation or the trend to renewables and Demand Side Response, both of which will be part of the smart grid program.

In New York the existing dielectric pipe network will probably be replaced in the next two (2) decades, both to improve maintenance costs and to open space for new substations and other infrastructure. This network has operated for over 70 years with a very high level of reliability. The voltage has been increased twice since the network was installed, allowing the city to continue to provide for the increasing power density required. In several of the largest buildings, multi-megawatt generation facilities exist that burn fossil fuels to provide electricity and district heating. The system in the Empire State Building provides over 50 megawatts of schedulable generation. Other buildings provide more than 200MW of embedded generation. Because of the density of the city most of the power will have to come from outside the city and not be generated internally. In New York the formulation of a smart grid program is underway and has been presented for review at the last Modern Grid meeting. Based on comments at that meeting and from other sources, the program is being revised.

In all the cities, except Toronto there are at least three (3) independent transmission links into the cities, and at peak load, loss of any one of these links would not have a major impact on the city. This is not true of Toronto, which relies on two major substations to provide the bulk of the power to the city and loss of either one at peak load would have a major impact on the city. This lack of a third source and military drivers has influenced the design standards in Toronto, without a clear ability to truly provide N-2 or N-3. Without local back up generation, the overall network is designed to N-1 standards. For an N-1 network, the reliability is very good. Against the peer group, made up mostly of N-2 and N-3 grids, Toronto lags. Add the fact that historically compared to the peer group, Toronto has been a low density city (except Montreal) and Toronto has a network that was designed for very different conditions than it faces today. This means that the Toronto Hydro smart grid program will have to address a lot more issues than in other cities to deliver the same results. Building in demand side management, embedded generation and more redundancy will be core parts of the smart grid program. The good news is that Toronto Hydro seems to be taking a holistic approach to the issue, rather than incremental programs that will result in costly rework.

7. RELIABILITY TRANSFORMATION ROADMAP

Reliability improvement at Toronto Hydro is a multi-year journey. It's a journey of people, processes, organizations, capital investments, integration and constraints that that requires both visibility and communication through Toronto Hydro. A Transformation Map is a practical, graphical representation of the reliability vision and the journey to achieve it. The process of transformation mapping is very adaptable and flexible.

The Transformation Map serves many purposes:

1. Communicate the vision and journey to the entire organization at a glance.
2. Plot strategies and initiatives and break these down into manageable timed pieces.
3. Identify conflicts and interdependencies across functions/business lines/stakeholders.
4. Ensure activities are all pulling in the same direction.
5. Key reference document that can be used during strategic business planning.
6. Use as input to budgeting process.

Figure 20 is the high-level Reliability Transformation Roadmap that has been developed for Toronto Hydro as a result of this analysis.

The transformation map has four tracks:

- **Physical Grid**: Activities related to the upgrade and maintenance of the equipment on the grid.
- **Smart Grid**: Activities related to Smart Grid program, that Toronto Hydro will need to implement because of the designed network limits and number of generation sources/feeds into Toronto.
- **People and Process**: Activities related to organization and process change or upgrades.
- **Renewable and Embedded Generation**: Activities related to actions needed to get ready for embedded generation and to limit the initial adverse impacts on reliability that it causes.

The roadmap also has three waves over ten years

- **Planning (2009 to 2010)**:
- **Foundation (2011 to 2013)**:
- **Steady State (2014 to 2018)**:

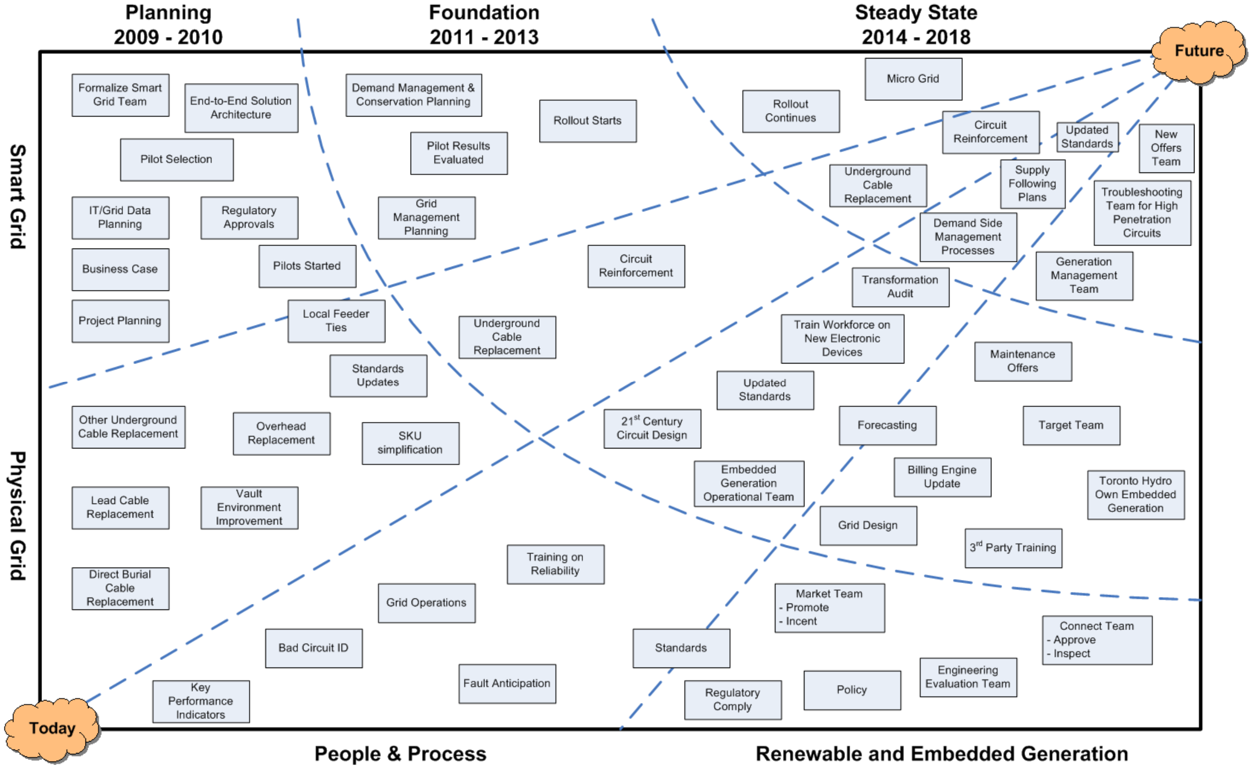


Figure 20: Toronto Hydro Reliability Transformation Map

The following subsections summarize the activities identified on the transformation map. We organized the sections by the there waves.

7.1. Planning (2009 to 2010)

Physical Grid

- **Direct Burial Cable Replacement:** Large amounts of older cable that was directly buried in accordance with best practice at the time have reached the end of their useful and safe life.
- **Lead Cable Replacement:** This older cable was the standard at the time it was installed and carried far more load in a smaller cable than other choices. This cable has reached the end of its useful life and is considered a hazard in many jurisdictions. Replacement of this cable helps maintain reliability and addresses environmental concerns.
- **Other Underground Cable Replacement:** There are other underground cables that have reached the end of their useful and safe life that need to be replaced. As part of replacing this cable, sizing or additional cables must be taken into account for future needs of the customers.
- **Vault Environment Improvement:** Many of the vaults are similar to vaults around the world; they maintain an environment that will support specialized utility equipment but not telecommunications and controls equipment. Improvement of this environment is a building block to providing better sensing and controls on the equipment installed in the vaults.

- **Overhead Replacement:** Much of the overhead in Toronto was installed as the neighbourhoods were built. The construction made sense when the equipment was originally installed, but over time, trees, building structures and other changes have put some of the equipment in poor locations. Additionally a portion of the equipment is beyond its useful life or improperly sized for current and future demand in the area. This project will maintain existing reliability and make future emergency replacement easier and faster to do should a storm damage equipment.

- **Local Feeder Ties**: The engineering design and installation of new local feeder ties to improve reliability and manageability of the electrical network. The local feeder ties when implemented in conjunction with smart grid will offer a number of options for better load and voltage management on the equipment

- **Standards Update:** Many of the design standards were selected before demand response and embedded generation were considered. To maintain reliability, some of these standards will need to be reviewed and revised.

- **SKU Simplification:** Over the years vendors and products have come and gone, but in many cases because the old equipment was installed in the grid, they have remained in the supply chain and procurement has bought replacements as needed. Simplification of the replacement strategy and the number of different items in the supply chain will help reduce the chance that something is out of stock which adds to the time to make repairs. While doing this simplification working with a firm like power advocate to benchmark alternatives and select only the best of bread equipment.

Smart Grid

- **Formalize Smart Grid Team:** Because of the significant size of this effort, in order to move ahead with the planning activities, business case and regulatory filing. Toronto Hydro needs a sizable, dedicated team to address smart grid activities.

- **Business Case:** Toronto Hydro needs to develop a business case for the improvements of the grid by the inclusion of smart grid technologies. This includes the ability to support embedded generation, storage and other new technologies. It's needed for regulatory filings and the development of project planning details, budgets, etc.

- **IT/Grid Data Planning:** This activity will drive the Smart Grid Network design. The Smart Grid scenarios will derive certain equipment that will have to be deployed and communicated. The data volume, frequency and latency will drive the bandwidth and the communication network design.

- **End-to-End Solution Architecture:** Developing a solution that addresses the business case benefits and the smart grid scenarios. The solution needs to address the customer premise, the electrical grid, the telecom network, and back-end application footprint including the systems integration necessary to make the scenarios work.

- **Regulatory Approval:** Getting approval from the Ontario Energy Board (OEB) and others for the business case and specific objectives outlined in the business case and related filings.

- **Pilot Selection:** Based on the outcome of the business case, projects would be outlined that would meet the approved objectives. These would be proof of concept pilots with the goal of confirming what works and quantifies the benefits for Toronto.

- **Project Planning:** Creating an overall plan for the various smart grid related projects including resource needs, capital requirements, interdependencies, and timing.
- **Pilot Started:** This is the launch of the pilots that would validate the smart grid objectives based on the project plans developed above.

People & Process

- **Key Performance Indicators:** Review of the key performance indicators (KPI) for the reliability and determination if the right KPI's have been selected and if the right levels have been set. This review should determine if there are any changes and if there should be a trend line set for a specific metric.
- **Bad Circuit ID:** Currently (Feeder Experiencing Several Interruption) FESI-7 and FESI-12 and Worst Performing Feeder (WPF) are the key gates for which circuits are reviewed for major repair and/or improvement. This results in around 4 feeders that get reviewed by the cross-departmental team and between 10-16 feeders by component reliability team and recommended corrective actions. Other utilities use these methods as well as others. The first step in this effort is to look at how the bad circuits are identified and if there might be a more pro-active way to do this in light of the possible technology that smart grid may provide.
- **Fault Anticipation:** Detection and recognition of fault signatures to anticipate a fault, and perform predictive maintenance or isolation activities to prevent its occurrence. This technology is in use in two US utilities and in Japan.
- **Grid Operations:** Toronto Hydro can develop the organization and processes to allow for the operation of the grid in Toronto. Today the grid is maintained, not operated. There will be a need to create a group to manage the operations as smart grid and active measures are deployed in the grid. This group will have a big impact on the reliability of the grid. The group will be responsible for:
    - Security of the communications systems and controls
    - Operation of the sensors and controls
    - Monitoring the operations of the grid
    - Working with dispatch to assign the right workers to open issues
    - Making control decisions
    - Making demand response decisions
    - Working with others to maintain the grid and forecasting models
- **Training on Reliability:** Field and operations people will need training on what to look for with regard to reliability and operations of the grid. This training will have to change area by area as new technology is rolled out.
- **Standards:** Many of the operation standards need to be reviewed and potentially revised to deal with the changes to how Toronto Hydro will have to operate in the future.

Renewable & Embedded Generation

- **Regulatory Compliance:** Developing a plan that will meet the regulatory requirements as they are provided and meet the requirements of the Green Energy and Green Economy Act and other laws.
- **Policy:** The development of a policy on how to deal with embedded generation and distributed resources within the Toronto Hydro service territory to provide for an orderly integration of these resources.
- **Engineering Evaluation Team:** In order to understand the impact of larger embedded generation or large numbers of smaller generation sources in a concentrated area (e.g. a Green Subdivision), a team needs to be organized to review the impact on the grid from a reliability and stability stand point.
- **Market Team (Promote, Incent):** In order to get embedded generation installed and to help get it installed in places that offer the most benefit to Toronto Hydro's customers, some one needs to help customers and interested third parties navigate the process and promote doing so.
- **Connect Team (Approve, Inspect):** As the embedded generation is installed both the inter-connect safety and the quality of the connection can have an impact on reliability locally. A team needs to be available to review the requests and then inspect the results (at least until building codes catch up with this issue and building inspectors are trained).

7.2. Foundations (2011 to 2013)

Physical Grid

- **Underground Cable Replacement:** This is a continuation of the various underground cable replacements. This will be an on going effort for the foreseeable future.
- **Circuit Reinforcement:** This is a continuation of the overhead work. This will be an on going effort for the foreseeable future and possibly other programs in the physical grid.

Smart Grid

- **Demand Management and Conservation Planning:** Putting in a system or set of systems that would allow an operator to see what is going on in the grid, let them know what autonomous control actions have been taken and where help is required, as well as taking control actions is a key step in the using the smart grid for reliability reasons. That includes integrated demand offers, smart appliances, smart homes, home displays, home energy system and many others.
- **Grid Management Planning:** Putting a system or a set of systems that will help the distribution operators to manage the future / smart distribution grid. That includes vault monitoring, power loss prevention, fault indicators, integrated outage management, feeder automation, distribution substation monitoring, energy storage, distributed generation, and many others.
- **Pilot Results Evaluated:** Once the pilots have run to conclusion, there are lessons that can be learned and information fed back to the vendors and others involved. The results evaluation is a key step in moving from pilot to full scale roll out or not, and making the necessary adjustments/corrections to plans.

- **Rollout Starts:** For those pilots that meet expectations, then a rollout should be started. This is when real benefits will be recognized.

People & Process

- **21st Century Circuit Design:** If Toronto Hydro is going to take advantage of smart grid technologies then a basic template circuit should be developed as a baseline for designers and engineers to use as a template for circuit rebuilds and extensions. This also will help Supply Chain and others to determine what needs to change in their areas as well.
- **Embedded Generation Operational Team:** In time there should be enough embedded generation within the city of Toronto that it will become noticeable when running. To keep this generation running at the right times and communicate with the Independent Electrical System Operator (IESO) on the status of the most significant units, an operations team needs to be created.
- **Updated Standards:** As work on the 21st Century Circuit and the Embedded Generation Operations Team continue, some standards will have to be revised, some several times, as thresholds change and Toronto Hydro determines how to best operate with more and more embedded generation and demand response.
- **Forecasting:** As the grid becomes more complex with embedded generation and electric vehicles, it will be important to have a good forecasting system not only at a city level but at a circuit and feeder level. This will help avoid issues with overloaded circuits and give the ability to send the right signals to devices connected to the circuits. This forecasting system will evolve as the embedded generation and electric vehicles grow.
- **Train Workforce on New Electronic Devices:** Many of the devices that will be deployed in the network are not part of the current training programs. Training programs will have to be updated and additional training will be required to support proper operation and maintenance.
- **Transformation Audit**: Conduct a formal audit of the transformation process against the goal that where set for the program.

Renewable & Embedded Generation

- **Grid Design:** As embedded generation is installed or planned it will have an impact on the grid design, conductor sizes, voltage transformers, protection schemes and other items may need to be reviewed for larger embedded sources and as the penetration increases, the aggregation may have design impacts to maintain reliability.
- **3rd Party Training:** As third parties start installing and maintaining embedded generation they will need an understanding of the interconnect rules, the way that Toronto Hydro interfaces with them, how they interface with the IESO and others. Without this training it will be harder to move the level of embedded generation forward.
- **Billing Engine Update:** As embedded generation becomes more common, there will be a point where the manual work around to create a correct bill will be more effort than updating the billing engine to provide an automated bill and to provide an audit level of tracking of the billing changes based on power produced by the customer.
- **Toronto Hydro Own Embedded Generation:** There may be a need for Toronto Hydro to either install or have installed embedded generation that they either own or operate or

contract for operation of. The determination of this need, the locations that would best help reliability and the structure of any involvement all need to be developed and worked out in compliance with regulatory rules and existing laws.

- **Maintenance Offers:** Most home owners and owners of smaller embedded generation do not maintain their systems at peak operating efficiency and in fact many fail when called upon after a period of disuse (e.g. spring and fall). It is important to maintain the capability to operate. Until there is a strong third party maintenance capability that generation owners can use, it may be necessary for Toronto Hydro to offer this service. For some customers it may be necessary to offer this service for the foreseeable future.
- **Target Team:** This team would look for the right locations to place generation in the city and work with the marketing team to get people interested in putting generation in these locations.

7.3. Steady State (2014 to 2018)

Physical Grid

- **Underground Cable Replacement:** This is a continuation of the various underground cable replacements. This will be an on going effort for the foreseeable future.
- **Circuit Reinforcement:** This is a continuation of the overhead work. This will be an on going effort for the foreseeable future.

Smart Grid

- **Rollout Continues:** Since these are large projects, they will not complete for all the customers for many years. The rollouts will continue over this time period. In many cases, as the rollout continues, improvements will be made.
- **Micro Grid:** Control algorithms, devices, and standards that control the creation and operation of a Micro Grid embedded in the utility grid. This can take the form of a Virtual Power Plant (coordination of resources from a group of distributed generation), community power (group of customers managing their own power), and intentional islands. This recognizes the wide-scale deployment of distributed generation and energy storage that has occurred.

People & Process

- **Demand Side Management Processes:** The implementation of Demand Side Management will require the development of processes that will allow the orderly operation of demand side management and the equipment that supports it.
- **Supply Following Plans:** As the amount of renewable generation grows, there will be a point where there will be a need to manage demand to match supply, both locally and globally. This will require both longer term forecasting, and short quick turn around processes for dips in supply.
- **Updated Standards:** As things continue to evolve, standards will have to continue to evolve as well.

Renewable & Embedded Generation

- **Generation Management Team:** As the penetration of embedded generation rises, it will become important to provide signals to run or not to run to the sources. This becomes even more important when Plug-in Hybrid Electrical Vehicles (PHEV) are included in the mix. There will need to be a team that can provide this guidance to the devices in the field. It is an open question "Is this better done by the LDC or the IESO?" that will need to be resolved. Is the IESO equipped and ready to deal with potentially thousands of sub-1 kW sources?

- **Troubleshooting Team for High Penetration Circuits:** The addition of embedded generation and PHEV will not be even across the Toronto Hydro territory. Penetration will be by demographics group, in some areas there will be almost none and in others it will occur on almost every connection to a customer. This unevenness will have a negative impact on reliability that will need troubleshooting support from people who have a background in embedded generation and reliability.

- **New Offers Team:** To continue to drive additional embedded resources (e.g. storage, generation and demand response), it will be important to innovate and provide a reason customers want to participate. This team will continue to drive new offers to the customers to get additional participation and maintain existing penetration.

8. FUTURE STUDIES

In conducting this study it became obvious that one of the limits to improved reliability in Toronto is the fact that there really are only two independent sources of power to the city that are large enough to support the daily needs of the city, and that any changes to the electrical network done below this level was still subject to these limits in the long run. Ontario is in the process of a major transformation of generation and power consumption in the province (conservation and demand management, embedded distributed generation and energy storage, renewable) and this set of changes is being put in place based on a single plan. It would be useful to look at the following future scenarios for Ontario and its power provision for Toronto:

1) The development of a third independent power source for Toronto from outside of the city, whether a substation to support new wind sources, or other renewables, or a feed on the new transmission link from Quebec. What would be the difference if a new major substation network was installed in the GTA that would provide a third external independent source of electricity? Two subsets should be looked at:
    a. A single major substation probably in the 750 – 1500 MVA size.
    b. A network of smaller substations all fitting a single design with interchangeable components that would all be fed from this new transmission link, this network of substations would be in the 125 to 300 MVA size.
2) The development of 600 to 900 MVA of embedded resources in the city itself. The resources should for the purposes of the study be broken into three groups of roughly equal size:
    a. Demand response that is schedulable and callable
    b. Renewable generation – probably mostly large wind off shore in Lake Ontario
    c. Conventional generation in the city itself (e.g. Heran Co-Gen and existing backup generation). A large amount of back up and emergency generation already exists that is not coordinated, so the absolute increase would be less than expected.
3) A clean sheet redesign of the downtown network. What would the downtown network look like if it were designed to support the planned density of development downtown and built from scratch.

All three of these studies would provide useful information to inform the debate on what should be done to support the City of Toronto and the Province of Ontario into the mid-century.

Within Toronto Hydro, there are also a number of studies that should be conducted or expanded:

1) Distributed Generation for Reliability Study. Which locations exist in Toronto where larger schedulable distributed generation could be installed? This should include looking at co-generation of heat and possibly other by-products of the generation. This detailed study should be done in conjunction with the City's Economic Development Division and should determine which businesses have a need for higher power reliability and would therefore be likely to participate in the projects once launched.

2) Distributed Storage for Reliability Study. Where in the city might multi-megawatt batteries be installed, understanding that today most battery chemistries have drawbacks that limit safe location of the batteries and supporting equipment?

3) Single Phase Renewable Generation Forecast Maps. Based on city demographics, what are the most likely locations for distributed renewable generation to get installed in the city? Since it takes people with capital to invest, some areas are more likely to get large amounts of distributed generation than others. Also city ordinances may limit the locations that have solar generation by limiting the amount of tree trimming and removal that can be done to allow solar to work. These two factors and more play into the likely locations and the areas where reliability may be impacted first by renewable generation. In most cases as renewable generation rises, the utility has to play catch up on relay schemes and other changes, leading to the loss of reliability in those areas for a period of time. As the utility catches up, then reliability returns to its prior levels. Knowing where renewables are likely to be installed means that changes can be planned into the grid.

4) Sequence Planning Study. Which smart grid and physical grid changes are most likely to have the highest impact on reliability and is there an order of installation that changes the impact of each technology on reliability? Could one order of projects provide more reliability earlier than another order of installations? No one has done enough actual smart grid work to have a good set of industry best practices.

9. APPENDIX

Appendix 1: Peer Group Cities Criteria

Appendix 2: Potential Peer Group Cities

Appendix 3: Toronto Hydro Reliability Data

Appendix 4: Toronto Hydro Reliability Data Analysis

Appendix 5: Other Cities Reliability Data

Appendix 6: Data Analysis

Appendix 7: Toronto Reliability Plan

Appendix 8: Circuits Schematics

Appendix 9: Transformation Map

10. TERMS AND ACRONYMS

Term	Explanation
C&I	Commercial and Industrial
CAIDI	Customer Average Interruption Duration Index. CAIDI gives the average outage duration that any given customer would experience
CEA	Canadian Electricity Association
CEATI	Centre for Energy Advancement through Technological Innovation (CEATI). CEATI is a user-driven technology solutions exchange, and a development program for utilities. The CEATI program model is built to combine inter-utility information exchange and informal benchmarking with the development of practical projects yielding results that have an immediate impact for our participants
EPRI	Electric Power Research Institute - an independent, non-profit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety and the environment.
FESI	Feeder Experienced Sustained Interruptions
IEEE	Institute of Electrical and Electronics Engineers - A non-profit organization, IEEE is the world's leading professional association for the advancement of technology.
IOU	Investment Own Utility
IESO	Independent Electricity System Operator
LOLE	Loss of Load Expectation
PHEV	Plug-in hybrid Electric Vehicle
SAIDI	System Average Interruption Duration Index. SAIDI is the average outage duration for each customer served
SAIFI	System Average Interruption Frequency Index. SAIFI is the average number of interruptions that a customer would experience
SCADA	Supervisory Control And Data Acquisition. Generally refers to an industrial control system: a computer system monitoring and controlling a process

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Campus Services &
Business Operations

4700 Keele St.
Toronto ON
Canada M3J 1P3
Tel 416 736 5789
Fax 416 736 5381

August 24, 2012

Mr. Chris Tyrrell
Vice-President, Customer Care & Chief Conservation Officer
Toronto Hydro-Electric System Limited
5800 Yonge Street
Toronto, Ontario M2M 3T3

Dear Chris,

York University is a leading interdisciplinary research and teaching university in Toronto. York offers a modern, academic experience at the undergraduate and graduate level. The third largest university in the country, York is host to a dynamic academic community of 55,000 students and 7,000 faculty and staff, as well as 250,000 alumni worldwide.

York's 11 faculties and 28 research centers conduct ambitious, groundbreaking research that is interdisciplinary, cutting across traditional academic boundaries. This distinctive and collaborative approach is preparing students for the future and bringing fresh insights and solutions to real-world challenges.

York relies on Toronto Hydro's services for a sprawling campus uptown, an intimate east-side campus, and downtown business centers. The Keele Campus is located at Keele Street and Steeles Avenue West on 550 acres. The Glendon Campus is located at Bayview and Lawrence Avenues on 85 acres. York has also established a Downtown Management Facility, the Miles S. Nadal Facility at King and Bay Streets, as part of the Seymour Schulich School of Business, and Osgoode Hall Law School Professional Development Centre at Yonge and Dundas Streets.

York acknowledges Toronto Hydro's electrical infrastructure capital investment application to the Ontario Energy Board. York University recognizes the need to upgrade outdated equipment for safety and reliability reasons, as York faces similar internal electrical infrastructure issues on a daily basis. World class ground breaking research requires 24/7 reliability, especially when working with the specialty research equipment in the physics and biology areas.

York University observes that on average it experiences 1.5 grid related interruptions per month. Some of these interruptions result in service outages for students, residences, classroom activities and sensitive research facilities, as well as costly recall of maintenance staff.

York University supports initiatives to improve the reliability of the Toronto Hydro grid.

Sincerely,

Richard Francki
Assistant Vice-President,
Campus Services & Business Operations

OWENS CORNING®
INNOVATIONS FOR LIVING™

August 3, 2012

Chris Tyrrell
Vice President: Customer Care & Chief Conservation Officer
Toronto Hydro-Electric System Limited
5800 Yonge St.
Toronto, Ontario
M2M 3T3

Dear Mr. Tyrrell:

The purpose of this communication is to put you on notice that as a very disappointed customer who spends roughly $10 million dollars annually with Toronto Hydro, I believe we deserve your attention as your organization is currently costing us $400,000 per year on machine uptime losses and significantly much more on reduced productivity as a function of your inability to supply reliable energy.

For the record, we have experienced 14 power supply failures year to date causing at least 37 hours of equipment downtime. We have recently identified that your power supply inefficiencies rank as my Scarborough plant's primary source of equipment downtime. In addition to the financial impact your inefficiencies continue to cause, I am also not happy about the potential implications associated with these process disturbances to the health and safety of my people.

As a power supplier, I expect Toronto Hydro to address these issues immediately. I am still waiting on the results of the Preventative Maintenance and Physical Asset replacement promises made on your behalf by Toronto Hydro representatives who recently visited by Scarborough facility. That said, I strongly urge you to reassess these efforts as we are still to see an improvement on the reliability of power supply to my operations.

I look forward to hearing from you and welcome your actions to help me sustain the 140+ jobs related to safely and efficiently running my plant in Scarborough to compete in today's global market.

Sincerely & Respectfully,

Wesley G Co

Wesley G. Co
Country Business Director
Owens Corning Canada
wesley.co@owenscorning.com
+1.416.332.7829

Standards.

Celestica

Chris Tyrrell
VP Customer Care & Chief Conservation Officer
Toronto Hydro-Electric System Limited
5800 Yonge Street
Toronto, Ontario M2M 3T3

Chris

It was a pleasure meeting you on the 13th.

As you are aware, Celestica operates a large electronics manufacturing services facility in Toronto, occupying approximately 900,000 square feet, at 844 Don Mills Road. The site serves customers in the green technology, aerospace, defence, telecommunications, enterprise computing and industrial markets. Specifically, Celestica's Toronto site is recognized as a leader in green technology, manufacturing green energy products such as photovoltaic panels, solar power inverters and components for wind turbines. We employ approximately 1,600 people and consume as much as 8MW of power at our site.

Our factory has experienced 34 power quality events in the last 18 months, with four in the month of June alone. These frequent Toronto Hydro electrical interruptions and voltage sags have a significant impact on our production lines. When our power supply is compromised, employees stand idle, for hours on some occasions, while production is re-established; customer delivery commitments are missed; and financial commitments are not met. We are considering further expansion of our manufacturing in Toronto, but poor power quality may force us to consider alternate locations.

We understand that Toronto Hydro has committed to making $1.8M of Price Capital Index (PCI) improvements via scope # X14332; this would include enhancements to our 53M24 feeder in 2013. In addition, we are aware of the application to the Ontario Energy Board for $4.06M of ICM improvements over the next two years.

Celestica strongly endorses these infrastructure investments and requests that expediting the PCI improvements into 2012 and approval of the ICM capital investment be given top priority. Our Toronto operation's competitive position depends on high quality reliable power.

Regards,

John Cundari
Site General Manager, Celestica Toronto

John Cundari
VP /GM
Celestica
844 Don Mills Road
Toronto, Ontario
Canada M3C 1V7
Telephone: (416) 448-2823
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Email: jcundari@celestica.com
www.celestica.com

Standard

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Mr. Chris Tyrrell
VP, Customer Care & Chief Conservation Officer
Toronto Hydro-Electric System Limited
5800 Yonge St
Toronto, Ontario M2M 3T3

September 4, 2012

Dear Mr. Tyrrell,

Further to our various discussions, this is to confirm that Brookfield Residential Services Ltd. fully supports any Toronto Hydro infrastructure renewal program that will positively affect condominium owners and their annual expense budgets. Because of “brown outs”, “black outs” and “dirty electricity” our clients have been incurring increasing operational costs related to burned out circuit boards and sensitive electronic equipment. We believe that continued investment in Toronto Hydro’s electrical infrastructure is essential to maintain overall levels of system reliability across the city.

We at Brookfield Residential Services Ltd. are committed to continually searching out and recommending capital projects and energy conservation initiatives in an effort to ease the demands from our buildings on the electrical system in Toronto. We currently manage approximately 45,000 condominium suites across the city and the reliability of the electrical infrastructure is of paramount importance to the tens of thousands of condominium owners who make up our portfolio. We are currently the leading promoter of energy efficiencies in the multi-residential sector in Toronto and as such we believe that we have the unique opportunity to see the negative impact the current infrastructure is having on our clients.

As you know, the condominium sector has been in growth for the last few years and Toronto is the global leader in new condominium construction developments and is forecast to continue at this pace for the next several years. This predicted continued development growth will in no doubt place excessive stresses on the existing systems. We encourage careful consideration of any infrastructure renewal program to help ensure an outcome that is in the best interest of the City of Toronto’s long term growth and development as well as the financial health of our many client condominiums.

Regards,

Murray Johnson
Vice President,
Client Service Development
Brookfield Residential Services Ltd.

Brookfield Residential Services Ltd.
3190 Steeles Avenue East, Suite 200, Markham, Ontario, L3R 1G9
Telephone: (416) 510-8700 Fax: (416) 510-8880

Stanb/ATP

Gay Lea

Better
Together

September 04, 2012

Mr. Chris Tyrrell
Vice President, Customer Care and Chief Conservation Officer
Toronto Hydro Electric Systems Limited
14 Carlton Street
Toronto, ON
M5B 1K5

Dear Mr. Tyrrell:

Gay Lea Foods Co-operative Limited is a dairy processor owning and operating six plants in Ontario that manufacture and market a variety of dairy products. Two of our plants are located in the Toronto area within six kilometers of each other.

Our Longlife Plant located at 180 Ormont Drive operates seven days per week, 24 hours a day through the year. Reliability of supply is of paramount importance to us as it directly impacts our continued viability as a manufacturing facility within the City of Toronto.

The plant at 180 Ormont Drive has a history of power supply issues that to this day remain essentially unresolved. Interruption of any kind, even very short term voltage surges or sags interrupt our milk sterilization process (among other processes), causing product loss (waste) and lost production (downtime) which directly impacts our ability to meet our customers delivery requirements. It is not uncommon for a power interruption to cause equipment to fail requiring investment in replacement motors and variable frequency drives further impacting our profitability and production.

We recognize that our continued success at the 180 Ormont site depends on a balanced plan that addresses the need for reliable electricity supply grid coupled with competitive rates. We were pleased to learn that Toronto Hydro proposes to invest in the electrical infrastructure that supplies our plant's power (subject to the funding approvals) and we support the need for a planned renewal of our electrical infrastructure within the City of Toronto.

Sincerely,

Michael Barrett

Michael Barrett
Chief Operating Officer

GAY LEA FOODS CO-OPERATIVE LIMITED
5200 ORBITOR DRIVE, MISSISSAUGA, ONTARIO, L4W 5B4
TEL 905.283.5200 | FAX 905.283.5330 | TOLL FREE 1.800.268.0504 | WWW.GAYLEA.COM

CROWN Metal Packaging Canada LP
21 Fenmar Drive
Weston, Ontario
M9L 2Y9
Main Phone: (416) 741-6002
Main Fax: (416) 741-6099

August 28, 2012

Toronto Hydro Electric System Limited
14 Carlton Street
Toronto, ON
M5B 1K5

Attention: Chris Tyrell, Vice-President, Customer Car and Chief Conservation Officer

Dear Mr. Tyrell:

Re: Power Quality and Reliability to Crown Metal Packaging Canada LP

We have been asked to provide a letter explaining our level power quality and reliability from Toronto Hydro.

Crown Metal Packaging Canada LP – Weston plant is part of a world-wide company that produces lightweight aluminum beverage cans. The plant has employed on average 135 well paid unionized employees since the mid-1980s. This is an extremely competitive business and we compete internally and externally with many plants in the USA. We are already at a disadvantage with higher tax rates, and labour rates.

If we experience a problem with power quality for as little as three milliseconds, it causes sudden, unexpected plant-wide shut down, that takes between 1 and 4 hours before we are back operating at an optimum rate. In 2011, we experience 16 such events and so far in 2012 we have experienced 11 events – 3 in one day!

It is hard to explain such poor reliability to our senior management when our plant is located in a major urban location. Anything that you can do to upgrade your system and improve your reliability will help to allow us to compete.

Please advise if you have any questions related to this issue and its impact on our plant.

Sincerely,

Gary Thornton
Plant Manager
416-747-5507

Redpath

Redpath Sugar Ltd.
95 Queen's Quay East
Toronto, ON M5E 1A3
Canada
Tel 416-366-3561
Fax 416-366-7550
www.redpathsugar.com

A subsidiary of American Sugar Refining, Inc.

August 8, 2012

Attention: Mr. Chris Tyrrell
Vice-President
Customer Care and Chief Conservation Offices

Toronto Hydro Electric System Limited
14 Carlton Street
Toronto, ON., M5B 1K5

Dear Sir

My name is Gary Porritt and my position is Chief Engineer at Redpath Sugar Limited at 95 Queens Quay East. We are a Sugar Refining plant that Generates some of hydro requirements and purchases the difference from Toronto Hydro. We are synchronized to Toronto Hydro on one of the two feeders A38X or A39X, whichever is in service. I am very interested as we are looking at our power Quality and ways of improving it. Power quality issues if caused on my site I can address but if it's a quality issue on the lines feeding the site from other users. I want to know that they are being addressed.

My comments for bad quality are for effects on equipment failure rates which cause loss production. We recently suffer losses of some equipment that were damaged during a system Failure on low voltage which our generation looked after part of the plant with no problems. Our return of Toronto hydro feed the equipment was damaged on the feed, our Generator was synchronized (attempted) but tripped immediately causing us to transfer the remainder of plant loads to Hydro Feed. At that point is was discovered by us that one phase had low voltage (400 range).We notified Toronto Hydro of problem which was traced to Hydro One supply transformer bad winding. This type of failure should not be seen by a customer and measures have to be taken to prevent this as we suffered large loss in production.

I would like to participate in a study to reduce if not eliminate poor power quality on Toronto Hydro lines and customers internal corrections.

Yours very truly,

Gary E. Porritt

Cc Phil Guglielmi

NOTHING EQUALS SUGAR.

celplast
metallized products

Celplast Metallized Products Limited
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Toronto, Ontario, M1S 3M7
O 416-293-4330 F 416-293-9198
http://cmp.celplast.com

Toronto Hydro Electric System Limited
14 Carlton Street Toronto ON, M5B 1K5

Attention: Mr. Chris Tyrrell, VP, Customer Care and Chief Conservation Officer

Dear Mr. Tyrrell,

Celplast Metallized Products Limited is located in Toronto at 67 Commander Blvd., and is a leading supplier of high barrier clear and metalized film primarily used in food packaging. Since Celplast's launch in 1983 we have continually grown and currently have in excess of 50 employees.

It is our wish to continue to grow our business and to remain in Scarborough where our roots are. Having said that we have a dilemma, we are currently considering an investment of several million dollars in additional equipment that will allow increased production, sales and will support additional employment. Our concern with making this investment at our Scarborough site is related to power quality / interruptions. Over the past few years we have noted a considerable increase in the number of short power disruptions, typically less than a second, that cause production to be disrupted, material losses and significant down time due to the time required to bring production back on line after the disruption.

The power issues are such that I and the management team are considering locating the new equipment outside of Toronto or possibly in the US (our first time expanding beyond our 67 Commander Blvd site).

We are seeking Toronto Hydro's support to ensure we have a reliable power supply that will allows us to invest in our Toronto location with confidence. The reliability of the distribution grid is a serious concern for Celplast.

We recognize that our continued success in this location depends on a balanced plan that addresses the need for a reliable electricity supply grid coupled with competitive rates and supports the need for a planned electrical infrastructure renewal that address our reliability concerns.

Sincerely,

Dante Ferrari

COO, Celplast Metallized Products Limited

Stan[illegible]

CBC Radio-Canada

Toronto Hydro Electric System Limited
14 Carlton Street Toronto ON, M5B 1K5

Attention: Mr. Chris Tyrrell, Vice-President, Customer Care and Chief Conservation Officer

Dear Mr. Tyrrell

The Canadian Broadcasting Centre at 250 Front Street is a 10 storey, 1.8 million square foot broadcasting and production facility and is home to programs such as Hockey Night in Canada, The National and CBC Radio and houses mission critical operations for the CBC. Reliability of electrical supply is a paramount concern for us.

The Canadian Broadcasting Centre has plans to double its current demand load and is working with future tenants to invest the redevelopment of the facility establishing it as a premiere facility in Canada.

We recognize that failure to invest in infrastructure upgrades within the downtown core may indirectly impact our own power quality even when work is not on our feeders but elsewhere on our supply bus. Through this level of interconnectedness, the overall reliability of the distribution grid given the tremendous growth and load intensification in the city core is a serious concern for CBC.

Moreover, we understand the planned work at Bremner is critical to safeguard the reliability of the downtown core distribution. Aged switchgear cannot be currently replaced at Windsor TS which serves our critical loads. It is our understanding Bremner will allow us to transfer our critical loads and perform the necessary switchgear replacements at Windsor TS. This new switchgear will improve reliability for the downtown area. Bremner TS will also provide new capacity for the downtown area, since Windsor TS is maxed out.

CBC recognizes that our continued success depends on reliable electricity supply and supports Toronto Hydro's infrastructure renewal plan.

Sincerely,

Marcel Gauthier

Marcel Gauthier
Deputy Executive Director
Real Estate Services

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 10 – SCHOOL ENERGY COALITION

UNDERTAKING NO. JT2.3:

Reference(s): Tab 6F, Schedule 1-31

To provide Appendix A and B to the reference in Excel format.

RESPONSE:

Excel versions of Appendix A and B are being provided as attachments to this response.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT2.4:

Reference(s): SEC 9

Why is Bremner TS non-discretionary as a result of "Statute, Code, or external requirements" as noted in SEC #9?

RESPONSE:

In preparing its response to this undertaking, THESL has determined that Bremner TS is not non-discretionary as a result of "Statute, Code, or external requirements". This box was checked in error. Bremner TS is non-discretionary for reasons (c), (d), and (e): imminent reliability degradations, imminent capacity shortages, and material increase in cost, respectively.

However, an additional external driver relevant to the Bremner TS project is that the OPA has assumed that, for the purposes of the Toronto Regional Plan, Bremner TS will be in service by THESL's proposed in-service date. Please see letter from OPA dated November 21, 2012, which is attached as Appendix A.

Toronto Hydro-Electric System Limited
EB-2012-0064
Schedule 2-4
Filed: 2012 Nov 27
Appendix A
(2 pages)

ONTARIO POWER AUTHORITY

120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1

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F 416-967-1947
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November 21, 2012

Mr. Ivano Labricciosa P. Enq., M. Enq., MBA
Vice President, Asset Management
Toronto Hydro Electric System Limited
14 Carlton Street
Toronto, ON
M5B 1K5

Dear Mr. Labricciosa:

This letter is in response to Toronto Hydro-Electric System Limited's ("THESL") request for clarification of the relationship between the scope of the ongoing Toronto Regional Plan and THESL's investment plans as filed in its application for 2012 to 2014 rates (EB-2012-0064).

As part of its evidence in EB-2012-0064, THESL has applied for capital funding in respect of a new station, Bremner TS, to be located within the geographical bounds of the Toronto Regional Plan. The OPA has been aware of THESL's intent to build Bremner TS since before the Toronto Regional Plan was initiated. THESL has indicated that the station is a connection facility intended to deal with reliability and load growth issues in a local service area, and upstream transmission capacity is available.

The Toronto Regional Plan is one of several regional plans across the province being prepared jointly with the Ontario Power Authority (OPA), affected local distribution companies, transmitters, and the IESO. The OPA supports strategic distribution investments that provide flexibility to enable connection of growth in demand, refurbishment of existing assets, and improvements in restoration for both distribution and transmission contingencies. The OPA formulated a view on facilities within a distribution system in its February 2012 submission to the Ontario Energy Board ("OEB") as part of the Renewed Regulatory Framework for Electricity (EB-2011-0043). The OPA specifically stated that:

"The OPA recognizes that distributors and transmitters conduct ongoing connection planning activities that are associated with growth in demand, connecting generators, or addressing reliability issues, and that are more local in nature than the OPA's joint regional planning studies. These planning activities are typically driven by specific customer requests where dedicated connection facilities are required, and where upstream transmission network capacity is available. The expectation is that transmitters will advise the OPA of such planning activities and of their outcomes."

The OPA's assessment is that the location and functionality provided by Bremner TS is consistent with the objectives stated above. At this time, the Toronto Regional Plan assumes that Bremner TS will be available by THESL's proposed in-service date. The OPA will defer to THESL for all aspects of Bremner TS's rationale, the justification of costs, and the evaluation of any potential alternatives.

Please contact me with any further questions.

Sincerely,

Amir Shalaby
Vice President, Power System Planning

cc: Amanda Klein, Toronto Hydro
Fred Cass, Aird & Berlis LLP (Counsel for Toronto Hydro)
Joe Toneguzzo, OPA
Nancy Marconi, OPA

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT2.5:

Reference(s): Tab 6F, Schedule 1-72

Provide dollar amounts for each asset category in table in OEB IR 72.

RESPONSE:

The proposed IT Hardware Asset Replacement costs by asset category for the years 2012 and 2013 are presented in Table 1 below.

Table 1

IT Hardware Asset Category	2012 Costs ($, millions)	2013 Costs ($, millions)
Servers	$1.95	$1.17
Storage and Backup	$1.92	$1.05
Network and Telephony	$1.40	$3.28
Printers and Plotters	$0.33	$0.50
User Endpoints	$0.14	$1.53
Security Appliances	-	$0.98
TOTAL	$5.74	$8.51

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT2.6:

Reference(s): Tab 5, Schedule M

a) Verify formulas in spreadsheet to Tab 5, Schedule M, "PILS RECOVERIES, 2002 TO 2006 SUMMARY," and correct if necessary.

b) In Tab 5, explain why the volumetric billing determinants in the tab on row 40, columns C through K are in the table and what use THESL makes of them.

RESPONSE:

a) The indicated formulas contained errors. A corrected version of Tab 5, Schedule M is attached.

b) The row labels shown in cells B29 through B40 are incorrectly placed one row down. The values shown in cells C40 through K40 are the sum of the billing determinants for the first three months of 2004. They are not used in any calculations. A corrected version of Tab 5, Schedule M showing the total of the 2004 billing determinants is attached.

PILs amount included in Rates

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS WH	RES WH
2001 PILS Customer Charge	0.16630	0.20420	0.34750	0.19510	3.46090	35.97460	0.00360		
2001 PILS Distribution Rate	0.00016	0.00021	0.05884	0.05817	0.04909	0.04165	0.03900	0.00021	0.00016
2002 PILS Customer Charge	1.82920	2.24600	3.82280	2.14650	38.07040	395.72070	0.03980		
2002 PILS Distribution Rate	0.00171	0.00231	0.64724	0.63990	0.54002	0.45812	0.42896	0.00231	0.00171
2004 Apr PILS Customer Charge	1.64380	1.92180	2.70470	2.52010	61.65190	214.71650	0.02870	0.00000	0.00000
2004 Apr PILS Distribution Rate	0.00210	0.00270	0.68610	0.67200	0.53710	0.43080	0.54790	0.00270	0.00210
2005 Apr PILS Customer Charge	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2005 Apr PILS Distribution Rate	0.00440	0.00330	0.70812	0.69533	0.57486	0.45827	0.72020	0.00330	0.00440

PILs Revenue Collected in Rates

	2002	**2003**	**2004**	**2005**	**2006**
Jan		$ 5,317,066	$ 5,375,228	$ 5,249,598	$ 5,208,059
Feb		$ 4,922,031	$ 4,935,067	$ 4,767,533	$ 4,911,712
Mar	$ 5,128,917	$ 5,072,630	$ 4,994,877	$ 4,990,076	$ 5,071,451
Apr	$ 4,844,074	$ 4,853,275	$ 4,729,326	$ 4,608,387	$ 4,463,329
May	$ 4,963,624	$ 4,765,135	$ 4,749,755	$ 4,672,416	
Jun	$ 5,167,317	$ 4,996,389	$ 4,781,694	$ 5,379,127	
Jul	$ 5,881,045	$ 5,294,225	$ 4,987,160	$ 5,973,653	
Aug	$ 5,666,001	$ 5,267,442	$ 4,981,559	$ 5,783,567	
Sep	$ 5,259,679	$ 4,881,929	$ 4,915,405	$ 4,936,440	
Oct	$ 5,034,408	$ 4,871,659	$ 4,689,751	$ 4,774,191	
Nov	$ 5,063,288	$ 4,814,453	$ 4,695,115	$ 4,778,520	
Dec	$ 5,321,901	$ 5,093,549	$ 5,105,490	$ 5,439,661	
Total	**$ 52,330,253**	**$ 60,149,784**	**$ 58,940,427**	**$ 61,353,168**	**$ 19,654,550**

Notes:

{1} In the 2002 January 25, 2002 Application, THESL applied for 2001 PILs Deferral Account Allowance ($5M) and 2002 PILs Proxy ($55M) to be included in the rates effective March 1, 2002.
{2} Rate change April 1, 2004
{3} Rate change April 1, 2005
{4} Rate change May 1, 2006

Customer Charge	0.1663	0.2042	0.3411	8.8386	35.9746	0.0036	
Distribution Rate	0.0002	0.0002	0.0588	0.0491	0.0416	0.0390	0.0002
Customer Charge	1.8292	2.246	3.7516	97.2251	395.7207	0.0398	
Distribution Rate	0.0017	0.0023	0.6472	0.5400	0.4581	0.4290	0.0018

Billing quantities from Revenue Model

	RES	GS<50	50-1000	1000-5000	>5000	Street Light	Unmetered WH
# customers	583,523	67,274	10,527	482	46	16,067	-
	kWh	kWh	kVA	kVA	kVA	kVA	kWh
Jan-02	499,242,279	241,161,462	1,887,137	912,011	462,728	26,461	18,012,187
Feb-02	458,277,079	212,781,726	1,794,018	876,663	443,003	26,461	16,167,911
Mar-02	450,617,117	234,576,408	2,016,231	931,093	466,361	26,461	18,607,657
Apr-02	418,910,743	218,071,115	1,809,264	906,562	424,314	26,461	17,298,383
May-02	417,323,664	203,470,994	1,977,285	960,001	461,945	26,461	12,495,316
Jun-02	441,560,926	215,288,152	2,092,122	1,015,756	488,774	26,461	13,221,017
Jul-02	526,487,299	256,694,991	2,494,504	1,211,118	582,781	26,461	15,763,844
Aug-02	500,899,197	244,219,215	2,373,267	1,152,256	554,457	26,461	14,997,696
Sep-02	452,551,077	220,646,528	2,144,193	1,041,037	500,939	26,461	13,550,079
Oct-02	425,746,215	207,577,506	2,017,191	979,376	471,268	26,461	12,747,500
Nov-02	429,182,590	209,252,951	2,033,473	987,281	475,072	26,461	12,850,390
Dec-02	461,226,975	224,876,563	2,170,158	1,060,995	510,543	26,461	13,809,849

PILS revenue

	RES	GS<50	50-1000	1000-5000	>5000	Street Light	Unmetered WH	Total Monthly Revenue
	1,164,420	164,835	43,084	51,123	19,858	697	-	
Jan-02								
Feb-02								
Mar-02	838,148	592,071	1,423,623	548,521	233,074	12,382	37,081	$ 5,128,917
Apr-02	779,174	550,411	1,277,487	534,069	212,060	12,382	34,472	$ 4,844,074
May-02	776,222	513,561	1,396,123	565,551	230,867	12,382	24,901	$ 4,963,624
Jun-02	821,303	543,387	1,477,207	598,397	244,276	12,382	26,347	$ 5,167,317
Jul-02	979,266	647,898	1,761,322	713,488	291,258	12,382	31,414	$ 5,881,045
Aug-02	931,673	616,409	1,675,719	678,811	277,102	12,382	29,887	$ 5,666,001
Sep-02	841,745	556,912	1,513,974	613,291	250,355	12,382	27,003	$ 5,259,679
Oct-02	791,888	523,926	1,424,300	576,965	235,527	12,382	25,403	$ 5,034,408
Nov-02	798,280	528,154	1,435,797	581,622	237,428	12,382	25,608	$ 5,063,288
Dec-02	857,882	567,588	1,532,307	625,048	255,155	12,382	27,520	$ 5,321,901

2002

2001 PILS Customer (	0.1663	0.2042	0.3475	0.1951	3.4609	35.9746	0.0036	0.2042	0.1663
2001 PILS Distribution	0.0002	0.0002	0.0588	0.0582	0.0491	0.0416	0.0390	0.0002	0.0002
2002 PILS Customer (	1.8292	2.246	3.8228	2.1465	38.0704	395.7207	0.0398	2.246	1.8292
2002 PILS Distribution	0.0017	0.0023	0.6472	0.6399	0.5400	0.4581	0.4290	0.0023	0.0017

Number of Customers from Revenue Model

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	GS Water Heaters
Jan-03	587,227	66,979	9,445	1,287	487	46	161,043		
Feb-03	588,021	67,139	9,463	1,323	487	46	161,043		
Mar-03	588,436	67,113	9,463	1,331	485	46	161,043		
Apr-03	588,797	67,039	9,476	1,333	487	46	161,043		
May-03	588,927	67,126	9,486	1,342	491	46	161,043		
Jun-03	589,308	66,958	9,493	1,347	489	46	161,043		
Jul-03	589,431	67,046	9,486	1,362	492	46	161,043		
Aug-03	589,695	67,040	9,481	1,369	491	46	161,043		
Sep-03	589,243	66,964	9,469	1,382	492	46	161,043		
Oct-03	589,569	67,018	9,488	1,404	493	46	161,043		
Nov-03	589,645	66,892	9,460	1,414	496	46	161,043		
Dec-03	590,109	67,064	9,484	1,424	497	47	161,043		

Billing Quantities from Revenue Model

	RES kWh	GS<50 kWh	50-1000 Non-Interval kVA	50-1000 Interval kVA	1000-5000 kVA	>5000 kVA	Street Light kVA	GS Water Heaters kWh	RES Water Heaters kWh
Jan-03	511,648,309	239,695,445	1,639,349	646,265	1,058,728	431,482	26,461	1,761,834	12,408,339
Feb-03	504,237,643	219,367,046	1,407,781	566,991	859,658	405,734	26,461	1,419,894	10,000,102
Mar-03	471,837,507	226,149,038	1,526,584	605,375	989,756	436,854	26,461	1,664,507	11,722,877
Apr-03	420,551,011	204,962,060	1,500,178	595,103	920,382	424,993	26,461	1,406,060	9,902,673
May-03	381,266,939	203,537,828	1,477,532	571,668	931,821	442,359	26,461	1,701,393	11,982,661
Jun-03	404,118,361	209,990,698	1,561,593	631,342	1,037,936	486,066	26,461	1,654,523	11,652,560
Jul-03	432,363,398	231,747,687	1,721,584	665,716	1,134,117	496,111	26,461	1,864,417	13,130,817
Aug-03	488,709,843	230,926,341	1,629,468	639,754	1,043,402	494,480	26,461	1,771,555	12,476,803
Sep-03	416,761,502	216,700,698	1,512,861	569,737	932,022	423,649	26,461	1,904,464	13,412,862
Oct-03	383,680,023	195,454,234	1,551,819	589,653	1,035,306	451,431	26,461	1,684,102	11,860,884
Nov-03	405,342,349	217,059,693	1,465,336	562,780	921,634	411,056	26,461	1,897,902	13,366,647
Dec-03	455,568,253	224,567,035	1,593,675	591,922	998,486	455,934	26,461	1,741,535	12,265,376
Total	5,276,085,138	2,620,157,802	18,587,759	7,236,307	11,863,247	5,360,148	317,526	20,472,188	144,182,601

PILS revenue - Customer portion

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	GS Water Heaters	Total
Jan-03	1,171,811	164,112	39,388	3,014	20,226	19,858	6,989			1,425,399
Feb-03	1,173,396	164,504	39,464	3,098	20,226	19,858	6,989			1,427,534
Mar-03	1,174,224	164,440	39,464	3,117	20,143	19,858	6,989			1,428,234
Apr-03	1,174,944	164,259	39,518	3,121	20,226	19,858	6,989			1,428,915
May-03	1,175,204	164,472	39,559	3,142	20,392	19,858	6,989			1,429,617
Jun-03	1,175,964	164,060	39,589	3,154	20,309	19,858	6,989			1,429,923
Jul-03	1,176,210	164,276	39,559	3,189	20,433	19,858	6,989			1,430,515
Aug-03	1,176,736	164,261	39,539	3,206	20,392	19,858	6,989			1,430,981
Sep-03	1,175,834	164,075	39,489	3,236	20,433	19,858	6,989			1,429,915
Oct-03	1,176,485	164,208	39,568	3,288	20,475	19,858	6,989			1,430,870
Nov-03	1,176,637	163,899	39,451	3,311	20,600	19,858	6,989			1,430,744
Dec-03	1,177,563	164,320	39,551	3,334	20,641	20,290	6,989			1,432,688

PILS revenue - Distribution portion

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	GS Water Heaters	Total
Jan-03	951,666	604,991	1,102,394	429,658	567,011	196,039	12,382	4,447	23,080	3,891,667
Feb-03	937,882	553,682	946,674	376,954	460,398	184,341	12,382	3,584	18,600	3,494,497
Mar-03	877,618	570,800	1,026,564	402,473	530,073	198,479	12,382	4,201	21,805	3,644,395
Apr-03	782,225	517,324	1,008,807	395,644	492,919	193,091	12,382	3,549	18,419	3,424,359
May-03	709,157	513,729	993,578	380,064	499,045	200,981	12,382	4,294	22,288	3,335,518
Jun-03	751,660	530,017	1,050,106	419,737	555,876	220,838	12,382	4,176	21,674	3,566,466
Jul-03	804,196	584,931	1,157,693	442,590	607,387	225,402	12,382	4,706	24,423	3,863,710
Aug-03	909,000	582,858	1,095,749	425,329	558,803	224,661	12,382	4,471	23,207	3,836,461
Sep-03	775,176	546,953	1,017,335	378,780	499,153	192,480	12,382	4,807	24,948	3,452,014
Oct-03	713,645	493,326	1,043,533	392,021	554,467	205,102	12,382	4,251	22,061	3,440,789
Nov-03	753,937	547,859	985,377	374,154	493,589	186,758	12,382	4,790	24,862	3,383,709
Dec-03	847,357	566,807	1,071,680	393,529	534,748	207,148	12,382	4,396	22,814	3,660,861

PILS revenue

	RES	**GS<50**	**50-1000 Non-Interval**	**50-1000 Interval**	**1000-5000**	**>5000**	**Street Light**	**GS Water Heaters**	**GS Water Heaters**	**Total**
Jan-03	2,123,477	769,103	1,141,782	432,671	587,237	215,897	19,372	4,447	23,080	5,317,066
Feb-03	2,111,278	718,186	986,137	380,052	480,624	204,199	19,372	3,584	18,600	4,922,031
Mar-03	2,051,842	735,240	1,066,027	405,590	550,215	218,337	19,372	4,201	21,805	5,072,630
Apr-03	1,957,169	681,583	1,048,324	398,765	513,145	212,949	19,372	3,549	18,419	4,853,275
May-03	1,884,360	678,202	1,033,138	383,206	519,437	220,839	19,372	4,294	22,288	4,765,135
Jun-03	1,927,624	694,077	1,089,694	422,891	576,185	240,696	19,372	4,176	21,674	4,996,389
Jul-03	1,980,405	749,207	1,197,252	445,779	627,820	245,260	19,372	4,706	24,423	5,294,225
Aug-03	2,085,737	747,119	1,135,287	428,535	579,195	244,519	19,372	4,471	23,207	5,267,442
Sep-03	1,951,011	711,028	1,056,824	382,016	519,586	212,338	19,372	4,807	24,948	4,881,929
Oct-03	1,890,130	657,534	1,083,101	395,308	574,942	224,960	19,372	4,251	22,061	4,871,659
Nov-03	1,930,573	711,757	1,024,828	377,465	514,189	206,616	19,372	4,790	24,862	4,814,453
Dec-03	2,024,919	731,127	1,111,231	396,863	555,389	227,438	19,372	4,396	22,814	5,093,549
Total	**23,918,527**	**8,584,165**	**12,973,627**	**4,849,141**	**6,597,965**	**2,674,047**	**232,461**	**51,672**	**268,180**	**60,149,784**
Q1	6,286,597	2,222,530	3,193,947	1,218,313	1,618,076	638,433	58,115	12,232	63,484	15,311,727
Q2	5,769,154	2,053,862	3,171,156	1,204,862	1,608,767	674,483	58,115	12,019	62,380	14,614,799
Q3	6,017,153	2,207,355	3,389,364	1,256,329	1,726,601	702,117	58,115	13,984	72,578	15,443,596
Q4	5,845,623	2,100,419	3,219,160	1,169,637	1,644,520	659,015	58,115	13,437	69,737	14,779,662

2001 PILS Customer Charge	0.1663	0.2042	0.3475	0.1951	3.4609	35.9746	0.0036	0.2042	0.1663
2001 PILS Distribution Rate	0.0002	0.0002	0.0588	0.0582	0.0491	0.0416	0.0390	0.0002	0.0002
2002 PILS Customer Charge	1.8292	2.2460	3.8228	2.1465	38.0704	395.7207	0.0398	2.2460	1.8292
2002 PILS Distribution Rate	0.0017	0.0023	0.6472	0.6399	0.5400	0.4581	0.4290	0.0023	0.0017
2004 PILS Customer Charge	1.6438	1.9218	2.7047	2.5201	61.6519	214.7165	0.0287	0.0000	0.0000
2004 PILS Distribution Rate	0.0021	0.0027	0.6861	0.6720	0.5371	0.4308	0.5479	0.0021	0.0027

*** Due to change in OEB model, customer/distribution split is changed

Number of Customers from Revenue Model

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	GS Water Heaters
Jan-04	590,973	66,973	9,506	1,433	497	47	161,043		
Feb-04	591,378	67,046	9,529	1,442	497	47	161,043		
Mar-04	591,576	67,000	9,544	1,442	499	47	161,043		
Apr-04	591,585	66,919	9,550	1,457	498	47	161,043		
May-04	591,293	66,875	9,554	1,464	498	47	161,043		
Jun-04	591,523	66,789	9,560	1,478	494	47	161,043		
Jul-04	591,374	66,753	9,565	1,480	495	47	161,043		
Aug-04	590,996	66,715	9,590	1,486	494	47	161,043		
Sep-04	590,899	66,658	9,601	1,503	494	47	161,043		
Oct-04	590,303	66,496	9,584	1,513	495	47	161,043		
Nov-04	591,275	66,585	9,597	1,522	498	47	161,043		
Dec-04	594,976	66,505	9,621	1,525	498	47	161,043		

PILS revenue - Customer portion

		RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	GS Water Heaters	Total
	Jan-04	1,179,287	164,097	39,643	3,356	20,641	20,290	6,989			1,434,302
	Feb-04	1,180,095	164,276	39,739	3,377	20,641	20,290	6,989			1,435,406
	Mar-04	1,180,490	164,163	39,801	3,377	20,724	20,290	6,989			1,435,834
rate change	Apr-04	972,447	128,605	25,830	3,672	30,703	10,092	4,622			1,175,970
	May-04	971,967	128,520	25,841	3,689	30,703	10,092	4,622			1,175,434
	Jun-04	972,346	128,355	25,857	3,725	30,456	10,092	4,622			1,175,452
	Jul-04	972,101	128,286	25,870	3,730	30,518	10,092	4,622			1,175,218
	Aug-04	971,479	128,213	25,938	3,745	30,456	10,092	4,622			1,174,545
	Sep-04	971,320	128,103	25,968	3,788	30,456	10,092	4,622			1,174,348
	Oct-04	970,340	127,792	25,922	3,813	30,518	10,092	4,622			1,173,098
	Nov-04	971,938	127,963	25,957	3,836	30,703	10,092	4,622			1,175,110
	Dec-04	978,022	127,809	26,022	3,843	30,703	10,092	4,622			1,181,112

Billing Quantities from Revenue Model

	RES kWh	GS<50 kWh	50-1000 Non-Interval kVA	50-1000 Interval kVA	1000-5000 kVA	>5000 kVA	Street Light kVA	GS Water Heaters kWh	RES Water Heaters kWh	Total
Jan-04	519,498,589	237,212,926	1,674,540	638,917	1,021,359	513,267	26,461	2,196,808	14,505,971	
Feb-04	507,703,943	221,058,187	1,403,984	560,011	846,894	413,132	26,461	1,843,936	12,175,888	
Mar-04	454,834,567	217,122,191	1,491,143	582,619	981,885	431,436	26,461	2,749,004	18,152,237	
Apr-04	431,630,904	211,789,460	1,497,131	571,284	764,489	389,031	26,461	3,578,526	23,629,739	
May-04	363,225,926	192,160,569	1,526,185	588,711	1,068,714	465,452	26,461	3,059,023	20,199,356	
Jun-04	371,624,927	198,990,656	1,542,530	605,205	1,019,011	522,330	26,461	1,841,526	12,159,973	
Jul-04	415,789,958	223,213,556	1,473,929	725,108	1,069,743	472,154	24,919	2,188,368	15,318,577	
Aug-04	464,725,676	219,572,223	1,425,068	684,607	1,005,539	468,791	24,919	2,131,769	14,922,384	
Sep-04	442,472,692	218,149,327	1,463,914	668,897	967,570	433,751	24,919	2,058,013	16,464,100	
Oct-04	379,762,239	195,814,904	1,377,629	678,132	1,003,268	453,833	24,919	1,977,928	13,845,498	
Nov-04	402,256,301	211,184,558	1,391,372	644,873	896,685	404,282	24,919	2,011,282	16,090,252	
Dec-04	481,742,545	229,719,825	1,530,925	698,059	972,071	442,021	24,919	2,230,290	15,612,027	
Total	5,235,268,268	2,575,988,383	17,798,349	7,646,423	11,617,228	5,409,480	308,277	27,866,472	193,076,002	

PILS revenue - Distribution portion

		RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	GS Water Heaters	Total
	Jan-04	966,267	598,725	1,126,058	424,772	546,998	233,197	12,382	5,545	26,981	3,940,926
	Feb-04	944,329	557,951	944,120	372,313	453,562	187,702	12,382	4,654	22,647	3,499,661
	Mar-04	845,992	548,016	1,002,731	387,344	525,857	196,018	12,382	6,938	33,763	3,559,043
rate change	Apr-04	906,425	571,832	1,027,182	383,903	410,607	167,595	14,498	7,515	63,800	3,553,356
	May-04	762,774	518,834	1,047,116	395,614	574,006	200,517	14,498	6,424	54,538	3,574,320
	Jun-04	780,412	537,275	1,058,330	406,698	547,311	225,020	14,498	3,867	32,832	3,606,242
	Jul-04	873,159	602,677	1,011,262	487,272	574,559	203,404	13,653	4,596	41,360	3,811,942
	Aug-04	975,924	592,845	977,739	460,056	540,075	201,955	13,653	4,477	40,290	3,807,015
	Sep-04	929,193	589,003	1,004,391	449,499	519,682	186,860	13,653	4,322	44,453	3,741,056
	Oct-04	797,501	528,700	945,191	455,705	538,855	195,511	13,653	4,154	37,383	3,516,653
	Nov-04	844,738	570,198	954,620	433,355	481,609	174,165	13,653	4,224	43,444	3,520,006
	Dec-04	1,011,659	620,244	1,050,368	469,096	522,099	190,423	13,653	4,684	42,152	3,924,378

	RES	**GS<50**	**50-1000 Non-Interval**	**50-1000 Interval**	**1000-5000**	**>5000**	**Street Light**	**GS Water Heaters**	**GS Water Heaters**	**Total**
Jan-04	2,145,554	762,823	1,165,701	428,128	567,639	253,486	19,372	5,545	26,981	5,375,228
Feb-04	2,124,424	722,227	983,859	375,690	474,203	207,991	19,372	4,654	22,647	4,935,067
Mar-04	2,026,482	712,180	1,042,533	390,720	546,582	216,308	19,372	6,938	33,763	4,994,877
Apr-04	1,878,872	700,436	1,053,012	387,575	441,310	177,686	19,120	7,515	63,800	4,729,326
May-04	1,734,742	647,354	1,072,957	399,303	604,709	210,608	19,120	6,424	54,538	4,749,755
Jun-04	1,752,758	665,630	1,084,187	410,422	577,767	235,111	19,120	3,867	32,832	4,781,694
Jul-04	1,845,259	730,963	1,037,133	491,002	605,077	213,496	18,275	4,596	41,360	4,987,160
Aug-04	1,947,403	721,058	1,003,677	463,801	570,531	212,047	18,275	4,477	40,290	4,981,559
Sep-04	1,900,512	717,107	1,030,359	453,287	550,138	196,952	18,275	4,322	44,453	4,915,405
Oct-04	1,767,841	656,492	971,113	459,518	569,373	205,603	18,275	4,154	37,383	4,689,751
Nov-04	1,816,676	698,161	980,577	437,190	512,312	184,256	18,275	4,224	43,444	4,695,115
Dec-04	1,989,681	748,053	1,076,390	472,939	552,802	200,514	18,275	4,684	42,152	5,105,490
Total	**22,930,205**	**8,482,483**	**12,501,496**	**5,169,575**	**6,572,441**	**2,514,059**	**225,124**	**61,398**	**483,645**	**58,940,427**
Q1	6,296,460	2,197,229	3,192,092	1,194,538	1,588,423	677,785	58,115	17,137	83,391	15,305,173
Q2	5,366,372	2,013,420	3,210,155	1,197,300	1,623,786	623,406	57,359	17,806	151,170	14,260,775
Q3	5,693,175	2,169,127	3,071,169	1,408,090	1,725,745	622,494	54,825	13,394	126,104	14,884,124
Q4	5,574,198	2,102,706	3,028,080	1,369,647	1,634,487	590,374	54,825	13,061	122,979	14,490,357
Annual	22,930,205	8,482,483	12,501,496	5,169,575	6,572,441	2,514,059	225,124	61,398	483,645	58,940,427

2004

2001 PILS Customer Charge	0.1663	0.2042	0.3475	0.1951	3.4609	35.9746	0.0036		
2001 PILS Distribution Rate	0.00016	0.00021	0.0588	0.0582	0.0491	0.0416	0.0390	0.00021	0.00016
2002 PILS Customer Charge	1.8292	2.2460	3.8228	2.1465	38.0704	395.7207	0.0398		
2002 PILS Distribution Rate	0.0017	0.0023	0.6472	0.6399	0.5400	0.4581	0.4290	0.0023	0.0017
2004 Apr PILS Customer Charge	1.6438	1.9218	2.7047	2.5201	61.6519	214.7165	0.0287	0.0000	0.0000
2004 Apr PILS Distribution Rate	0.0021	0.0027	0.6861	0.6720	0.5371	0.4308	0.5479	0.0027	0.0021
2005 Apr PILS Customer Charge	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2005 Apr PILS Distribution Rate	0.0044	0.0033	0.7081	0.6953	0.5749	0.4583	0.7202	0.0033	0.0044

#Customers from Revenue Model

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	RES Water Heaters
Jan-05	592,297	66,464	9,634	1,533	501	47	159,861		
Feb-05	593,094	66,628	9,638	1,546	501	47	159,861		
Mar-05	593,950	66,630	9,640	1,558	504	47	159,861		
Apr-05	593,966	66,556	9,632	1,560	505	47	159,861		
May-05	593,982	66,482	9,623	1,562	506	47	159,861		
Jun-05	594,499	66,668	9,640	1,574	507	47	159,861		
Jul-05	594,652	66,741	9,643	1,590	507	47	159,861		
Aug-05	594,858	66,807	9,645	1,597	509	47	159,861		
Sep-05	595,630	66,885	9,648	1,607	510	47	159,861		
Oct-05	595,500	66,923	9,658	1,609	514	47	159,861		
Nov-05	596,783	67,066	9,675	1,611	515	47	159,861		
Dec-05	597,469	67,147	9,871	1,627	517	47	159,861		

Billing Quantities from Revenue Model

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	RES Water Heaters	Total
	kWh	**kWh**	**kVA**	**kVA**	**kVA**	**kVA**	**kVA**	**kWh**	**kWh**	
Jan-05	500,289,731	235,728,558	1,600,761	731,188	1,003,857	463,308	26,461	3,144,960	16,329,386	
Feb-05	491,697,558	219,438,635	1,382,531	557,043	796,943	370,471	26,461	2,688,448	15,093,899	
Mar-05	471,469,627	226,210,599	1,468,866	655,752	934,272	422,575	26,461	4,322,732	24,104,132	
Apr-05	390,985,692	196,179,619	1,334,505	624,731	911,569	408,845	26,461	4,083,408	26,690,267	
May-05	387,372,123	203,994,028	1,420,779	608,588	927,720	421,315	26,461	4,062,508	24,275,397	
Jun-05	438,349,683	229,473,240	1,627,492	796,952	1,140,654	513,733	26,461	2,879,143	15,216,774	
Jul-05	557,936,588	251,647,796	1,671,915	776,543	1,108,669	482,360	26,461	3,208,911	17,374,484	
Aug-05	556,531,741	237,600,547	1,624,903	721,089	1,030,064	460,846	26,461	2,877,688	15,192,666	
Sep-05	422,768,179	202,959,686	1,434,140	690,431	1,036,966	478,486	26,461	2,895,659	15,215,505	
Oct-05	394,516,090	202,541,098	1,458,631	667,059	1,005,833	433,569	26,461	3,191,450	15,190,467	
Nov-05	398,022,755	205,442,535	1,488,703	661,078	938,697	424,387	26,461	3,276,866	16,261,414	
Dec-05	496,852,098	234,073,275	1,712,173	592,204	963,039	443,886	26,461	2,416,822	16,562,819	
Total	5,506,791,865	2,645,289,616	18,225,400	8,082,657	11,798,284	5,323,781	317,526	39,048,595	217,507,210	

PILS revenue - Customer portion

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS WH	RES WH	Total
Jan-05	973,618	127,731	26,057	3,863	30,888	10,092	4,588			1,176,836
Feb-05	974,928	128,046	26,068	3,896	30,888	10,092	4,588			1,178,505
Mar-05	976,335	128,050	26,073	3,926	31,073	10,092	4,588			1,180,136
Apr-05	-	-	-	-	-	-	-			-
May-05	-	-	-	-	-	-	-			-
Jun-05	-	-	-	-	-	-	-			-
Jul-05	-	-	-	-	-	-	-			-
Aug-05	-	-	-	-	-	-	-			-
Sep-05	-	-	-	-	-	-	-			-
Oct-05	-	-	-	-	-	-	-			-
Nov-05	-	-	-	-	-	-	-			-
Dec-05	-	-	-	-	-	-	-			-

rate change April 1, 2005

PILS revenue - Distribution portion

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS WH	RES WH	Total
Jan-05	1,050,608	636,467	1,098,282	491,358	539,172	199,593	14,498	8,491	34,292	4,072,762
Feb-05	1,032,565	592,484	948,554	374,333	428,038	159,599	14,498	7,259	31,697	3,589,028
Mar-05	990,086	610,769	1,007,789	440,665	501,797	182,045	14,498	11,671	50,619	3,809,940
Apr-05	1,720,827	646,794	944,995	434,396	524,024	187,361	19,057	13,463	117,471	4,608,387
May-05	1,704,923	672,558	1,006,088	423,171	533,308	193,075	19,057	13,394	106,842	4,672,416
Jun-05	1,929,288	756,561	1,152,466	554,146	655,715	235,427	19,057	9,492	66,973	5,379,127
Jul-05	2,455,621	829,670	1,183,923	539,955	637,329	221,050	19,057	10,580	76,470	5,973,653
Aug-05	2,449,438	783,357	1,150,632	501,397	592,142	211,191	19,057	9,488	66,867	5,783,567
Sep-05	1,860,710	669,148	1,015,549	480,079	596,109	219,275	19,057	9,547	66,967	4,936,440
Oct-05	1,736,366	667,767	1,032,891	463,828	578,212	198,691	19,057	10,522	66,857	4,774,191
Nov-05	1,751,799	677,333	1,054,186	459,669	539,618	194,483	19,057	10,804	71,571	4,778,520
Dec-05	2,186,772	771,727	1,212,430	411,778	553,611	203,419	19,057	7,968	72,897	5,439,661

rate change April 1, 2005

PILS revenue

	RES	GS<50	Interval	Interval	1000-5000	>5000	Street Light	GS WH	RES WH	Total
Jan-05	2,024,226	764,198	1,124,340	495,222	570,059	209,685	19,086	8,491	34,292	5,249,598
Feb-05	2,007,493	720,530	974,622	378,229	458,926	169,691	19,086	7,259	31,697	4,767,533
Mar-05	1,966,421	738,818	1,033,862	444,591	532,870	192,137	19,086	11,671	50,619	4,990,076
Apr-05	1,720,827	646,794	944,995	434,396	524,024	187,361	19,057	13,463	117,471	4,608,387
May-05	1,704,923	672,558	1,006,088	423,171	533,308	193,075	19,057	13,394	106,842	4,672,416
Jun-05	1,929,288	756,561	1,152,466	554,146	655,715	235,427	19,057	9,492	66,973	5,379,127
Jul-05	2,455,621	829,670	1,183,923	539,955	637,329	221,050	19,057	10,580	76,470	5,973,653
Aug-05	2,449,438	783,357	1,150,632	501,397	592,142	211,191	19,057	9,488	66,867	5,783,567
Sep-05	1,860,710	669,148	1,015,549	480,079	596,109	219,275	19,057	9,547	66,967	4,936,440
Oct-05	1,736,366	667,767	1,032,891	463,828	578,212	198,691	19,057	10,522	66,857	4,774,191
Nov-05	1,751,799	677,333	1,054,186	459,669	539,618	194,483	19,057	10,804	71,571	4,778,520
Dec-05	2,186,772	771,727	1,212,430	411,778	553,611	203,419	19,057	7,968	72,897	5,439,661
Total	**23,793,884**	**8,698,461**	**12,885,983**	**5,586,461**	**6,771,924**	**2,435,484**	**228,769**	**122,679**	**829,522**	**61,353,168**
Q1	5,998,140	2,223,546	3,132,824	1,318,042	1,561,855	571,512	57,257	27,422	116,608	15,007,207
Q2	5,355,039	2,075,913	3,103,548	1,411,713	1,713,048	615,863	57,171	36,349	291,286	14,659,929
Q3	6,765,768	2,282,174	3,350,103	1,521,431	1,825,580	651,516	57,171	29,614	210,304	16,693,660
Q4	5,674,937	2,116,828	3,299,508	1,335,275	1,671,442	596,593	57,171	29,294	211,325	14,992,372
Annual	23,793,884	8,698,461	12,885,983	5,586,461	6,771,924	2,435,484	228,769	122,679	829,522	61,353,168

rate change April 1, 2005

2001 PILS Customer Charge	0.1663	0.2042	0.3475	0.1951	3.4609	35.9746	0.0036		
2001 PILS Distribution Rate	0.00016	0.00021	0.0588	0.0582	0.0491	0.0416	0.0390	0.00021	0.00016
2002 PILS Customer Charge	1.8292	2.2460	3.8228	2.1465	38.0704	395.7207	0.0398		
2002 PILS Distribution Rate	0.0017	0.0023	0.6472	0.6399	0.5400	0.4581	0.4290	0.0023	0.0017
2004 Apr PILS Customer Charge	1.6438	1.9218	2.7047	2.5201	61.6519	214.7165	0.0287	0.0000	0.0000
2004 Apr PILS Distribution Rate	0.0021	0.0027	0.6861	0.6720	0.5371	0.4308	0.5479	0.0027	0.0021
2005 Apr PILS Customer Charge	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2005 Apr PILS Distribution Rate	0.0044	0.0033	0.7081	0.6953	0.5749	0.4583	0.7202	0.0033	0.0044
2006 May PILS Customer Charge	1.2583	1.6858	2.6833	2.7086	75.2453	289.2999	0.0268	0.0000	0.0000
2006 May PILS Distribution Rate	0.0016	0.0019	0.5233	0.5216	0.4363	0.3724	0.3771	0.0019	0.0016

#Customers from Revenue Model

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	RES Water Heaters
Jan-06	597,795	67,209	9,707	1,642	519	47	159,861		
Feb-06	598,290	67,183	9,705	1,653	504	46	159,861		
Mar-06	598,190	67,145	9,675	1,683	517	47	159,861		
Apr-06	597,720	67,108	9,686	1,689	519	47	159,861		
May-06									
Jun-06									
Jul-06									
Aug-06									
Sep-06									
Oct-06									
Nov-06									
Dec-06									

Billing Quantities from Revenue Model

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS Water Heaters	RES Water Heaters	Total
	kWh	**kWh**	**kVA**	**kVA**	**kVA**	**kVA**	**kVA**	**kWh**	**kWh**	
Jan-06	479,784,500	218,525,281	1,468,545	704,776	958,660	429,453	26,461	3,160,136	15,586,241	
Feb-06	476,564,855	218,888,076	1,392,607	565,441	790,611	357,731	26,461	2,834,445	15,093,445	
Mar-06	459,670,582	222,192,714	1,386,889	675,317	944,107	426,931	26,461	4,235,650	21,064,204	
Apr-06	375,372,183	191,857,594	1,347,412	605,283	888,114	383,357	26,461	3,740,504	19,553,180	
May-06										
Jun-06										
Jul-06										
Aug-06										
Sep-06										
Oct-06										
Nov-06										
Dec-06										

PILS revenue - Customer portion

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS WH	RES WH	Total
Jan-06	-	-	-	-	-	-	-			-
Feb-06	-	-	-	-	-	-	-			-
Mar-06	-	-	-	-	-	-	-			-
Apr-06	-	-	-	-	-	-	-			-
May-06	-	-	-	-	-	-	-			-
Jun-06	-	-	-	-	-	-	-			-
Jul-06	-	-	-	-	-	-	-			-
Aug-06	-	-	-	-	-	-	-			-
Sep-06	-	-	-	-	-	-	-			-
Oct-06	-	-	-	-	-	-	-			-
Nov-06	-	-	-	-	-	-	-			-
Dec-06	-	-	-	-	-	-	-			-

rate change May 1, 2006

PILS revenue - Distribution portion

	RES	GS<50	50-1000 Non-Interval	50-1000 Interval	1000-5000	>5000	Street Light	GS WH	RES WH	Total
Jan-06	2,111,653	720,467	1,039,912	490,053	551,094	196,804	19,057	10,419	68,599	5,208,059
Feb-06	2,097,483	721,663	986,138	393,169	454,490	163,937	19,057	9,345	66,430	4,911,712
Mar-06	2,023,127	732,558	982,089	469,569	542,729	195,649	19,057	13,965	92,709	5,071,451
Apr-06	1,652,108	632,545	954,135	420,873	510,540	175,680	19,057	12,332	86,059	4,463,329
May-06	-	-	-	-	-	-	-	-	-	-
Jun-06	-	-	-	-	-	-	-	-	-	-
Jul-06	-	-	-	-	-	-	-	-	-	-
Aug-06	-	-	-	-	-	-	-	-	-	-
Sep-06	-	-	-	-	-	-	-	-	-	-
Oct-06	-	-	-	-	-	-	-	-	-	-
Nov-06	-	-	-	-	-	-	-	-	-	-
Dec-06	-	-	-	-	-	-	-	-	-	-

rate change May 1, 2006

PILS revenue

	RES	GS<50	Interval	Interval	1000-5000	>5000	Street Light	GS WH	RES WH	Total
Jan-06	2,111,653	720,467	1,039,912	490,053	551,094	196,804	19,057	10,419	68,599	5,208,059
Feb-06	2,097,483	721,663	986,138	393,169	454,490	163,937	19,057	9,345	66,430	4,911,712
Mar-06	2,023,127	732,558	982,089	469,569	542,729	195,649	19,057	13,965	92,709	5,071,451
Apr-06	1,652,108	632,545	954,135	420,873	510,540	175,680	19,057	12,332	86,059	4,463,329
May-06	-	-	-	-	-	-	-	-	-	-
Jun-06	-	-	-	-	-	-	-	-	-	-
Jul-06	-	-	-	-	-	-	-	-	-	-
Aug-06	-	-	-	-	-	-	-	-	-	-
Sep-06	-	-	-	-	-	-	-	-	-	-
Oct-06	-	-	-	-	-	-	-	-	-	-
Nov-06	-	-	-	-	-	-	-	-	-	-
Dec-06	-	-	-	-	-	-	-	-	-	-
Total	**7,884,372**	**2,807,232**	**3,962,274**	**1,773,665**	**2,058,853**	**732,070**	**76,228**	**46,061**	**313,797**	**19,654,550**
Q1	6,232,263	2,174,687	3,008,139	1,352,792	1,548,313	556,390	57,171	33,729	227,738	15,191,222
Q2	1,652,108	632,545	954,135	420,873	510,540	175,680	19,057	12,332	86,059	4,463,329
Q3	-	-	-	-	-	-	-	-	-	-
Q4	-	-	-	-	-	-	-	-	-	-
Annual	7,884,372	2,807,232	3,962,274	1,773,665	2,058,853	732,070	76,228	46,061	313,797	19,654,550

rate change May 1, 2006

that includes

$46.9M PILS per year
or $3.9M average per month

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT2.7:

Reference(s):

Advise whether meter multiplier problem at Ellesmere during 2002 to 2004 is a result of 2004 year looking so much lower than the year before it and the year after.

RESPONSE:

The 2004 PILs revenue is lower than the 2003 or 2005 PILs revenue as a result of lower actual billing units in 2004, due primarily to weather factors. The referenced Ellesmere meter multiplier issue is not related.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT2.8:

Reference(s):

To confirm the reasons behind the tax-back adjustment in 2002 related to obsolete inventory write-offs.

RESPONSE:

THESL has verified the circumstances of the adjustment made in 2002 in respect of inventory obsolescence. As a result of an income tax audit in 2002, an addition to taxable income in the amount of $1,529,753 was made. Subsection 10(1) of the Income Tax Act (Canada) (the “Act”) allows a taxpayer to write down inventory whose value at year end has declined below its cost. Paragraph 12(1)(r) of the Act requires any allowance for inventory obsolescence to be included in a taxpayer’s taxable income. The methodology used by THESL to determine the inventory obsolescence reserve was to review inventory line items and apply an estimated reserve percentage. The determination of inventory obsolescence was not based on how quickly inventory turned over, but rather based on the decline in value due to changes in standards. In 2002, the Ministry of Finance took the position that $1,529,753 represented a general reserve in respect of inventory obsolescence, and added it to taxable income. Note, that the adjustment did not relate to 2001 pre and post taxable periods but rather to an adjustment for a general reserve in respect of inventory obsolescence. Given that the adjustment was in respect of a reserve and it was greater than materiality as calculated, it was included as a true-up item.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT2.9:

Reference(s): Tab 6E, Schedule 11-16

To provide calculations of forecasted capital in-service, and not in-service for 2012 and 2013 in VECC #16.

RESPONSE:

Below are the in-service and not in-service amounts for the 2012 and 2013 projects:

	2012 Cost Estimates ($M)						
	2012 Forecast	Actual Q1 2012 In-Service	Actual Q2 2012 In-Service	Forecast Q3 2012 In-Service	Forecast Q4 2012 In-Service	2012 CWIP Additions (In-Service)	2012 CWIP Additions (Not In-Service)
Total	**283.00**	**10.01**	**14.81**	**31.24**	**60.25**	**116.31**	**166.69**
Percentage In-Service Additions						**41%**	

	2013 Cost Estimates ($M)		
	2013 Budget	2013 CWIP Additions (In-Service)	2013 CWIP Additions (Not In-Service)
Total	**579.09**	**283.76**	**295.33**
Percentage In-Service Additions		**49%**	

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT2.10:

Reference(s): **Updated Evidence Tab 2, Addendum Pages 13/14, Tables 1&2**
Updated Evidence Tab 4, Schedule A, Appendix1, Page 1
Summary of Capital Program
Updated IRR Tab 6E, Schedule 11-16, Parts a), b)

Provide notional rate base calculations for 2012, 2013, and carry-over opening balance for 2014 on the same basis as shown in VECC #16(a) and (b), as requested in Energy Probe TCQ #1, parts (b) and (c).

RESPONSE:

In order to provide the most clear basis for its answer, THESL has responded to the entirety of Energy Probe TCQ #1 below.

a) **Energy Probe TCQ#1a): Please provide in tabular form the current forecast of 2012 YTD and forecast and 2013 forecast CAPEX by major category per the first reference.**

THESL does not have a more up-to-date spending forecast of capex than that provided in Tab 4, Schedule A, Appendix1. However, the revised table provided below includes an increase to the 2012 capex as a result of a correction for an understatement of ICM Engineering Capital. This understatement was caused by a calculation error which utilized a lower allocation rate for Engineering Capital to the ICM projects. Engineering Capital represents fixed labour costs directly associated with design, planning and construction of capital projects, and the application of this correction more accurately reflects the total cost of the ICM projects. The corrected

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forecast of the updated evidence, originally provided in Tab 4, Schedule A, Appendix1, page 1 of the Summary of Capital Program, is presented below:

			2012 Cost Estimates ($M)	2013 Cost Estimates ($M)
Schedule Number	**Projects**	**Segments**	**2012 Forecast**	**2013 Budget**
B1	Underground Infrastructure and Cable	Underground Infrastructure	28.75	58.94
B2		Paper Insulated Lead Covered Cable - Piece Outs and Leakers	0.08	5.42
B3		Handwell Replacement	13.65	16.65
B4	Overhead Infrastructure and Equipment	Overhead Infrastructure	9.07	55.88
B5		Box Construction	0.58	23.04
B6		Rear Lot Construction	16.36	29.43
B7		Polymer SMD-20 Switches	-	1.53
B8		SCADA-Mate R1 Switches	-	1.43
B9	Network Infrastructure and Equipment	Network Vault & Roofs	2.84	18.76
B10		Fibertop Network Units	1.48	7.71
B11		Automatic Transfer Switches (ATS) & Reverse Power Breakers (RPB)	-	3.26
B12	Station Infrastructure and Equipment	Stations Power Transformers	0.38	3.48
B13.1 & 13.2		Stations Switchgear - Muncipal and Transformer Stations	1.73	21.81
B14		Stations Circuit Breakers	0.76	0.55
B15		Stations Control & Communicaton Systems	0.14	1.00
B16		Downtown Station Load Transfers	0.68	2.14
B17	Bremner TS	Bremner Transformer Station	8.50	81.00
B18	Hydro One Capital Contributions	Hydro One Capital Contributions	22.98	48.12
B19	Feeder Automation	Feeder Automation	2.30	20.66
B20	Metering	Metering	4.74	8.40
B21	Plant Relocations	Externally-Initiated Plant Relocations and Expansions	10.16	24.84
B22	Grid Solutions	Grid Solutions	-	-
BXX	Engineering Capital	ICM Understatement of Capitalized Labour	8.32	-
C1	Operations Portfolio Capital		120.51	121.63
C2	Information Technology Capital		22.00	15.00
C3	Fleet Capital		0.80	2.00
C4	Buildings and Facilities Capital		5.00	5.00
	Allowance for Funds Used During Construction		1.20	1.40
Total			**283.00**	**579.09**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

b) Energy Probe TCQ#1b) - Please provide a schedule based on Reference 2 that shows, for each category of capital cost, the forecast amount of In- Service Additions (ISAs -additions to Notional Rate Base) by quarter for 2012 YTD and estimate, 2013 including carryover into 2014.

	2012 Cost Estimates ($M)								
	2012 Forecast	Actual Q1 2012 In-Service	Actual Q2 2012 In-Service	Forecast Q3 2012 In-Service	Forecast Q4 2012 In-Service	2012 CWIP Additions (In-Service)	2012 CWIP Additions (Not In-Service)	Forecast 2013 In-Service for 2012 Carryforward	Forecast 2014 In-Service for 2012 Carryforward
Total	283.00	10.01	14.81	31.24	60.25	116.31	166.69	140.59	26.10
Percentage In-Service Additions						41%		50%	9%

	2013 Cost Estimates ($M)			
	2013 Budget	2013 CWIP Additions (In-Service)	2013 CWIP Additions (Not In-Service)	Forecast 2014 In-Service for 2013 Carryforward
Total	579.09	283.76	295.33	295.33
Percentage In-Service Additions		49%		51%

c) Energy Probe TCQ#1 c) - Please provide the calculation of the notional rate base (opening and closing) associated with the projects for 2012, 2013 and 2014 (using 2011 approved RB as the base).

The notional Rate Base calculation is provided in the table. Please note the following assumptions:

- no consideration was given to 2011 end of year CWIP in-service for 2012 and 2013

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- working capital allowance was increased year over year at 0.068% from the approved 2011 working capital allowance

Notional Rate Base - based on In-Service Additions

	2011 Approved	**NFA Continuity (excl CWIP)**	**2012P**	**2013P**
	1,897	Opening balance	2,105.1	2,084.7
	-	*Energization of CapEx, 2012*	*116.3*	*140.6*
	-	*Energization of CapEx, 2013*	-	*283.8*
►	349	Energized	116.3	424.4
►	(142)	Amortized	(136.7)	(136.0)
►	2,105.1	Ending balance	2,084.7	2,373.1
	2,001	Average balance	2,095	2,229

	2011 Approved	**Rate Base Continuity - Projection**	**2012P**	**2013P**
	2,001	Average NFA balance	2,095	2,229
►	297	Working capital allowance	► 299	► 301
►	2,298	Rate Base	2,394	2,530

d) Energy Probe TCQ#1 d) - Please reconcile the response to parts a)-c) to the In Service capital forecasted in the second reference –VECC-16.

Please find below the requested reconciliation of parts a) – c) as it relates to IR VECC #16 (Tab 6E, Schedule 11-16):

Source Reference	**2012 Capital Program**			**2013 Capital Program**		
	Column	**$ value**		**Column**	**$ value**	
As per Part a)	2012 Cost Estimate ($M)	283.00	**(A)**	2013 Cost Estimate ($M)	579.09	**(B)**
As per Part b)	2012 Forecast	283.00		2013 Budget	579.09	
Difference		-			-	
As per Part b)	2012 CWIP Additions (In-Service)	116.31	**(X)**	2013 CWIP Additions (In-Service)	283.76	**(Y)**
As per Part c)	Enerization of CapEx, 2012 in 2012P	116.31		Enerization of CapEx, 2013 in 2013P	283.76	
Difference		-			-	
As per Tab 6E Schedule 11-16	2012 Forecasted Capital In-Service (%)	41%		2013 Forecasted Capital In-Service (%)	49%	
As per above	**= (A) / (X)**	41%		**= (B) / (Y)**	49%	
Difference		*0%*			*0%*	

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT2.11:

Reference(s):	**Updated IRR Tab 6C, Schedule 7-4, Page 2**
	Updated Evidence Tab 2, Addendum Pages 13/14, Tables 1 & 2
	Updated/Corrected Tab 2, Appendix 3, Comparative Revenue Requirements Analysis
	Updated IRR Tab 6E, Schedule 11-16, Parts a), b)

Provide answer to EP TCQ 12:

There are two proposed methodologies to estimate the Revenue Requirements related to the ICM, termed by THESL Standard and Alternative. This TCQ confirms the differences and requests a second alternative based on forecast In Service Additions for 2012 and 2013.

a) Confirm the forecast CAPEX spend is still the current amount for 2012 and 2013.

b) Reconcile the CAPEX amounts shown in the first reference with Tab 2 Addendum Pages 13/14 Tables 1&2.

c) Assume that In-Service Additions (ISAs) by year are as shown in VECC-16 and recast the Table in reference #1 with amended additions (line 3) including approved actual 2011 and forecast carryover into 2014.

d) Please provide a MS Word or PDF Version of the Notes to Tab 2 Appendix 3.

e) Please provide a calculation of the 2011-2013 Revenue Requirements using the methodology in the third reference BUT using the latest forecast of CAPEX and ISAs provided in the references and responses to parts a)-c).

f) Please provide chart(s) showing the CAPEX, ISAs, notional Rate Base (average) and Revenue Requirements from 2011-2013.

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g) Please provide the Rate Base and Revenue Requirement impact of a delay of $10 million in scheduled ISAs for 2013.

RESPONSE:

a) Please refer to JT2.10 part a).

b) The difference shown in the first reference and Tab 2 Addendum pages 13 and 14 Tables 1 and 2 are disposals (2012 - $0.2M and 2013 - $0.5M). The first reference is presented as net capex, while the second reference is gross capex.

c) Please see the table below:

	2011 Approved	*2011 Actual*	*2012 (YTD) Actual*	*2012 Forecast*	*2013 Forecast*
CAPEX	*$ 378.8*	$ 445.5	$ 152.5	$ 283.0	$ 579.1
GROSS FIXED ASSETS					
Opening Balance	*$ 4,183.6*	$ 4,179.7	$ 4,607.8	$ 4,607.8	$ 4,724.1
Additions	*$ 348.9*	$ 439.1	$ 120.8	$ 116.3	$ 424.4
Disposals	*$ -*	$ (11.1)	$ (6.2)	$ -	$ -
Closing Balance	*$ 4,532.5*	$ 4,607.8	$ 4,722.3	$ 4,724.1	$ 5,148.4
ACCUMULATED DEPRECIATION					
Opening Balance	*$ (2,285.7)*	$ (2,283.9)	$ (2,424.2)	$ (2,424.2)	$ (2,560.9)
Accumulated Depreciation	*$ (141.6)*	$ (148.6)	$ (93.0)	$ (136.7)	$ (136.0)
Disposals	*$ -*	$ 8.3	$ 5.7	$ -	$ -
Closing Balance	*$ (2,427.4)*	$ (2,424.2)	$ (2,511.5)	$ (2,560.9)	$ (2,696.9)
NET FIXED ASSETS OPENING BALANCE	*$ 1,897.8*	$ 1,895.8	$ 2,183.5	$ 2,183.5	$ 2,163.2
NET FIXED ASSETS CLOSING BALANCE	*$ 2,105.1*	$ 2,183.5	$ 2,210.9	$ 2,163.2	$ 2,451.5
Average NFA	*$ 2,001.4*	*$ 2,039.7*	*$ 2,197.2*	*$ 2,173.3*	*$ 2,307.3*
Working Capital Allowance	*$ 296.7*	*$ 313.6*	*n/a*	*$ 326.2*	*$ 348.5*
Rate Base	*$ 2,298.2*	*$ 2,353.2*	*n/a*	*$ 2,499.5*	*$ 2,655.8*

d) Please see attached table in Appendix A to this Schedule.

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e) Please see attached Appendix B to this Schedule, based on Appendix 3 of the Manager's Summary, which calculates an approximate Revenue Requirement for the proposed 2012 and 2013 incremental ICM capital using Energy Probe's requested use of in-service additions instead of capex amounts. The 2011 Revenue Requirement is not relevant to these calculations.

f) Please see the table below:

	2012 ($M)	2013 ($M)	Sources
CAPEX	283.0	579.1	JT2.10.a
Forecast ISA Capex	116.3	283.8	Tab 6E, Schedule 11-16
Notional Rate Base	2,394.0	2,530.0	JT2.10.c
Incremental Revenue Requirement	2.1	23.7	JT2.11.e

g) A delay of $10 million of scheduled in-service additions in 2013 would reduce incremental rate base by $10 million, with an approximate reduction in 2013 revenue requirement of $1 million (based on the assumption that only in service additions get added to rate base, and an approximate 10% revenue requirement to rate base additions estimate).

Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7
Schedule 2-11
Appendix A
Filed: 2012 Nov 27
(1 page)

Notes to Revised Appendix 3 to Managers Summary

THESL has revised Appendix 3 to the Managers Summary to improve the clarity and accuracy of the analysis of the comparative revenue requirements produced by both the Standard Approach and the Alternate Approach, at various levels of approved capital expenditures above the respective Thresholds under each approach. In summary, the revised analysis calculates the respective revenue requirements under each Approach to determine at what levels of capital expenditure the revenue requirements are equal, and what the differential revenue requirements are at arbitrarily lower and higher levels of capital expenditure. The revised analysis shows that the requirements are equal when the combined capital expenditures for 2012 and 2013 are $228.2 million under the Standard Approach excluding Deadband capital, and $283.7 million including Deadband capital under the Alternate Approach.

At levels of Standard Approach CAPEX less than $228.2 million for 2012 and 2013 combined, the effect of the exclusion of Deadband CAPEX outweighs the effect of applying the half year rule to the 2012 and 2013 CAPEX under the Alternate Approach, and the Standard Approach produces a lower revenue requirement. Conversely, at higher levels of CAPEX, the opposite result occurs, with the Standard Approach producing a higher revenue requirement. At an arbitrarily selected level of $400 million of Standard Approach CAPEX for 2012 and 2013 combined, the Standard Approach revenue requirement is $8.1 million higher. The CAPEX levels under each Approach are always different by the Deadband amount of $27.8 million per year.

The revenue requirements derived in the revised analysis are indicative and are based on certain assumptions which may differ from an exact calculation performed when all relevant information is available. These assumptions include:

a) A depreciation rate of 3%.
b) A capital-related revenue requirement attraction percentage of 10%.
c) Constant figures for the Deadband amount and the respective Thresholds under each approach. These will vary in 2013 and 2014 depending on then-current values of parameters involved in the Threshold calculation.
d) CAPEX being equally divided between 2012 and 2013.
e) Year end incremental ratebase resulting from both 2012 and 2013 CAPEX being recognized for rate setting purposes in subsequent years.

The derivation of the foregone revenue due to the exclusion of the Deadband CAPEX is marginally revised to reflect greater precision in the Deadband amount and straight line depreciation.

ICM Revenue Requirement Estimate
(based on methodology from Managers Summary Appendix 3)
Energy Probe In-Service Additions Scenario
($ millions)

REVENUE REQUIREMENT CALCULATED USING STANDARD APPROACH	**2012**	**2013**	**2014**	**Total**	**Notes**
2012 In-Service Additions					
Opening Incremental Ratebase	0.0	20.9	20.3		
Above-Threshold In-Service Additions in 2012	21.6				2012 non-ICM capex (149.3M) plus 2012 ICM ISA (45.2M) less Threshold value (172.9M)
Depreciation @ 3%	0.6	0.6	0.6		
Closing Incremental Ratebase	20.9	20.3	19.6		
Average Incremental Ratebase	21.2	20.6	19.9		
Revenue Requirement on Average Incremental Ratebase @ 10% - 2012 ISA	2.124	2.059	1.994	6.177	
2013 In-Service Additions					
Opening Incremental Ratebase		0.0	213.4		
Above-Threshold In-Service Additions in 2013		220.0	239.5		For 2013, 2013 non-ICM capex (144.5M) plus 2013 ICM ISA (194.6M) plus 2012 ICM amounts in-service in 2013 (53.9M) less Threshold (172.9M) For 2014, 2013 ICM amounts in service in 2014 (239.5M)
Depreciation @ 3%		6.6	13.6		
Closing Incremental Ratebase		213.4	439.3		
Average Incremental Ratebase		216.7	326.3		Average ratebase in 2014 reflects half year treatment of 2013 ICM amounts in service in 2014
Revenue Requirement on Average Incremental Ratebase @ 10% - 2013 ISA		21.671	32.634	54.306	
TOTAL REVENUE REQUIREMENT CALCULATED USING STANDARD APPROACH				**60.482**	
REVENUE REQUIREMENT CALCULATED USING ALTERNATE APPROACH					
Deadband CAPEX	27.763				
2012 In-Service Additions					
Opening Incremental Ratebase	0.000	48.582	47.103		
Above-Threshold In-Service Additions in 2012	49.322				
Average Above-Threshold In-Service Additions in 2012	24.661				
Depreciation @ 3%	0.740	1.480	1.480		
Closing Incremental Ratebase	48.582	47.103	45.623		
Average Incremental Ratebase	24.291	47.842	46.363		
Revenue Requirement on Average Incremental Ratebase @ 10% - 2012 ISA	2.429	4.784	4.636	11.850	
2013 CAPEX					
Opening Incremental Ratebase		0.000	244.059		
Above-Threshold In-Service Additions in 2013		247.775	239.452		
Average Above-Threshold In-Service Additions in 2013		123.888	241.755		
Depreciation @ 3%		3.717	14.6		
Closing Incremental Ratebase		244.059	468.9		
Average Incremental Ratebase		122.029	356.497		
Revenue Requirement on Average Incremental Ratebase @ 10% - 2013 ISA		12.203	35.650	47.853	
TOTAL REVENUE REQUIREMENT CALCULATED USING ALTERNATE APPROACH				**59.702**	

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT2.12:

Reference(s):	**Managers Summary Updated and Corrected Tab 2, Page 13, Table 1**
	Updated Tab 4, Schedules E1.1-1.4 and E2.1-2.4
	Updated IRR Tab 6L, Schedule 7-56 and Appendix A
	Updated IRR Tab 6H, Schedule 11-115, Appendices A-D
	For part d) – EP TCQ 12

Provide answer to EP TCQ 13:

a) For 2012 and 2013 Confirm and summarize in tabular form the following:
   i) The ICM threshold
   ii) The actual YTD and Forecast 2012 CAPEX and ISA amounts.
   iii) The 2013 forecast CAPEX and ISA amounts
   iv) The Revenue Requirement increment associated with the IRM Formula

b) Starting with the estimated Revenue Requirements for the Standard and Alternative methods per the first Reference Table 1, please provide details of the derivation of the 2012 and 2013 rate adders for each class. Reconcile to the Tab 3 Rate Schedules.

c) Please provide a Summary Table that shows by class the amounts collected by the ICM Rate Adders for 2012-2013:
   i) Using the Standard Approach
   ii) Using the Alternative Approach

d) Please provide a version using CAPEX and ISAs provided in response to Energy Probe TCQ # 12.

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RESPONSE:

a) Please see table below:

	2012 ($M)	2013 ($M)	Sources
ICM Threshold	172.989	172.989	Tab 4, E1.2 and E2.1, page 10
2012 YTD (Aug) Capex	149.3	n/a	Tab 2, Addendum, Table 1, page 13
Forecast Capex	283.0	579.1	Tab 7, Schedule 2-10
2012 YTD ISA Capex (as at Q2 2012)	24.82	n/a	
Forecast ISA Capex	116.3	283.76	Tab 7, Schedule 2-10
Rev Req increment associated with IRM forumla	3.5	3.6	

Notes:
1. ICM Threshold for 2012 and 2013 based on current ICM threshold parameters
2. Rev Req increment associated with IRM forumla based on 2011 Board approved Rev Req X 0.68% for 2012, and further 0.68% for 2013

b) The derivation of the 2012 and 2013 Rate Adders based on the Standard Model and Alternative models are provided in the following exhibits:

- 2012 Rate Adders – Standard Method: Tab 4, Schedule E1.1, page 13, Schedule E1.3, and Schedule E1.4
- 2013 Rate Adders – Standard Method: Tab 4, Schedule E2.1, page 13, and Schedule E2.3
- 2012 Rate Adders – Alternative Method: Tab 6H, Schedule 11-115, Appendix A, Tab F1.1, and Appendix C (Excel versions)
- 2013 Rate Adders – Alternative Method: Tab 6H, Schedule 11-115, Appendix D, Tab F1.1, and Appendix F (Excel versions)

To maintain the consistency with Table 1 in the pre-filed evidence, the 2012 rate adders shown in the updated Table 1 do not reflect THESL’s updated proposal to collect the incremental revenue requirement associated with the 2012 ICM spending

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
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over the two-year period May 2013-Apr 2015.

The rate adders derived based on the Standard Method and reflecting THESL's updated proposal related to 2012 ICM rate adders in the above referenced schedules are the rates shown in exhibit Tab 3, Schedule B2 (updated October 31, 2012) Tariff of Rates and Charges.

c) and d)

Please see table below. For derivation of the Revenue Requirement using Energy Probe's in-service capital methodology, see response to JT2.11(e).

Amounts to be collected by ICM rate adders
(implemented for 24 months, effective May 1, 2013)

	Standard Approach ($M)	Alternative Approach ($M)	EP Alternative Approach ($M)
Residential	42.6	37.1	23.4
Competitive Sector Multi-Unit Residential	1.6	1.4	0.9
GS<50 kW	14.0	12.2	7.7
GS 50-999 kW	32.6	28.3	17.9
GS 1000-4999 kW	10.7	9.3	5.9
LU	5.3	4.6	2.9
Streetlighting	2.5	2.1	1.4
Unmetered Scattered Load	0.8	0.7	0.4
Total	110.0	95.6	60.5

Assumptions

1. Revenue calculated based on 2011 Board Approved Billing Units

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT2.13:

Reference(s): **Updated Tab 4 Schedules E1.1-1.4 and E2.1-2.4**
IRR Tab 6G, Schedule 7-53

Provide answer to EP TCQ 14:

a) Using the estimated annual and total amounts to be collected from each class due to the ICM rate adders under each approach (Standard, Alternative 1 (THESL) and Alternative 2 (ISA per Energy Probe), please estimate for each method, the “true up” related to Account 1508, that will required for each class at the time of the next COS proceeding.

b) Please provide notes on all assumptions (especially about 2014) and supporting calculations. Reconcile the notional Rate Base amounts to those shown in the response to Updated Tab 6C, Schedule 7-4 (Energy Probe 4).

RESPONSE:

(a) and (b)

The true-up that will be required at the time of the next COS proceeding will be dependent on the amount collected through the approved rate adders, and the revenue requirements calculated based on actual capital spending over the ICM period, which are necessarily unknown at this time. However, based on THESL’s response to JT2.12c and d, if THESL were to assume that the true-up mechanism were to calculate the revenue requirements based on in-service capital as per Energy Probe, that actual capital spend and energization matched that proposed by THESL and that rate adders were determined using the OEB’s standard methodology, the true-up amount would be approximately the difference between $110M and $60.5M, or $49.5M. With the same assumptions but

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INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

assuming rate adders were determined using THESL's alternative approach, the approximate true-up amount would be the difference between $95.6M and $60.5M, or $35.1M.

It is THESL's desire that amounts – positive or negative – for true-up are minimized at the time of rebasing, which is one of the reasons THESL has proposed the Alternate method of deriving the proposed rate adders.

As stated in the Addendum to the Managers summary (page 5), THESL is committed to implementing the true-up mechanism the OEB approves in an efficient and cooperative manner, and is receptive to working with OEB staff and intervenors to develop a detailed proposal in this regard.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 6 – CONSUMERS COUNCIL OF CANADA

UNDERTAKING NO. JT2.14:

Reference(s):

Provide "as filed" capital numbers for 2006-2011, in format of CCC #9 (with exception of year(s) in which as no request was filed).

RESPONSE:

THESL is not able to present the capital expenditures for 2006 and 2007 in the requested format because it did not track capital costs in the same manner as that presented in CCC#9. The 2008 to 2011 "as filed" capital numbers are presented in the below table.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 6 – CONSUMERS COUNCIL OF CANADA

	2008 Filed	2009 Filed	2010 Filed	2011 Filed
OPERATIONAL INVESTMENTS				
Grid System Investments				
Underground System	75.9	81.8	106.6	112.4
Overhead System	17.3	18.9	22.0	46.8
Network System	4.5	6.2	5.7	15.1
Stations	17.4	17.1	22.7	22.5
Total Grid System Investments	**115.2**	**124.0**	**157.0**	**196.8**
Reactive Work	15.6	15.5	22.5	22.2
Customer Connections	36.4	37.4	32.5	41.8
Customer Capital Contribution	(19.6)	(19.6)	(24.4)	(16.7)
Externally Initiated Plant Relocations			27.8	12.2
Capital Contributions to HONI				15.0
Engineering Capital	26.4	27.1	31.2	39.4
AFUDC	3.3	3.9	4.4	6.6
Other	5.9	8.8	2.8	2.7
Total Distribution Plant Capital	**183.0**	**197.1**	**253.8**	**320.0**
CORPORATE OPERATIONAL INVESTMENTS				
Fleet &Equipment Services	8.8	8.2	11.4	13.3
Facilities	25.3	17.8	12.6	13.2
Other	0.4	0.1	4.4	2.7
Total Corporate Operational Investments	**34.5**	**26.1**	**28.4**	**29.2**
CUSTOMER SERVICES				
Wholesale Metering	13.0	16.5	10.9	4.9
Smart Metering	36.2	34.6	2.4	12.6
Suite Metering				2.6
Other			0.6	0.5
Total CUSTOMER SERVICES	**49.2**	**51.1**	**13.9**	**20.6**
Total INFORMATION TECHNOLOGY	**27.7**	**27.2**	**33.3**	**32.8**
Total OPERATIONAL INVESTMENTS	**294.4**	**301.5**	**329.4**	**402.6**
CRITICAL ISSUES				
Standardization	-	-	32.7	4.7
Downtown Contingency	-	-	31.3	5.4
FESI / WPF	-	-	5.5	10.9
Smart Grid Operations			3.0	1.3
Stations System Enhancements	-	-	15.2	33.1
Secondary Upgrade	-	-	6.5	10.0
Energy Storage				30.0
Total CRITICAL ISSUES	**-**	**-**	**94.2**	**95.4**
TOTAL CAPITAL	**294.4**	**301.5**	**423.6**	**498.0**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

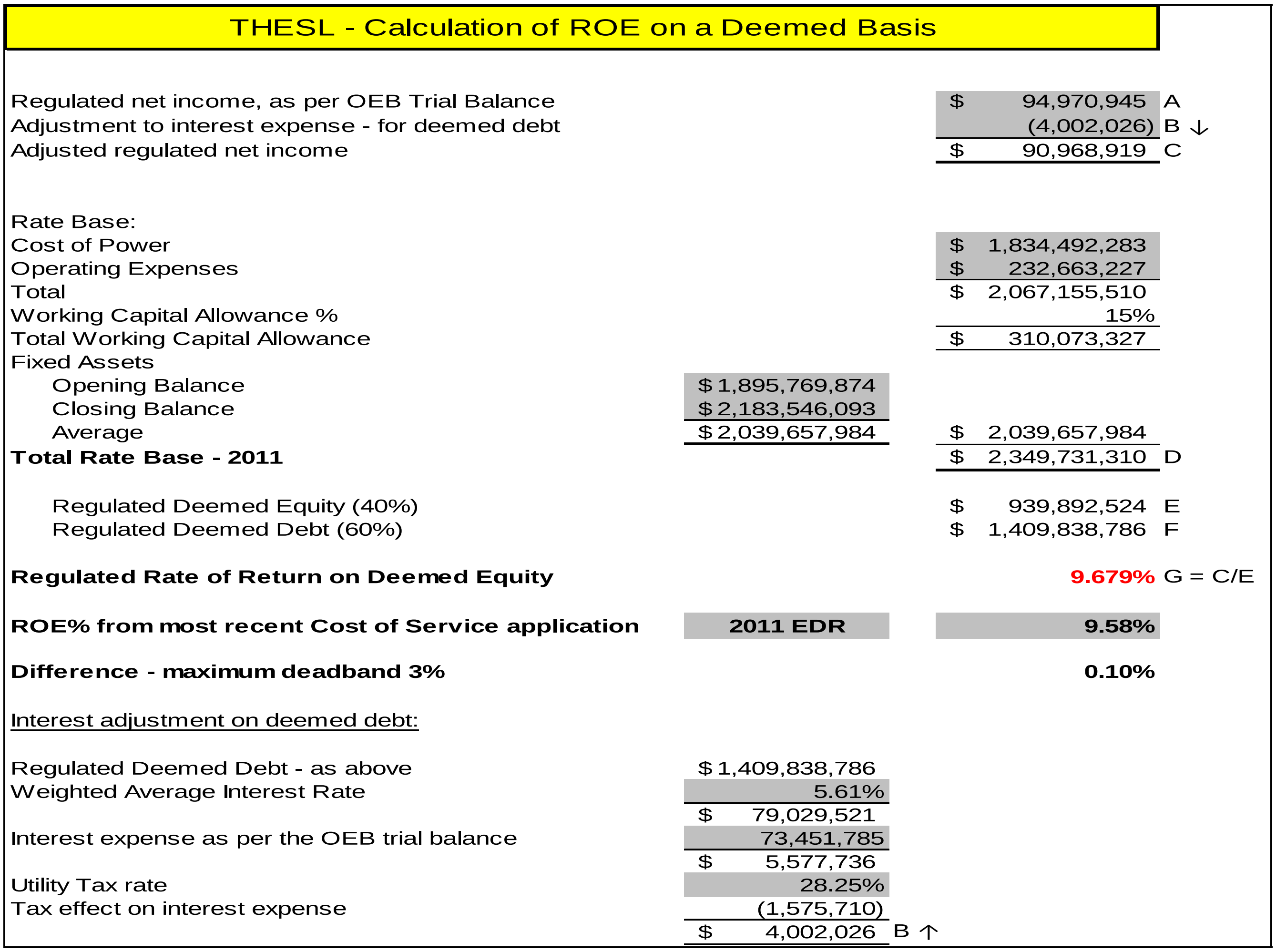
UNDERTAKING NO. JT2.15:

Reference(s): **Tab 6C, Schedule 7-10 (EP #10)**
Tab 6C, Schedule 7-6 (EP #6)
Tab 6L, Schedule 6-29 (CCC #29)

Provide a schedule that sets out the determination of THESL's actual 2011 ROE on a deemed basis using the prescribed approach in Appendix 5 of the Board's April 2012 RRR filing requirements.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

RESPONSE:



THESL - Calculation of ROE on a Deemed Basis

Regulated net income, as per OEB Trial Balance		$ 94,970,945	A
Adjustment to interest expense - for deemed debt		(4,002,026)	B ↓
Adjusted regulated net income		$ 90,968,919	C
Rate Base:			
Cost of Power		$ 1,834,492,283	
Operating Expenses		$ 232,663,227	
Total		$ 2,067,155,510	
Working Capital Allowance %		15%	
Total Working Capital Allowance		$ 310,073,327	
Fixed Assets			
Opening Balance	$ 1,895,769,874		
Closing Balance	$ 2,183,546,093		
Average	$ 2,039,657,984	$ 2,039,657,984	
Total Rate Base - 2011		$ 2,349,731,310	D
Regulated Deemed Equity (40%)		$ 939,892,524	E
Regulated Deemed Debt (60%)		$ 1,409,838,786	F
Regulated Rate of Return on Deemed Equity		**9.679%**	G = C/E
ROE% from most recent Cost of Service application	**2011 EDR**	**9.58%**	
Difference - maximum deadband 3%		**0.10%**	
Interest adjustment on deemed debt:			
Regulated Deemed Debt - as above	$ 1,409,838,786		
Weighted Average Interest Rate	5.61%		
	$ 79,029,521		
Interest expense as per the OEB trial balance	73,451,785		
	$ 5,577,736		
Utility Tax rate	28.25%		
Tax effect on interest expense	(1,575,710)		
	$ 4,002,026	B ↑	

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT2.16:

Reference(s): **Tab 6C, Schedule 7-10 (EP #10)**
Tab 6C, Schedule 7-6 (EP #6)
Tab 6L, Schedule 6-29 (CCC #29)

a) Make best efforts to calculate 2012 and 2013 forecast ROE using the prescribed approach in Appendix 5 of the Board's April 2012 RRR filing requirements, providing a clear description of assumptions made in respect of inputs.

b) To advise assumptions used to come up with the 8.77 percent in terms of revenues, net income, equity debt, rate base, et cetera.

RESPONSE:

a) The calculation of the 2012 and 2013 forecast ROE using the prescribed approach in Appendix 5 of the Board’s April 2012 RRR filing requirements is shown below:

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

THESL - Proforma calculation of ROE on a Deemed Basis (2012)

Regulated net income		$ 91,415,073	A
Adjustment to interest expense - for deemed debt		(4,412,845)	B ↓
Adjusted regulated net income		$ 87,002,227	C
Rate Base:			
Total Working Capital Allowance (as per EP04)		$ 326,200,000	
Fixed Assets			
Opening Balance	$ 2,183,546,093		
Closing Balance	$ 2,310,696,093		
Average	$ 2,247,121,093	$ 2,247,121,093	
Total Rate Base - 2012 (as per EP04)		$ 2,573,321,093	D
Regulated Deemed Equity (40%)		$ 1,029,328,437	E
Regulated Deemed Debt (60%)		$ 1,543,992,656	F
Regulated Rate of Return on Deemed Equity		**8.452%**	G = C/E
ROE% from most recent Cost of Service application	**2011 EDR**	**9.580%**	
Difference - maximum deadband 3%		**-1.128%**	
Interest adjustment on deemed debt:			
Regulated Deemed Debt - as above	$ 1,543,992,656		
Weighted Average Interest Rate	5.16%		
	$ 79,628,052		
Interest expense	73,624,181		
	$ 6,003,871		
Utility Tax rate	26.50%		
Tax effect on interest expense	(1,591,026)		
	$ 4,412,845 B ↑		

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

THESL - Proforma calculation of ROE on a Deemed Basis (2013)

Regulated net income		$ 113,834,877	A
Adjustment to interest expense - for deemed debt		(8,493,333)	B ↓
Adjusted regulated net income		$ 105,341,543	C
Rate Base:			
Total Working Capital Allowance (as per EP04)		$ 348,500,000	
Fixed Assets			
Opening Balance	$ 2,310,696,093		
Closing Balance	$ 2,732,756,093		
Average	$ 2,521,726,093	$ 2,521,726,093	
Total Rate Base - 2013 (as per EP04)		$ 2,870,226,093	D
Regulated Deemed Equity (40%)		$ 1,148,090,437	E
Regulated Deemed Debt (60%)		$ 1,722,135,656	F
Regulated Rate of Return on Deemed Equity		**9.175%**	G = C/E
ROE% from most recent Cost of Service application	**2011 EDR**	**9.580%**	
Difference - maximum deadband 3%		**-0.405%**	

Interest adjustment on deemed debt:

Regulated Deemed Debt - as above	$ 1,722,135,656	
Weighted Average Interest Rate	4.86%	
	$ 83,658,588	
Interest expense	72,103,033	
	$ 11,555,555	
Utility Tax rate	26.50%	
Tax effect on interest expense	(3,062,222)	
	$ 8,493,333	B ↑

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

b) The ROE calculated at 8.77% was based on a USGAAP financial statement basis and determined using the forecasted net income of consolidated THESL for 2012 of $91.7M as the numerator. The average of the closing shareholder’s equity in the Audited 2011 THESL financial statements of $986.0M and the forecasted 2012 closing shareholder’s equity of $1,106.1M was used as the denominator.

To arrive at the consolidated THESL $91.6M forecasted net income for 2012, $2,923.3M revenue, $2,348.4M cost of power, $239.1M operating expenses, $139.4M depreciation, $74.8M net interest expense, $3.6M income tax and $26.4M other expenses were assumed.

As the ROE was calculated on a financial statement basis, no consideration was given as to rate base values. However, property, plant and equipment and intangible assets of $2,447.3M, and $2,643.6M were used in 2011 and 2012 respectively, which was included in the calculation of shareholder’s equity.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 11 – VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT2.17:

Reference(s): **Tab 6C, Schedule 11-8 (VECC #8) and Schedule 11-9 (VECC #9) 6**

a) Advise how actual capital spending for 2011 that was energized and in-service as of the end of 2011 compares with the approved capital for in-service for 2011, based on THESL’s last rate decision from the OEB.

b) Advise what the approved 2011 depreciation would have been associated with the above I/S additions, based on the half-year rule?

RESPONSE:

a) The in-service capital for 2011 spend is not explicitly approved. Based on the original 2011 filing (EB-2010-0142), 46% of 2011 spending was estimated to be in-service by the end of 2011. Therefore, it is estimated that $172.7M of the approved 2011 capital spending would be in-service at the end of 2011. Actual spending for 2011 that was energized and in-service as of the end of 2011 was $270.0M.

b) The estimated 2011 depreciation associated with the approved in-service additions is $3.0M.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 2 – ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT2.18:

Reference(s): **Tab 6F, 2-6**

Provide revised percentage of labour costs for 2012 and 2013.

RESPONSE:

The summary below presents revised labour costs for 2012 and 2013. As noted in response to JT2.10 (Tab 7, Schedule 2-28), these values are based on a corrected version of the Summary of Capital which accounts for an understatement of ICM capitalized labour.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 2 – ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

Summary of Capital Program

			Cost Estimates ($M)				
Schedule Number	**Projects**	**Segments**	**2012 Forecast**	**2012 Labour**	**2013 Budget**	**2013 Labour**	**Total**
B1	Underground Infrastructure and Cable	Underground Infrastructure	28.75	5.48	58.94	14.47	87.70
B2		Paper Insulated Lead Covered Cable - Piece Outs and Leakers	0.08	0.06	5.42	3.64	5.50
B3		Handwell Replacement	13.65	1.88	16.65	2.29	30.30
B4	Overhead Infrastructure and Equipment	Overhead Infrastructure	9.07	4.71	55.88	28.20	64.95
B5		Box Construction	0.58	0.31	23.04	11.27	23.62
B6		Rear Lot Construction	16.36	5.08	29.43	9.92	45.78
B7		Polymer SMD-20 Switches	-	-	1.53	1.29	1.53
B8		SCADA-Mate R1 Switches	-	-	1.43	0.15	1.43
B9	Network Infrastructure and Equipment	Network Vault & Roofs	2.84	0.79	18.76	5.81	21.60
B10		Fibertop Network Units	1.48	0.39	7.71	1.91	9.19
B11		Automatic Transfer Switches (ATS) & Reverse Power Breakers (RPB)	-	-	3.26	1.24	3.26
B12	Station Infrastructure and Equipment	Stations Power Transformers	0.38	0.12	3.48	0.95	3.86
B13.1 & 13.2		Stations Switchgear - Muncipal and Transformer Stations	1.73	0.73	21.81	5.77	23.54
B14		Stations Circuit Breakers	0.76	0.32	0.55	0.18	1.31
B15		Stations Control & Communicaton Systems	0.14	0.06	1.00	0.34	1.14
B16		Downtown Station Load Transfers	0.68	0.38	2.14	0.98	2.82
B17	Bremner TS	Bremner Transformer Station	8.50	-	81.00	-	89.50
B18	Hydro One Capital Contributions	Hydro One Capital Contributions	22.98	-	48.12	-	71.10
B19	Feeder Automation	Feeder Automation	2.30	0.66	20.66	5.89	22.97
B20	Metering	Metering	4.74	2.00	8.40	2.58	13.14
B21	Plant Relocations	Externally-Initiated Plant Relocations and Expansions	10.16	3.58	24.84	5.04	35.00
B22	Grid Solutions	Grid Solutions					-
B2X	Engineering Capital	ICM Understatement of Capitalized Labour	8.32	8.32	-	-	8.32
C1	Operations Portfolio Capital		120.51	45.62	121.63	45.35	242.14
C2	Information Technology Capital		22.00	7.52	15.00	5.12	37.00
C3	Fleet Capital		0.80	0.04	2.00	0.04	2.80
C4	Buildings and Facilities Capital		5.00	0.36	5.00	0.36	10.00
	Allowance for Funds Used During Construction		1.20	-	1.40	-	2.60
Total			**283.00**	**88.39**	**579.09**	**152.80**	**862.09**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE INTERVENOR 2 – ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT2.19:

Reference(s): Tab 6F, 2-6

Provide breakdown for 2012 and 2013 amounts of the $366.74M total amount from THESL's response to part h of AMPCO #6.

RESPONSE:

The $366.74M dollar value provided in the initial response was THESL's 2012 to 2014 capital spending that does not pertain to work including replacement.

The capital spending over 2012 to 2013 (as updated on October 31) that does not pertain to work including replacement is $298.55M, of which $87.24M is in 2012 and $211.31M is in 2013.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 10 – SCHOOL ENERGY COALITION

UNDERTAKING NO. JT2.20:

Reference(s):

On best efforts basis, provide the revenue requirement impact of using the full year for CCA.

RESPONSE:

Applying a full year of CCA in the calculation of 2011 Board-Approved revenue requirement would reduce the PILs requirement to $0. As the 2011 Board-Approved PILs amount was $11.8M, the impact on Revenue Requirement would be a reduction of $11.8M. THESL notes that the calculation of CCA in an EDR application ignoring the half year rule is inconsistent with the guidance provided in Chapter 7 of the Electricity Distribution Rate Handbook.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 10 – SCHOOL ENERGY COALITION

UNDERTAKING NO. JT2.21:

Reference(s):

Provide a detailed calculation of the impact of inclusion of CWIP in the ICM for each of the test years or 2012, 2013. Alternatively, identify prior EP undertakings in which the same information is provided.

RESPONSE:

Please refer to the response to TC Undertaking JT2.12 part c) and d) provided at Tab 7, Schedule 2-12.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 10 – SCHOOL ENERGY COALITION

UNDERTAKING NO. JT2.22:

Reference(s): EP 57

At the reference, provide a net income and ROE calculation for each column, including all details in those calculations.

RESPONSE:

Please see attached Appendix A.

($M)	2011 Board Approved	2011 Actual	2012	2013	Assumptions for 2012-13
Base Revenue Requirement	522.0	532.5	535.7	579.1	
Revenue Offsets	26.0	24.3	26.2	26.4	Applies PCI to 2011 Board Approved Revenue Offsets
Service Revenue Requirement	548.1	556.7	561.9	605.5	
OM&A Expenses	238.0	235.8	239.6	241.3	Applies PCI to 2011 Board Approved OM&A
Depreciation Expense	138.8	146.4	142.9	156.3	Applies PCI to 2011 Board Approved Depreciation, plus depreciation related to ICM amounts
Income Tax Expense	11.8	9.0	12.0	12.2	Applies PCI to 2011 Board Approved Income Tax expense, plus income tax expense related to ICM amounts
Cost of Capital	159.4	165.5	167.4	195.8	Applies PCI to 2011 Board Approved Return on Ratebase, plus return on Ratebase related to ICM amounts
Capital Expenditures	378.8	445.5	274.7	579.1	Total Capex as filed. See updated Tab 4, Schedule A, Appendix 1 for summary.
Net Income	88.1	93.8	92.4	108.1	Applies PCI to 2011 Board Approved Net Income, plus return on equity related to ICM amounts
Return on Equity	9.58%	9.975%	9.58%	9.58%	Same as 2011 Board Approved, as per ICM requirements

Notes:
- assumes PCI of 0.68% each year
- ICM incremental Depreciation, PILS and Return on Rate Base from updated Tab 4, Schedules E1.1, and E2.1, page 12
- 2011 Actual ROE and Net Income as per JT2.15

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 1 – ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT2.23:

Reference(s): Tab 4, Schedule C1, Table1

To provide breakdown of items in Table 1 into material and labour (or provide missing materials component to AMPCO #6).

RESPONSE:

The requested breakdown is provided below:

	2012 ($M)				
Project Name	**Labour**	**Catalogued Materials**	**Equipment & Direct Purchases**	**Contributions**	**Total**
Engineering Capital	9.50	-	-	-	9.50
Worst Performing Feeders	1.12	1.67	2.10	-	4.90
Customer Connections (net of Customer Contributions	11.79	9.89	20.40	(17.10)	24.98
Reactive Capital	9.53	13.39	2.49	-	25.40
Continuing Projects and Emerging Issues Portfolio	13.68	10.62	31.43	-	55.73
Total	**45.62**	**35.58**	**56.42**	**(17.10)**	**120.51**

	2013 ($M)				
Project Name	**Labour**	**Catalogued Materials**	**Equipment & Direct Purchases**	**Contributions**	**Total**
Engineering Capital	9.50	-	-	-	9.50
Worst Performing Feeders	1.25	1.86	2.34	-	5.44
Customer Connections (net of Customer Contributions	13.80	11.58	23.87	(11.86)	37.39
Reactive Capital	10.99	15.44	2.87	-	29.30
Continuing Projects and Emerging Issues Portfolio	9.82	7.63	22.56	-	40.00
Total	**45.35**	**36.50**	**51.64**	**(11.86)**	**121.63**

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT2.24 (originally taken under advisement):

Reference(s): Tab 6F, Schedule 1-12

To confirm what communications THESL's contractors make with customers as a job starts.

RESPONSE:

THESL provides communication to customers throughout the lifecycle (design, construction, and restoration) of all projects. This would include rear-lot conversion, overhead, underground, and handwell projects. Customers in a rear-lot conversion project area could receive up to nine different pieces of communications via direct mail which would include the samples provided in Appendix A. Other forms of communications may include updates on the PowerUp Toronto microsite, telephone and/or email correspondence, face-to-face meetings, news releases through the corporate communications team, and advertisements. THESL also provides frequent updates to City Councillors whose wards may be impacted by a project. These would include email, letter, phone call updates, as well as face-to-face meetings. If appropriate, THESL may also host a community meeting that provides an overview of the project as well as an opportunity for further customer engagement.

If a project is designed and constructed by a THESL contractor, the contractor is responsible for distribution of the "Day Before Notice" during civil construction, for notifying customers of outages by distributing the "Outage Notification" during electrical construction, and for distribution of the "Sod Pamphlet" during restoration. Samples of each are provided in Appendices B, C, and D, respectively.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 7 – ENERGY PROBE RESEARCH FOUNDATION

When THESL stopped work in January 2012, three waves of communication were sent out via direct mail to affected customers. The first wave was sent to approximately 20,000 customers in April to advise that the capital job in their neighbourhood was on hold, and comprised a “PowerUP Update Letter” as shown in Appendix E. Between April and July, some of the jobs were resumed, affecting 5,000 customers who in the second wave received a “Project Start-Up Letter” as shown in Appendix F. A third wave of letters, similar to the “PowerUP Update Letter”, was issued in July to the remaining 15,000 customers informing them that their job was still on hold.

Customer Communications

Creative Collateral (Current Examples)	Timing/Issuer	Key Messaging	Logos, Letterheads and Contact Info
	**INTRODUCTION POSTCARD** **Once the project has been assigned** **Issued by Toronto Hydro via courier**	**This introduces the project to the customer, gives them general information to let them know we will be there in the future**	Power Up Logo Letterhead for Toronto Hydro Power Up Team Contact Information (Rationale: This is a standard postcard and cannot reflect who the contractor will be)
	**SPECIALTY LETTER** **Required to obtain permit, sent after design approved and just prior to permit application** **Issued by Toronto Hydro via Canada Post**	**Provides Customers with project-specific information detailing the impact to their property. Sent to all customers receiving "hydro furniture"**	Power Up Logo Letterhead by Toronto Hydro Contact is Toronto Hydro only (Rationale: Customer concerns & expectation must be managed by Toronto Hydro)
 	**GENERAL NOTIFICATION LETTER (Safety Insert)** **Can be sent same time as the specialty letter, or after permit received** **Issued by Toronto Hydro via courier**	**Provides customers with project-specific information, indicating the duration of the project, streets affected, ward, and contact information for further detail.** **Can include specific introduction to contractor**	Power Up Logo Letterhead by Toronto Hydro Can include Contractor Logo Power Up Team Contact Information (Rationale: Construction has not yet started, therefore customer issues should be managed Toronto Hydro)
	**CONSTRUCTION POSTCARD** **Sent out a week prior to the construction** **Issued by Toronto Hydro via courier**	**Provides customers with an overview of the civil construction. Advises customers that crews will return for the electrical portion of the project once the civil work is complete.**	Power Up Logo Letterhead for Toronto Hydro Power Up Team Contact Information (Rationale: This is a standard postcard and cannot reflect who the contractor will be)
ℹ	**DAY BEFORE NOTICE** **Send out on the day before or day of construction start** **Issued by Contractor via Crews**	**Introduces the customer to the contractor that will be working in their neighbourhood and provides contact information**	**Contractor Logo & Letterhead** **Includes Power Up logo** **Contractor Crew Contact Info** **Contractor Office Contact Info**
	**OUTAGE NOTIFICATION** **Issued 48 – 24 hr prior to outage** **Option A – Issued by Contractor via crews** **Option B – Issued by Toronto Hydro via courier**	**Advises customers of power outages specific to the project within their neighbourhood.**	Option A – Smaller Outage Contractor Logo & Letterhead Contractor Contact Info Option B – Larger Outage Toronto Hydro Logo & Letterhead Toronto Hydro Contact Info *Contractor may send additional notice as defined in Option A
	**COMPLETION/RESTORATION LETTER** **Send out after the project has been deemed "attained"** **Issued by Toronto Hydro via Courier**	**Thanks customers for their continued patience and sets expectation for what happens next with respect to restoration**	Power Up Logo Letterhead by Toronto Hydro Can include Contractor Logo Power Up Team Contact Information Can Include Crew Contact Info (Rationale: Contractor have presence in neighbourhood and often calls relate to restoration)
	**SOD PAMPHLET** **Left at property when the restoration has been completed** **Issued by contractor via crew**	**Sod/Driveway Postcard Insert provides customers with tips on caring for their new driveway and/or sod.**	Power Up Logo Letterhead by Toronto Hydro Can include Contractor Logo Power Up Team Contact Information Can Include Crew Contact Info **NOTE: PLAN TO INCLUDE A SPACE FOR CONTRACTOR STAMP OR STICKER**

Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7
Schedule 2-24
Appendix B
Filed: 2012 Nov 27
(1 page)

Month, Day, Year

Dear Valued Customer:

IMPORTANT NOTICE: Hydro Construction in your Area

This notification is to inform you that our organization, Contractor Name on behalf of Toronto Hydro-Electric System Limited (Toronto Hydro) is in the process of upgrading the electrical system on your street to improve the level of reliable service to you and your neighbours on **Insert road here.**

Our construction personnel will be in front of your home within the next few days to upgrade the system in front of or adjacent to your property. Entry into your home is not required. Prior to working in front of your home **we may have** taken photos or video of the public road allowance.. If you have any questions or concerns, please call the construction representative as indicated below. Alternatively, you can contact our main office at **Office phone number.**

Contractor Representative: ____________________

Cell Number: ________________________________

Once construction begins, we will take extra care and precaution to minimize inconveniences. The portion of the driveway and other areas affected by our work will be replaced to pre-construction conditions. Upon project completion, repair work will be competed as season, weather and schedule permits. Toronto Hydro inspector, **SNC Lavalin** will be on site on a regular basis.

We kindly ask that you notify us of any buried private service lines such as irrigation systems and natural gas lines for barbeques. To learn more about this investment in your neighbourhood visit www.poweruptoronto.ca. For all other inquiries, please call Toronto Hydro at 416-542-3366 or email capitalprojects@torontohydro.com .

Sincerely,

TORONTO HYDRO

Contractor Details

Important Notice

powerUp

A power interruption is planned for your neighbourhood

NOTICE TO CUSTOMERS: PLANNED POWER OUTAGE

Toronto Hydro-Electric System Limited (Toronto Hydro) is in the process of replacing the electrical system on your street to help improve the level of reliable service to you and your neighbours.

Location: Ridge Hill Drive

Project Name: Forest Hill Phase 4 Electrical Conversion

Date: Saturday November 24, 2012

Alternate/ Rain Date: Sunday, November 24, 2012

Time: Between 9am – 1pm

Duration of Interruption: 3 – 4 Hours

Reason for Power Interruption: Transferring from the old power supply to the new upgraded power supply

Contact: Joe Smith, Customer Operations Representative,
Contact Phone: 416-542-3366

Other Notes: For the purpose of installing, removing, maintaining, operating or changing transformers and associated equipment, please provide unimpeded and safe access to Toronto Hydro at all times by exercising caution around construction areas. If you have electric garage door openers, and require your vehicle during this period, please arrange to have it removed prior to the outage.

Other unforeseen circumstances may also change the above interruption plans. If this occurs, Toronto Hydro will endeavor to provide reasonable notice. Should power not be restored after the above noted time period, please call 416-542-8000.

PREPARATION CONSTRUCTION RESTORATION

For further information on the powerUp initiative please visit:

poweruptoronto.ca

Contact **capitalprojects@torontohydro.com** or call the powerUp line at **416.542.3366** to speak to a Customer Operations Representative directly.

TORONTO HYDRO

Toronto Hydro-Electric System Limited
EB-2012-0064
Tab 7
Schedule 2-24
Appendix D
Filed: 2012 Nov 27
(2 pages)

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Tips on caring for your NEW SOD

DO

- ✓ Water sod daily for the first week and then on alternate days after 7-10 days
- ✓ Water sod on a regular basis with enough water to keep the lawn from drying out
- ✓ Balance is key, not too much and not too little
- ✓ Cut the lawn once grass has reached 3-4 inches (8-10 cm)
- ✓ Ensure mower is sharp for a nice clean cut
- ✓ Be careful when using gas powered mowers to prevent pulling turf off the ground

DO NOT

- ✗ Walk on the lawn for the first several weeks
- ✗ Water the lawn in the middle of a hot, sunny day (to prevent it from burning or drying out)
- ✗ Water the lawn at night (due to enhanced fungus growth)
- ✗ Cut off more than half the height of the grass blades, ideal height is 1.5-2.5 inches (4-6 cm)
- ✗ Let grass grow too long

TORONTO
HYDRO

Call Before You DIG....

Before starting any work in the yard, or around your house, call us for the location of underground power lines, especially if you're planning to use auguring or trenching equipment.

Our service locators will confirm and mark Toronto Hydro-Electric System owned underground electrical cables.

CONTACT INFORMATION

All Toronto Hydro-Electric System Limited customers living in the former Toronto (downtown), East York, North York (East of Yonge Street), Scarborough, Etobicoke and York districts please call Ontario One Call at **1.800.400.2255** or **on1call.com**

Customers living in the former North York area West of Yonge Street can call Toronto Hydro at **416.542.3344**.

To contact the Forestry Department call **416.542.7800**.

TORONTO HYDRO

Toronto Hydro-Electric System Limited
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Toronto, Ontario M5B 1K5

Telephone: (416) 542-3100

www.torontohydro.com

TORONTO HYDRO

Spring 2012

Re: PowerUP PROJECT UPDATE

Dear Valued Customer:

Our regulator, the Ontario Energy Board (OEB), recently issued a decision that reduced Toronto Hydro's capital budget. This decision may affect you as Toronto Hydro has put some of its projects on hold while it prepares a new application to the OEB for renewed funding.

During this time, we have asked our crews and construction contractors to stop work and make **all** job sites safe while we complete the regulatory process.

Customers will be notified by mail and further updates will be posted on our website, as information becomes available.

Additional information on Toronto Hydro's regulatory changes can be found at torontohydro.com/learnmore. For a current project list, please visit our website at poweruptoronto.ca.

For all other inquiries, please email Toronto Hydro's Customer Operations team at capitalprojects@torontohydro.com or call 416-542-3366. If you are inquiring about a specific project, please reference the project name and street address.

Thank you in advance for your co-operation and understanding.

Sincerely,

Customer Operations Team

RELIABILITY REPORT

Toronto's electricity distribution system delivers power to approximately 705,000 customers and serves several million people who live and work in the city every day. It's an interconnected network made up of overhead and underground electrical equipment.

In 2008, Toronto Hydro began to execute an Ontario Energy Board approved 10-year grid renewal plan under the brand PowerUp. The Ontario Energy Board approved rate increases to fund capital investments over three successive hearings, most recently in 2011. The system is aging and needs investment in order to help it remain reliable and keep pace with growth.

Much of the system was built between the 1940s and 1970s, and in certain neighbourhoods, service reliability has been gradually worsening due to failures in aging equipment. Approximately 40 per cent of outages are a result of equipment failures and aging underground cable.

In some suburban communities, underground "direct buried cable" was installed in the '70s, and is now approximately 40-years old. We estimate that problems with this cable account for about half of our outages in the underground system. To improve service, it is necessary to replace approximately 900 kilometres (km) of underground cable over the next decade.

Significant investments are needed across our distribution system over the coming decades.

Toronto's electricity system is aging and it shows:

- Today, approximately 29 per cent of Toronto Hydro's assets are beyond their useful life, and a further 20 per cent (approximately) of the plant will reach this state over the next 10 years. The asset replacement cost is in the range of $13.5 billion.

- In 2011, more than 130,000 residents experience at least one power outage every six weeks for an average duration of 50 minutes.

- Toronto is one of the fastest growing cities in North America. With close to 200 new sky-scrapers being built in 2012[1] and with the City's population projected to grow to 3 million[2], Toronto Hydro needs to upgrade the distribution system to keep pace with demand.

Toronto Hydro Talks about our grid, our workforce, our productivity and more at torontohydro.com/learnmore

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[1] The Economist (http://www.economist.com/node/21546057)

[2] Ontario Population Projections (http://www.fin.gov.on.ca/en/economy/demographics/projections/)

Important Notice

We're upgrading electrical service in your neighbourhood

powerUp

May 15, 2012

To our valued customer:

IMPORTANT UPDATE: Overhead Construction - Project Willowdale Phase 2A (E11645)

We are pleased to advise you that your project is restarting following a review of our capital program. The overhead construction for Project Willowdale Phase 2A restarted in **early May 2012 with an extended completion date of late July 2012**.

The project involves replacing selected poles, transformers and overhead conductors in order to help increase service reliability. The boundaries include Holmes Avenue (North), Estelle Avenue (East), Church Avenue (South), and Kenneth Avenue (West).

Throughout the project, power interruptions may be necessary to switch from the old to the new electrical system. Toronto Hydro will provide you with advance notice prior to any planned outages.

Toronto Hydro crews will take extra care and precaution to minimize inconveniences. Upon project completion, affected areas will be restored to pre-construction conditions.

We appreciate your cooperation and ask that you exercise caution around construction areas. For further information on **Project Willowdale Phase 2A (E11645)** and the PowerUp initiative, please reference the contact information below. We look forward to working with you.

Sincerely,

Paul Reesor
Customer Operations

**PROJECT
Willowdale
Phase 2A**

Ward

23 / Willowdale

Activity

Overhead Rebuild

Timeline

May to July 2012

PREPARATION CONSTRUCTION RESTORATION

For further information on the powerUp initiative please visit:

poweruptoronto.ca

Contact **capitalprojects@torontohydro.com** or call the powerUp line at **416.542.3366** to speak to a Customer Operations Representative directly.

TORONTO HYDRO

TECHNICAL CONFERENCE UNDERTAKING RESPONSE
INTERVENOR 10 – SCHOOL ENERGY COALITION

UNDERTAKING NO. JT2.25 (originally taken under advisement):

Reference(s): Tab 4, Schedule 3, Page 1

Provide the number of cube vans replaced in the years 2007 to 2011, and the aggregate cost of those replacements for each year.

RESPONSE:

The number of cube vans replaced over 2007 through 2011 is provided below:

Year	Cube Vans Replaced	Replacement Aggregate Cost
2007	4	$400,000 est.
2008	0	$0
2009	3	$293,801
2010	0	$0
2011	6	$648,932