INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

INTERROGATORY 1:

Reference(s): **Exhibit B1 Tab 14 Schedule1**

a) Please provide a Schedule with THESL's actual reliability indices for the period 2006 to 2008 (SAIDI, SAIFI and CAIDI, with and without LoS and MEDs.)

b) Provide an analysis and assessment of trends in reliability.

c) Indicate which parts of the system has the worst reliability, by providing the 2006-2008 relevant SAIDI and CI indices for Transformers, underground and overhead. Discuss the result.

RESPONSE:

a)

Service Reliability Indicators Performance Measures (with Loss of Supply but including Major Event Days)	2006	2007	2008
	Actual	Actual	Actual
SAIDI (number of hours of interruption per customer)	1.57	1.95	1.24
SAIFI (number of interruptions per customer)	2.17	2.28	1.76
CAIDI (number of hours per interruption)	0.72	0.86	0.70

Service Reliability Indicators Performance Measures (with Loss of Supply but excluding Major Event Days)	2006	2007	2008
	Actual	Actual	Actual
SAIDI (number of hours of interruption per customer)	1.24	1.35	1.24
SAIFI (number of interruptions per customer)	2.06	2.01	1.76
CAIDI (number of hours per interruption)	0.60	0.67	0.70

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

Service Reliability Indicators Performance Measures (without Loss of Supply but including Major Event Days)	2006	2007	2008
	Actual	Actual	Actual
SAIDI (number of hours of interruption per customer)	1.38	1.85	1.21
SAIFI (number of interruptions per customer)	1.91	2.04	1.66
CAIDI (number of hours per interruption)	0.72	0.91	0.73

Service Reliability Indicators Performance Measures (without Loss of Supply but excluding Major Event Days)	2006	2007	2008
	Actual	Actual	Actual
SAIDI (number of hours of interruption per customer)	1.17	1.25	1.21
SAIFI (number of interruptions per customer)	1.84	1.77	1.66
CAIDI (number of hours per interruption)	0.64	0.71	0.73

b) Table 1 below shows the SAIDI and SAIFI contribution by different cause codes and the past five-year trend. This is also shown graphically in Figures 1 and 2 below.

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

Table 1: SAIDI and SAIFI trends excluding Major Event Days ("MEDs")

Cause Codes	SAIFI		SAIDI	
	2008%	Trend (2004 – 2008)	2008%	Trend (2004 – 2008)
Adverse Environment	1%	Upward	5%	Upward
Adverse Weather	7%	Upward	9%	Upward
Defective Equipment	48%	Upward	52%	Upward
Foreign Interference	10%	Upward	9%	Downward
Human Element	2%	Upward	1%	Downward
Lightning	4%	Upward	7%	Upward
Loss of Supply	6%	Upward	2%	Downward
Scheduled Outage	2%	Downward	3%	Downward
Tree Contacts	8%	Upward	10%	Upward
Unknown	11%	Downward	2%	Downward

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

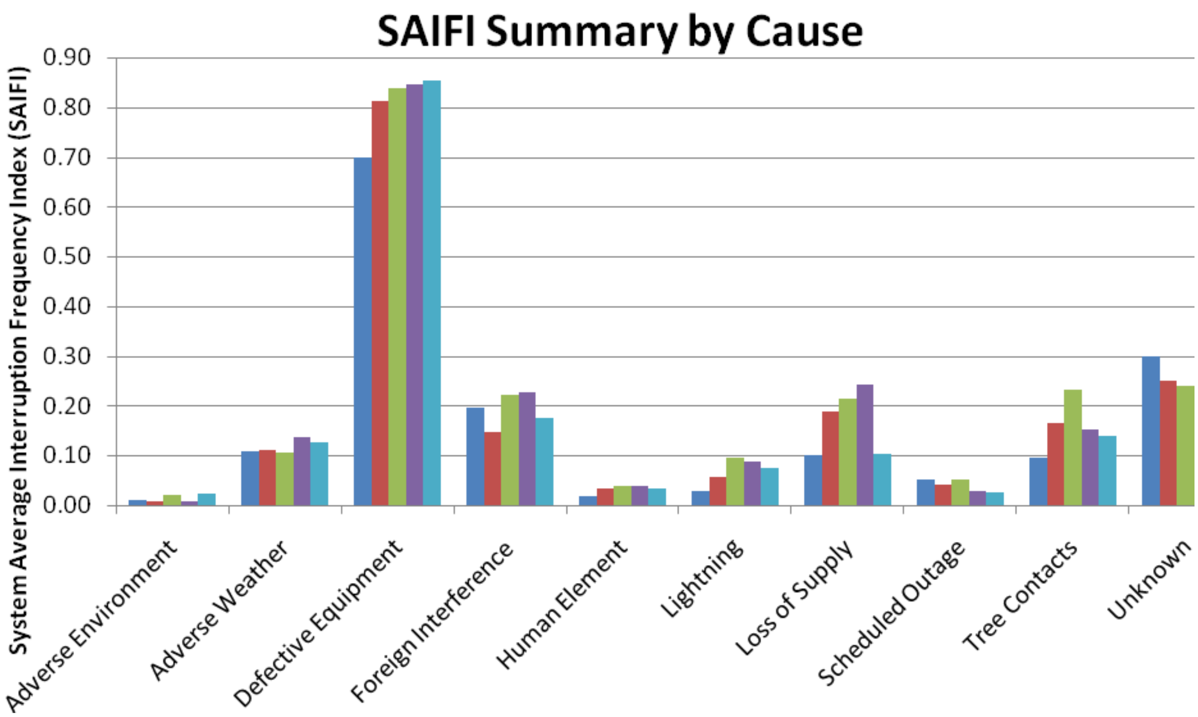

Figure 1: SAIFI Summary by Cause

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

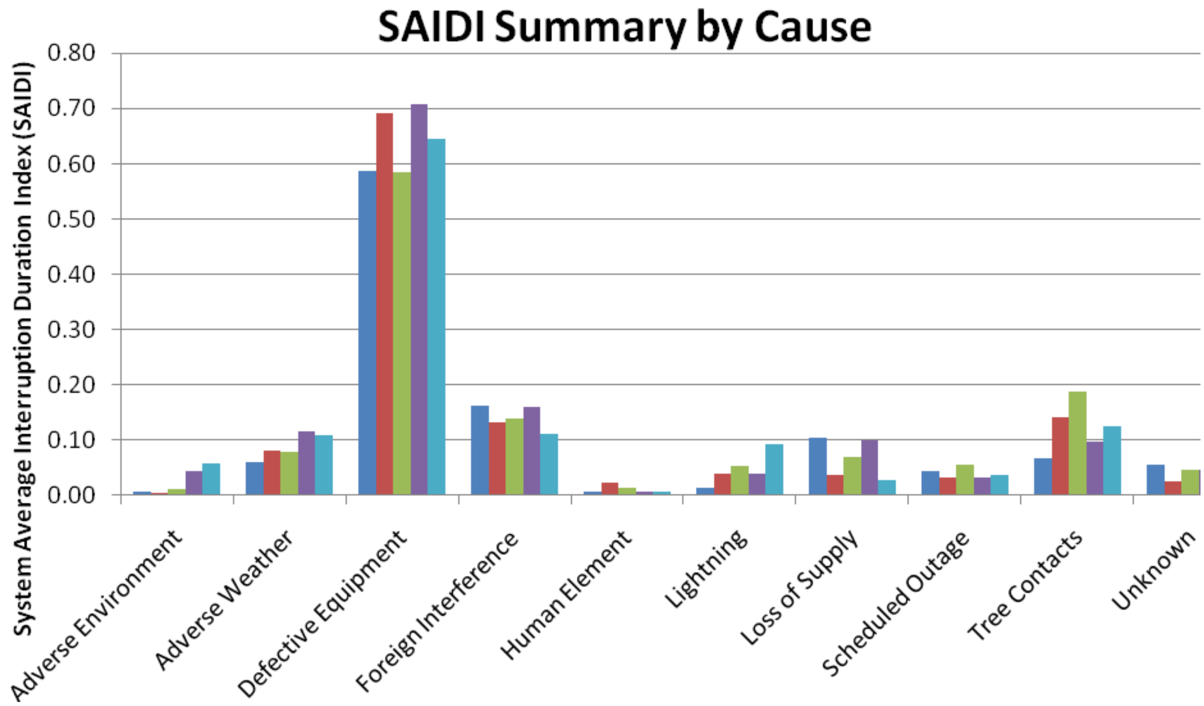

Figure 2: SAIDI Summary by Cause

Defective equipment has the largest contribution to both SAIDI and SAIFI. In overhead system switches, insulators and lightning arresters were the largest contributors to both SAIFI and SAIDI. In underground system direct buried cable, switches and transformers are significant contributors to both SAIFI and SAIDI.

c) SAIDI and CI indices due to defective equipment in the three systems – Overhead, Underground and Stations (transformer stations) are shown in Table 2 and Table 3 below:

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

Table 2. SAIDI excluding Major Event Days

SAIDI (hours)	2006	2007	2008
Overhead	0.15	0.20	0.20
Transformer Stations	0.02	0.07	0.02
Underground	0.39	0.44	0.43

Table 3: CI excluding Major Event Days

Customers Interrupted (CI)	2006	2007	2008
Overhead	190,468	171,736	232,167
Transformer Stations	16,902	34,905	12,633
Underground	293,808	365,677	331,518

Amongst the three systems, Transformer Stations have the best SAIDI and CI followed by Overhead and Underground. SAIDI and CI contribution due to station equipment is the least as the total proportion of station equipment is much lower compared to overhead and underground equipment.

THESL has 4,263 kilometres of overhead circuit and 5,557 kilometres of underground circuit. Higher CI contribution due to underground equipment may be partially attributed to the fact that underground circuit serves a larger area compared to overhead. Furthermore, the SAIDI contribution due to underground equipment is higher as it generally takes longer to address an underground outage compared to overhead.

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

INTERROGATORY 2:

Reference(s): **Exhibit C1Tab 2 Schedule 1 Page 1**
Exhibit C1Tab 2 Schedule 2 Page 1

"THESL takes the view that the substance of any shared services study that it might now perform has been so reduced that it would no longer be of any significant value to the Board, stakeholders, or THESL, and that any costs so undertaken would be arguably imprudent."

a) Provide a copy of the Board's reply to Mr. Couillard's June 15, 2009 Letter.
b) Provide a comparison of the size of THESLs 2009 and 2010 Shared Services Budget compared to other regulated utilities including Hydro One.
c) How many OEB regulated distributors have a formal shared services cost allocation model. Provide a list and estimated size of shared services budget.

RESPONSE:

a) THESL provided rationale for not completing the Shared Services study in its June 15, 2009 letter and requested a response in writing from the Board if the rationale was unacceptable. THESL did not receive a response to its June 15, 2009 letter from the Board.

b) THESL does not have this information..

c) THESL does not have this information..

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

INTERROGATORY 3:

Reference(s): **Exhibit C1 Tab 3 Schedule 1Page 1 and Appendix A and Appendix B**

a) Given the change in governance at THC/THESL provide an estimate of the reduction in The Governance Responsibility Centre cost paid by THESL to THC for 2010.

b) In Appendix A clarify whether the 2008 Historical column is the Board Approved or the 2008 Historical Actual.

c) If the latter provide the Board-Approved 2008 and provide a variance explanation.

d) In Appendix B Clarify whether the 2008 Historical is the Board Approved or the 2008 Historical Actual.

e) If the latter provide the Board-Approved 2008 and provide a variance explanation.

f) Provide more details of positions/functions and related costs repatriated from THC to THESL in 2009/ 2010. Ensure the costs add/reconcile to the difference between 2009 Bridge and 2010 costs.

RESPONSE:

a) The amount paid by THESL to THC for the Governance Responsibility in 2010 will be reduced by $160,000. In addition, THESL’s governance costs will be reduced by $790,000. These changes are shown in Appendix A.

b) The historical column presents the actual 2008 amounts.

c) The Board approved a total OM&A amount and not specific OM&A amounts for cost categories. Please see page 38, paragraph 1 of the Board’s Decision in EB-2007-0680.

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d) The historical column presents the actual 2008 amounts.

e) The Board-approved a total amount for controllable expenses and not specific OM&A amounts. Please see page 38, paragraph 1 of the Board's Decision in EB-2007-0680.

f) As described in Exhibit C1, Tab 3, Schedule 1, the balance of 33 staff members in Finance, Organizational Effectiveness, Legal Services and certain other areas will be transferred to THESL in 2010. Within the Finance area, the functions of corporate financial reporting, business planning, financial planning and reporting, corporate tax, and internal audit will move to THESL in 2010. Within the Organizational Effectiveness area, the functions of strategic direction and leadership will move to THESL in 2010. Within the Legal area, the functions of legal strategic direction, leadership and services will move to THESL in 2010. Within the Communications area, the functions of strategic direction, leadership and external communication will move to THESL in 2010. Lastly, within the EHS area, the functions of strategic and direction and leadership will move to THESL in 2010. Please see Appendix B of this Schedule reconciling the difference between the 2009 Bridge and 2010 costs.

Summary

<table>
<tr><th></th><th>THC</th><th>THESL</th><th>Total</th></tr>
<tr><td>Payroll costs</td><td rowspan="2">$ (0.19)</td><td>$ (0.61)</td><td rowspan="2">$ (0.94)</td></tr>
<tr><td>Payroll Benefits</td><td>$ (0.14)</td></tr>
<tr><td>Vehicle</td><td></td><td>$ (0.01)</td><td>$ (0.01)</td></tr>
<tr><td>Communications</td><td></td><td>$ (0.00)</td><td>$ (0.00)</td></tr>
<tr><td>Employee expenses</td><td></td><td>$ (0.03)</td><td>$ (0.03)</td></tr>
<tr><td>Total</td><td>$ (0.19)</td><td>$ (0.79)</td><td>$ (0.98)</td></tr>
<tr><td>% of time allocated to THESL</td><td>81%</td><td></td><td></td></tr>
<tr><td>THESL portion of reduction from THC</td><td>$ (0.16)</td><td></td><td></td></tr>
<tr><td>Total reduction to THESL</td><td>$ (0.16)</td><td>$ (0.79)</td><td>$ (0.95)</td></tr>
</table>

Response:

The estimate of cost reduction resulting from the change in leadership is approximately $0.95M.

This includes a reduction in payroll and benefits ($0.91M) and vehicle, communications and employee expenses ($0.04M).

Shared Services
Toronto Hydro-Electric System Limited
THESL Paid to THC

($ millions)

Functional Group	2008 Historical	2009 Bridge	2010 Test	2009-2010 Change ($) Inc (Dec)	2009-2010 Change (%) Inc (Dec)
	$	$	$		
Governance	1.31	0.08	1.50	1.42	1883%
Finance	5.01	6.94	0.74	(6.20)	(89%)
Organization Effectiveness & EHS	0.60	0.65	-	(0.65)	(100%)
Legal	0.64	0.66	-	(0.66)	(100%)
Communications	0.24	0.21	-	(0.21)	(100%)
GRAND TOTAL	**7.79**	**8.54**	**2.24**	**(6.30)**	**(74%)**

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

INTERROGATORY 4:

Reference(s): Exhibit C1 Tab 3 Schedule 2-1 and 2-2 SLAs

a) Provide details of the transfer pricing schedule and formula (as referenced in Paragraph 5-“Transfer Price” or “Transfer Prices”), for services purchased from THC and services sold to THC and THESI (except for Schedule 9 of the SLA for THESI) Reconcile the cost to those in Exhibit C1 Tab 3 Schedule 1 Appendix A and Appendix B.

b) Confirm that the pricing for FES, Facilities and IT&S is based on the internal cost allocation model as discussed at Exhibit C1 Tab 4 Schedule 3 Page 1 of 3.

c) Provide the 2008 and 2010 amounts embedded in the services sold to THC and THESI respectively.

d) Using the 2008 Board-approved SLA as a base, compare and provide an explanation of the changes (>+ 10%) in service level and costs of services sold to THESI between 2008 and 2010.

RESPONSE:

a) The schedules are attached at the end of the Schedule 2-1, 2-2 and 2-3 SLAs. The methodology utilized in arriving with these costs is consistent with prior years' approach involving allocation of direct costs appropriately and indirect costs using a time based approach. The total of the amounts found in each SLA for THESL and THC can be seen at the corresponding lines of Exhibit C1, Tab 1, Schedule 1, Appendices A and B. For example, the total of the amounts presented in Exhibit C1, Tab 3, Schedule 2-2, Schedule 1 "Governance and Leadership" can be found in Exhibit C1, Tab 1, Schedule 1, Appendix A on the Governance line for 2010.

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

b) Confirmed.

c) 2008 and 2010 amounts are set out in Exhibit C1, Tab 3, Schedule 1, Appendix B.

d) The OEB did not approve the 2008 level of services sold to THESI or their costs in the last EDR proceeding (EB-2007-0680). Rather the OEB authorized an overall amount for controllable expenditures. In addition, the specific amounts charged to the competitive businesses were redacted from the SLAs filled in the last proceeding as explained in EB-2007-0680 Transcript Volume 2 at page 100. Thus THESL is unable to provide the requested comparison. Exhibit C1, Tab 3, Schedule 1, Appendix B provides 2008 historical costs for services sold to THESI and explains why these costs are forecast to decrease in 2010 (see Exhibit C1, Tab 3, Schedule 1, page 3).

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

INTERROGATORY 5:

Reference(s): **Exhibit C1 Tab 3 Schedule 3**

a) Provide a Version of Schedule 3 that extracts information from the SLAs to add two cost columns "2008 Board Approved" and "2010 Test" to each service. Add in 2008 services that are discontinued in 2010 as necessary.

b) Ensure the costs reconcile the cost to those in Exhibit C1 Tab 3 Schedule 1 Appendix A and Appendix B.

c) Provide a variance report for all service for those costs in 2010 that are higher or lower (+ 10%) in 2010 compared to 2008 (except discontinued services).

RESPONSE:

a) Please see attached Schedule A, which provides the requested information.

b) THESL has confirmed that the amounts reconcile. Please note that THESL will be filing a revised version of Exhibit C1, Tab 3, Schedule 1, Appendix A to incorporate the change in THC Governance costs presented in Exhibit R1, Tab 11, Schedule 3.

c) Please see Appendix A to this Schedule.

Shared Services Inventory

Service	Service Definition	Service Provider Company	Service Receiver Company	2010 Test	2008 SLA as Filed	Change 2008-2010 $	Change 2008-2010 %	Notation
Stewardship & Leadership - CEO	Provide strategic direction, leadership and communication to the organization.	THC	THESL	$1,420,897.00	$785,784.00	$635,113.00	81%	A higher percentage of costs are allocated to THESL since virtually all staff and operations have moved from THC to THESL.
Governance - Board of Directors	Provide strategic direction, leadership and communication to the organization.	THC	THESL	$80,000.00	$74,875.00	$5,125.00	7%	Immaterial Change.
Finance - Stewardship	Provide strategic direction, leadership and communication to the Finance group and the organization.	THC	THESL	$742,137.00	$226,410.00	$515,727.00	228%	A higher percentage of costs are allocated to THESL since virtually all staff have moved from THC to THESL and that THTI no longer exists.
Finance-Discontinued	Corporate Financial Planning, Business Planning, Financial Planning & Reporting, Corporate Tax, Internal Audit and Internal Control Certification.	THC	THESL	$0.00	$3,991,825.00	-$3,991,825.00	-100%	Discontinued due to reorganization from THC to THESL in 2010.
Legal-Discontinued	Legal Services, Legal Strategic Direction & Leadership	THC	THESL	$0.00	$696,074.00	-$696,074.00	-100%	Discontinued due to reorganization from THC to THESL in 2010.
Communications-Discontinued	External Communications, Strategic Direction, Leadership & Communications	THC	THESL	$0.00	$169,805.00	-$169,805.00	-100%	Discontinued due to reorganization from THC to THESL in 2010.
Environmental Health Safety-Discontinued	Strategic Direction & Leadership	THC	THESL	$0.00	$409,823.00	-$409,823.00	-100%	Discontinued due to reorganization from THC to THESL in 2010.
Organizational Effectiveness-Discontinued	Strategic Direction & Leadership	THC	THESL	$0.00	$622,240.00	-$622,240.00	-100%	Discontinued due to reorganization from THC to THESL in 2010.
IT-Management Services	Maintain and implement "Ellipse" and "Hyperion" based IT infrastructure, such as enterprise systems, enterprise database and enterprise storage needs and that they are separated and yet incorporated as part of of Enterprise IT Infrastructure.	THESL	THC	$29,460.00	$351,007.00	-$321,547.00	-92%	Cost reduced accordingly due to employee transfer from THC to THESL, in 2010.
Facilities	Occupancy charges for various types of space. Operation & Maintenance, Real Estate, Human & Environmental Factors, Planning and Project Management, Manage Facility Function, Quality Assessment & Innovation, Investment Recovery	THESL	THC	$77,879.00	$486,336.00	-$408,457.00	-84%	Cost reduced accordingly due to employee transfer from THC to THESL, in 2010.

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INTERROGATORY 6:

Reference(s): **Exhibit C1 Tab4 Schedule 1 Appendix B and Schedule 2 Appendix B**

a) Provide the date of the Controllers Memo.

b) Will THESL update the Conference Board of Canada Report (Exhibit C1 Tab4 Schedule 2 Appendix B) used as the basis of the 2010 2.3% inflation forecast? If so when will this be filed?

c) What is the OEB inflation factor for 2010 used with the Cost of Capital projection for distributors?

RESPONSE:

a) The memo at Exhibit C1, Tab 4, Schedule 1, Appendix B was distributed in early August 2009. The process as described in the memo was verbally communicated to all executives at the beginning of the planning cycle (April 2009) and further communicated to operational coordinators via a cross-functional planning team that meet regularly through the planning cycle. The process was not significantly changed from prior years.

b) Please see response to Board Staff interrogatory #4.

c) While the request is unclear, VECC appears to be seeking the inflation factor to be used in the 2010 IRM model for those LDCs applying for rates based on the IRM mechanism. This figure will not be available until early 2010.

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INTERROGATORY 7:

Reference(s): **Exhibit C2 Tab 3 Schedule 3 Page 9 of 11and Table 1**
Exhibit C2 Tab3 Schedule 1 Appendix A

a) Provide a schedule that provides the major elements of the $41.3 million increase in Civil Construction services.

b) How much of this work was tendered? Provide the # tenders and Aggregate amount including the largest tender.

c) Provide the duration, name(s) and Costs of the Contract(s) for tree trimming. Explain in terms of contract labour rates ($/hour) and accomplishment (feeder km) why there was no increase in costs over 2008 in 2009 but there is a $400,000 or 13% increase in 2010?

d) Provide the list of bidders and summary of the winning bid for the new Contact Voltage Scanning service. If Sole Source, provide a copy of the Sole Source justification form F as required under Procurement Policy Sole Source Exception paragraph b) and documentation regarding the date this was approved by the Procurement Department

e) Explain in detail from the contract terms the basis of how the Scanning contractor’s costs are charged- for example $ per day per truck/crew flat rate or $ /scan/km etc. Show the build up to the $4 million contract cost in 2010.

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RESPONSE:

a) The increased budget for New Portfolios, Downtown Contingency, and Externally Initiated Plant Contingency is needed for new energy system needs and changing customer demands, as well as the continuing effort to modernize assets in order to be an industry leader in customer satisfaction. The 2010 budget is made up as follows:

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

Category	IOP Portfolio	Description	Total Civil Construction Capital Costs
Higher Sustaining Capital Program	Direct Buried	Direct Buried Upgrade	$8,372,412
	Direct Buried	Direct Buried Rebuild	$31,706,956
	UG Rehab	UG Rehab – Upgrade	$2,927,576
	UG Rehab	UG Rehab – Rebuild	$10,309,452
	Overhead	Overhead – 27.6 voltage Conversion	$2,971,282
	Overhead	Overhead – 13.8 voltage Conversion	$1,411,993
	Network	Network Transformer Upgrade	$225,460
New Portfolios	Customer Connections	Residential Service	$569,000
	Customer Connections	Commercial Service	$8,726,829
	Customer Connections	Residential Subdivision	$192,850
	Reactive UG	Reactive UG – Rebuild	$333,050
	Reactive OH	Reactive OH – Rebuild	$108,752
	Standardization	Standardization	$1,871,040
Downtown Contingency	Downtown Contingency	Downtown Contingency	$14,414,638
Externally Initiated Plant Contingency	City + Utility Relocation	City + Utility Relocation	$5,377,150
TOTAL:			$89,518,440

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The increase from $43.1M from 2009 to the 2010 budget is comprised of the following:

Category	IOP portfolio	Civil Construction Capital Costs
Downtown Contingency	Downtown Contingency	14,414,638
New Portfolios	Customer Connections Reactive UG Reactive OH Standardization	11,801,521
Higher sustaining Capital Program	UG Rehab Overhead	11,525,131
Externally initiated plant contingency	City + Utility Relocation	5,377,150
	TOTAL	**43,118,440**

b) One-hundred percent of the 2010 Civil Construction work was tendered by way of a single Request for Proposal (RFP 09P-097) issued to the market place in August 2009. Twenty contractors were invited to submit proposals; three were awarded business. The work will be distributed based on an approximate ratio of 40% - 40% - 20% assigned between the three successful respondents.

c) The tree trimming increase from 2009 to 2010 is $400,000 or 11.8%.

Toronto Hydro's tree trimming program was awarded to a single provider for three years from 2008 to 2010 inclusive following a formal competitive bid process. The

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

price for each year's tree trimming program was submitted by bidders after field survey of all feeders proposed for trimming on a three-year contract. The cost of the tree trimming contract is determined by more than the contract labour rates and the accomplishment (feeder km). With the adoption of reliability based tree trimming program using Davies Consulting Inc's ("DCI") Tree Trimming Model ("TTM") in 2008, Toronto Hydro has also implemented an additional proactive initiative, aimed to improve reliability, in which tree branches found above power conductors that are normally outside the scope of tree trimming work will also be maintained during regular pruning work. This reduces the chance of limbs breaking and falling on OH lines during stormy weather. Depending on the type and size of trees along the trimming route, the requirement for this tree storm hardening varies from tree to tree and may result in variations in amount of work between calendar years.

As a result, although the distance of trimming remained virtually the same between 2008 and 2009, the amount of tree-related storm hardening requirement in 2009 is projected to be less as compared to 2008, which offsets the annual labour rate increase.

There is a cost increase of $400,000 from 2009 to 2010 because of significant feeder km increase as called for by the TTM and general average labour rate increase. (Due to the confidentiality of the agreements established with its suppliers Toronto Hydro is unable to include contract labour rates in this response.) The following table shows the feeder kilometres for 2008 to 2010:

	2008	2009	2010
Circuit km	1,512	1,522	1,638

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d) This contract was awarded on a Sole Source basis due to the proprietary nature of the technology and services provided.

P46790 SS#1344 S.A.

toronto hydro

SOLE SOURCE JUSTIFICATION REPORT

REQUISITION

Submitted By: Name: Ben LaPianta Date (dd/mm/yy): 17/07/09

Title: VP Department: ______

Signature: ______ Corporation: ______

RC: ______

REPORT

Sole Source X **Preferred Vendor** ______

The above noted Business Unit requires the purchase of the following goods/services:

Mobile stray voltage detection program.

Term of Contract: (if applicable)	01/07/09 Start Date (dd/mm/yy)	31/06/12 End Date (dd/mm/yy)	3 years Total Length

The Business Unit has made a due diligent review of the market place and has determined that the following vendor should be selected to provide the goods or services required:

Vendor: Power Survey LLC

Key Terms: ______

Price: $12,000,000 (Including option years) PST: $960,000 GST: $600,000 Total: $13,560,000

<Attach supporting document justifying sole source recommendation>

RECOMMENDATION

The undersigned hereby recommend and authorize the Procurement Manager to award the above purchase to Stray Voltage Detection Services at an estimated cost of $ 4,520,000/YR.

Term of Contract: (if applicable)	01/07/09 Start Date (dd/mm/yy)	31/06/12 End Date (dd/mm/yy)	3 years Total Length

Recommended by Business Unit Supervisor or Manager:	Concurred by Business Unit VP:
Signature:	Signature:
Name:	Name:
Title:	Title:
Department:	Department:
Date:	Date:

IT-related purchases/services >=$25,000 requires CIO approval. ☐

Signature: ______ Date: ______
Eduardo Bresani - CIO

At this point, please return signed document to Procurement

Concurred by Procurement Department Supervisor:	Approved by Procurement Department Manager:
Signature: EArmstrong	Signature: [signature]
Name: Elizabeth Armstrong	Name: Owen Nash
Title: Supervisor, Supply Chain Services	Title: Manager, Supply Chain Services
Date: July 29/09	Date: 9/11/09

Additional Authorization required as per Toronto Hydro's Signing Policy:

Signature: B. LaPianta	Signature: [signature]
Name:	Name: A. Haines
Title: VP DGM.	Title:
Date: Aug 17/09	Date: Aug. 26. 09.

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

e) Proposed Mobile Stray Voltage Detection Program Includes:

- An aggregate of 40 hours per week of stray voltage scanning utilizing SVD2000 systems and crews each working 8 hours per night in Toronto Hydro territory
- 3 SVD2000 systems (September 1 – March 31).
- 1 SVD2000 system (April 1 – August 31)
- 24 hour / 7day dispatch team to coordinate efforts between Power Survey field crews and Toronto Hydro
- Full-time client manager
- Full-time data manager
- Highly trained PSC senior stray voltage technicians
- Data storage
- GPS and paper map recording and storage
- Customizable daily program reports
- Quarterly and semi-annual summary reports
- Quality control technician(s)
- Monthly QA reports
- Use of professional engineering services

The Power Survey Company costs are charged on a lump-sum basis for the provision of these services on a yearly basis.

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INTERROGATORY 8:

Reference(s): Exhibit C2 Tab 4 Schedule 2 Tables1 and 2 and Pages4-5

a) Provide the historical Bridge and 2010 fleet operating costs broken down between fuel insurance and maintenance.

b) Provide details of the fleet fuel costs for 2008, 2009 and projected 2010

i. Total Costs
ii. Average $/litre (Liquid fuels and equivalent for gaseous fuels)
iii. # km of travel and or hours of use
iv. Fleet Average fuel cost per vehicle and per km

c) Explain why average fuel use and costs per vehicle would not decrease in 2010 given the change to more fuel efficient vehicles?

d) Explain the increase in Fleet Capital expenditure 2008-2010 based on the actual and projected number of

i. Retirements/replacements
ii. Increase in vehicle fleet
iii. Average cost of new/replacement vehicles

e) Provide a list of executive and staff vehicles – type and age. Indicate which are personal/dedicated and which are general fleet.

RESPONSE:

a) See Table 1 below

Table 1	2008	2009	2010
Vehicle Fuel	$1.9M	$1.9M	$2M
Vehicle Insurance	$280K	$301K	$420K
MAINT	**$7.2M**	**$9.7M**	**$9.8M**

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b) THESL tracks total fuel costs and does not track fuel consumption by mileage or per vehicle.

- 2008 = $1.9M for 1.8M Litres fuel
- 2009 = $1.9M for 1.8M Litres fuel
- 2010 = $2.0M

c) Vehicle use has increased in line to support the increase in business requirements.

d) Fleet Capital Expenditure increases are based on increases to business requirements and not directly co-related to (i), (ii) and (iii).

e) Please see Appendix A to this Schedule.

Equipment Description	Equipment Description 2
2008 LEXUS RX 350	EXECUTIVE VEHICLE
2007 CADILLAC CTS	EXECUTIVE VEHICLE
2007 LEXUS RX 350	EXECUTIVE VEHICLE
2007 VOLK ELP	EXECUTIVE VEHICLE
2007 LEXUS IS250	EXECUTIVE VEHICLE
2008 MERCEDES BENZ C350	EXECUTIVE VEHICLE
2006 BMW 750I	EXECUTIVE VEHICLE
2008 - BMW 328i	EXECUTIVE VEHICLE
2005 TOYOTA AVALON	EXECUTIVE VEHICLE
2008 CHEVY TAHOE 4WD 4-DR HYBRID LT	EXECUTIVE VEHICLE
1999 FORD F450	PICKUP - REGULAR CAB
2004 CHEV CAVALIER	4DR SEDAN
2004 CHEV CAVALIER	4DR SEDAN
2006 AUDI A6 4.2L	EXECUTIVE VEHICLE
2007 LEXUS IS 350	EXECUTIVE VEHICLE
2007 ACURA MDX	EXECUTIVE VEHICLE
2007 LEXUS IS 250 AWD	EXECUTIVE VEHICLE
2007 ACURA 3.2 TLS	EXECUTIVE VEHICLE
2007 Lincoln MKX	EXECUTIVE VEHICLE
2007 NISSAN MAXIMA SE	EXECUTIVE VEHICLE
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2008 DODGE CALIBER	4DR SEDAN
2009 FORD FOCUS - AUTOMATIC TRANSAXLE	4DR SEDAN
2009 FORD FOCUS - AUTOMATIC TRANSAXLE	4DR SEDAN
2001 CHEV SILVERADO 1500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP

Equipment Description	Equipment Description 2
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2002 CHEV CAVALIER	COMPACT CAR
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO 25	FULLSIZE EXTENDED CAB PICKUP
2007 CHEV SILVERADO 25	FULLSIZE EXTENDED CAB PICKUP
2007 CHEV SILVERADO 25	FULLSIZE EXTENDED CAB PICKUP
2007 Dodge Model 1500 4x4	FULL SIZE - PICK UP
2009 DODGE 1500 RAM PICKUP	4 DR EXTENDED CAB PICKUP
1999 FORD F450	FULLSIZE PICKUP W UTILITY BODY
1999 FORD F450	FULLSIZE PICKUP W UTILITY BODY
1999 FORD F450	FULLSIZE PICKUP W UTILITY BODY
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
1992 FORD F800	SINGLE BUCKET - CONVENTIONAL BOOM
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2003 DODGE 3500	FULL SIZE VAN
2005 FORD E350	FULL SIZE VAN
2005 FORD E350	FULL SIZE PASSENGER VAN
2006 FORD E350	FULL SIZE VAN
2008 FORD ECONOLINE E2	FULL SIZE VAN
2008 FORD ECONOLINE E2	FULL SIZE VAN
2009 FORD ECONOLINE E2	FULL SIZE VAN
2009 FORD ECONOLINE E2	FULL SIZE VAN
2003 FORD E350	FULL SIZE VAN

Equipment Description	Equipment Description 2
2003 FORD E350	FULL SIZE VAN
2003 FORD E350	FULL SIZE VAN
1996 DODGE B250	FULL SIZE - CARGO VAN
2000 CHEV G2500	FULLSIZE CARGO VAN
2003 FORD F150	FULL SIZE REGULAR CAB PICK UP
2003 FORD F150	FULL SIZE REGULAR CAB PICK UP
2003 FORD F150	FULL SIZE REGULAR CAB PICK UP
2003 FORD F150	FULL SIZE REGULAR CAB PICK UP
2003 FORD F150	FULL SIZE REGULAR CAB PICK UP
2008 FORD F150	FULL SIZE REGULAR CAB PICK UP
2008 FORD F150	FULL SIZE REGULAR CAB PICK UP
2009 FORD E150	FULL SIZE - CARGO VAN
2008 CHEVROLET UPLANDER	PASSENGER MINIVAN
2008 CHEVROLET UPLANDER	PASSENGER MINIVAN
2008 CHEVROLET UPLANDER	PASSENGER MINIVAN
2008 CHEVROLET UPLANDER	PASSENGER MINIVAN
2008 CHEVROLET UPLANDER	PASSENGER MINIVAN
2008 CHEVROLET UPLANDER	PASSENGER MINIVAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2007 FORD F450	LINE TRUCK W/ STAKE BODY - FLEET SERVICE
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2008 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
1996 FORD F450	LINE TRUCK W/ STAKE BODY - FLEET SERVICE
1995 FORD E150	FULL SIZE - CARGO VAN
2000 FORD E350	CREW/CARGO VAN
1991 NAVISTAR 4900	DOUBLE BUCKET - 51` - 64` REACH
2002 STERLING M7500	SINGLE BUCKET
1996 NAVISTAR 4700	DOUBLE BUCKET - 50` - MATERIAL HANDLER
2005 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2005 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2006 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM

Equipment Description	Equipment Description 2
2006 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	DOUBLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	DOUBLE BUCKET CONVENTIONAL BOOM
2005 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2006 INTERNATIONAL 4400	SINGLE BUCKET - CONVENTIONAL BOOM
2006 INTERNATIONAL 4400	SINGLE BUCKET - CONVENTIONAL BOOM
2006 INTERNATIONAL 4400	SINGLE BUCKET - CONVENTIONAL BOOM
2006 INTERNATIONAL 4400	SINGLE BUCKET - CONVENTIONAL BOOM
2006 INTERNATIONAL 4400	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2006 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
1998 FORD E250	CARGO (MINI) VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'

Equipment Description	Equipment Description 2
2007 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2007 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2007 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
1998 FORD E250	FULL SIZE - CARGO VAN
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
1999 FORD E350	FULL SIZE - CARGO VAN
1994 FREIGHTLINER FL80	DOUBLE BUCKET - UP TO 50` REACH
2007 GMC W5500	CUBE VAN - JOINTER`S TRUCK
1992 NAVISTAR 4700	CRANE TRUCK
1993 NAVISTAR 4700	CRANE TRUCK
1993 NAVISTAR 4900	LARGE DIGGER DERRICK (I.E. P60)
1995 FORD E350	CUBE VAN
1995 FORD E350	CUBE VAN
1994 NAVISTAR 4900	SINGLE BUCKET - CONVENTIONAL BOOM
1992 NAVISTAR 4700	LINE TRUCK - 10001-16000 KG
2005 INTERNATIONAL 40S	LINE TRUCK 10001-16000KG
2005 GMC	UNKNOWN SINGLE AXLE CONVENTIONAL CAB
1992 NAVISTAR 4700	DUMP TRUCK - 10001 - 16000 KG
1994 FREIGHTLINER FL80	SINGLE BUCKET - CONVENTIONAL BOOM
1994 NAVISTAR 4700	CRANE TRUCK - 16001 - 26000 KG
1994 NAVISTAR 4700	DUMP TRUCK - 10001 - 16000 KG
1994 NAVISTAR 4900	SINGLE BUCKET - CONVENTIONAL BOOM
1994 NAVISTAR 4900	SINGLE BUCKET - CONVENTIONAL BOOM
1994 NAVISTAR 4900	DUMP TRUCK
1994 FREIGHTLINER FL80	TANDEM CABLE TRUCK
2008 INTERNATIONAL MODEL 7400 6x4 TRUCK	TANDEM CABLE TRUCK
1992 FORD LNT 8000	TANDEM CABLE TRUCK
2006 INTERNATIONAL TANDEM TRUCK	TANDEM CABLE TRUCK
1996 FORD F450	CUBE VAN
1995 NAVISTAR 4700	SINGLE BUCKET - CONVENTIONAL BOOM
1995 NAVISTAR 4700	AERIAL PLATFORM TRUCK
1995 NAVISTAR 4700	DUMP TRUCK
1995 NAVISTAR 4700	DUMP TRUCK
1995 NAVISTAR 4900	LARGE DIGGER DERRICK
1995 NAVISTAR 4700	CRANE W/ KNUCKLE BOOM
1995 NAVISTAR 4700	CRANE W/ KNUCKLE BOOM

Equipment Description	Equipment Description 2
1995 NAVISTAR 4700	CRANE W/ KNUCKLE BOOM
1995 FORD F350	DUMP TRUCK 10001-16000 KG
1997 FORD F450	CUBE VAN > 4600 KG
1997 FORD F450	CUBE VAN > 4600 KG
1998 NAVISTAR 4900	DOUBLE BUCKET - UP TO 50` REACH
1998 NAVISTAR 4900	SINGLE BUCKET - COMVENTIONAL BOOM
2006 FORD E450	CUBE VAN
1999 FORD F450	CUBE VAN > 4600 KG
1994 FREIGHTLINER FL80	DOUBLE BUCKET - 51` - 64` REACH
1992 FREIGHTLINER FL80	DOUBLE BUCKET - 65`+ REACH (TX5065)
2009 HINO 258 # WS3078 DUMP TRUCK	DUMP TRUCK
1996 NAVISTAR F2-654	DOUBLE BUCKET - 51` - 64` REACH
1996 GMC SIERRA	FULL SIZE - REGULAR CAB
1996 GMC 1500	FULL SIZE - REGULAR CAB
1996 GMC SIERRA	FULL SIZE - REGULAR CAB 1/2 TON
1997 FORD F150	FULL SIZE - REGULAR CAB
1997 FORD F150 XL	FULL SIZE - REGULAR CAB
1999 GMC TC7H042	SINGLE BUCKET- CONVENTIONAL BOOM
2004 CHEV SILVERADO 1500	FULLSIZE EXTENDED CAB PICKUP HYBRID
2005 CHEV SILVERADO 1500	FULLSIZE EXTENDED CAB PICKUP HYBRID
2005 CHEV SILVERADO 1500	FULLSIZE EXTENDED CAB PICKUP HYBRID
2005 CHEV SILVERADO 1500	FULLSIZE EXTENDED CAB PICKUP HYBRID
2007 CHEV SILVERADO	FULLSIZE EXTENDED CAB PICKUP
2007 CHEV SILVERADO	FULLSIZE EXTENDED CAB PICKUP
2007 CHEV SILVERADO	FULL SIZE - PICK UP TRUCK
2007 CHEV SILVERADO 1500	FULLSIZE EXTENDED CAB PICKUP
2007 CHEV SILVERADO	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2007 CHEV SILVERADO	FULLSIZE EXTENDED CAB PICKUP
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
2007 CHEV SILVERADO	FULL SIZE - PICK UP FULL SIZE VAN
1994 DODGE DAKOTA	FULL SIZE - REGULAR CAB
1990 WESTERN STAR 3864-S	DOUBLE BUCKET - `65` + REACH
1998 GMC T8500	SINGLE BUCKET-SQUIRT BOOM
2002 STERLING M7500	SINGLE BUCKET - CONVENTIONAL BOOM
2002 STERLING M7500	SINGLE BUCKET-CONVENTIONAL BOOM
1990 FREIGHTLINER FLC11264SD	DOUBLE BUCKET - 65` +REACH
2002 STERLING M7500	SINGLE BUCKET - CONVENTIONAL BOOM
1992 FORD LTS8000	DOUBLE BUCKET - `65`+ REACH
2007 STERLING M8500	DOUBLE BUCKET CONVENTIONAL BOOM
2007 STERLING M8500	DOUBLE BUCKET CONVENTIONAL BOOM
2008 FORD E350 8T0339	VAN W/ AERIAL DEVICE
2000 CHEV G3500	SCADA VAN + AERIAL DEVICE

Equipment Description	Equipment Description 2
1997 FREIGHTLINER FL80	SINGLE BUCKET- CONVENTIONAL BOOM 5.9L
1995 FREIGHTLINER FL80	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	SMALL DIGGER DERRICK
1992 FREIGHTLINER FL80	DIGGER DERRICK
2007 STERLING M8500	DIGGER DERRICK
2006 - STERLING M8500	SMALL DIGGER DERRICK
2001 STERLING M7500	SMALL DIGGER DERRICK
1992 NAVISTAR 4900 4X2	SMALL DIGGER DERRICK
1992 WESTERN STAR 4864F	DERRICK LARGE (I.E. P60)
1993 WESTERN STAR 4864F	SMALL DIGGER DERRICK
1997 NAVISTAR 4900	SMALL DIGGER DERRICK
2002 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2002 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2002 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2002 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2002 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2006 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2006 GMC TT8F042	SINGLE BUCKET - SQUIRT BOOM
2006 GMC T8500	SINGLE BUCKET - SQUIRT BOOM
2006 FORD E350	VAN W/ AERIAL DEVICE
2007 INTERNATIONAL MODEL 4200	SINGLE BUCKET SQUIRT BOOM
1996 NAVISTAR 4700	CRANE W/ KNUCKLE BOOM
1996 FREIGHTLINER FL80	CRANE TRUCK W/ KNUCKLE BOOM
1996 FREIGHTLINER FL80	CRANE TRUCK W/ BOOM
1997 FREIGHTLINER FL80	SMALL DIGGER DERRICK
1997 NAVISTAR 4700	CRANE TRUCK 10001-16000KG
2009 STERLING LT8513	CRANE TRUCK - 26001-33000 KG
1997 CHEV CAVALIER	COMPACT CAR
2003 DODGE SX 2.0	COMPACT 4DR SEDAN
2003 DODGE SX 2.0	COMPACT 4DR SEDAN
2003 DODGE SX 2.0	COMPACT 4DR SEDAN
2005 DODGE SX 2.0	COMPACT
2005 DODGE SX 2.0	COMPACT
2005 DODGE SX 2.0	COMPACT
2005 DODGE SX 2.0	COMPACT
2005 DODGE SX 2.0	COMPACT
2005 DODGE SX 2.0 COMPACT	SUB COMPACT CAR
2007 TOYOTA PRIUS	4DR SEDAN HYBRID VEHICLE
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET

Equipment Description	Equipment Description 2
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
2001 STERLING M7500	SINGLE BUCKET
1995 FREIGHTLINER FL80	SGL BKT CONVENTIONAL BOOM AERIAL DEVICE
1995 FREIGHTLINER FL80	DBL BKT - 51` TO 64` REACH AERIAL DEVICE
2002 Sterling M7500	SINGLE BUCKET - CONVENTIONAL BOOM
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2002 FORD E250	FULL SIZE VAN
2004 FORD E350	FULL SIZE VAN
2004 FORD E350	FULL SIZE VAN
2004 FORD E350	FULL SIZE VAN
2004 FORD E350	FULL SIZE VAN
2004 FORD E350	FULL SIZE VAN
1992 NAVISTAR 4600LP	LINE TRUCK 10001-16000KG
1996 CHEV LF3500	DUMP TRUCK 10001-16000KG
1994 CHEV 3500	DUMP TRUCK 10001-16000KG
1991 FORD F800	DUMP TRUCK 10001-16000KG
2006 CHEV UPLANDER 9197RS	CARGO MINI VAN
2006 CHEV UPLANDER 9198RS	CARGO MINI VAN
2006 CHEV UPLANDER 9199RS	CARGO MINI VAN
2006 CHEV UPLANDER	CARGO MINI VAN
2006 CHEV UPLANDER 4401TA	CARGO MINI VAN
2006 CHEV UPLANDER 4402TA	CARGO MINI VAN
2006 CHEV UPLANDER 4403TA	CARGO MINI VAN
2006 CHEV UPLANDER 4404TA	CARGO MINI VAN
2006 CHEV UPLANDER 4405TA	CARGO MINI VAN

Equipment Description	Equipment Description 2
2009 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2009 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
2009 CHEV UPLANDER EXT.WB.4-DR	CARGO MINI VAN
1996 FREIGHTLINER FL80	SINGLE BUCKET TROUBLE TRUCK
1996 FREIGHTLINER FL80	DOUBLE BUCKET - UP TO 50` REACH
1997 NAVISTAR SA475	SINGLE BUCKET - CONVENTIONAL BOOM
1997 NAVISTAR SA475	SINGLE BUCKET - CONVENTIONAL BOOM
1997 NAVISTAR 4700	SINGLE BUCKET - CONVENTIONAL BOOM
2005 GMC 3500	FULL SIZE CARGO VAN
2005 GMC 3500	FULL SIZE CARGO VAN
2005 GMC G3500	FULL-SIZE CARGO VAN
2005 CHEV GMC G3500	FULL-SIZE CARGO VAN
2005 GMC G3500	FULL-SIZE CARGO VAN
2005 CHEV GMC G3500	FULL-SIZE CARGO VAN
2006 GMC CC5E042	LINE TRUCK - 10001-16000 KG
1987 NAVISTAR SS	CUBE VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2006 CHEV UPLANDER	PASSENGER (MINI) VAN
2009 CHEV UPLANDER	PASSENGER (MINI) VAN
2009 CHEV UPLANDER	PASSENGER (MINI) VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2004 FORD FREESTAR	CARGO MINI VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2005 DODGE CARAVAN	CARGO MINI VAN
2006 FORD FREESTAR 8116RH	CARGO MINI VAN
2006 FORD FREESTAR	CARGO MINI VAN
2006 FORD FREESTAR	CARGO MINI VAN
2006 FORD FREESTAR	CARGO MINIVAN
1997 NAVISTAR 4700 LP	CUBE VAN
2002 GMC W4S042	CUBE VAN
2002 GMC W4S042	CUBE VAN
2007 GMC W5500	CUBE VAN - JOINTER`S TRUCK

Equipment Description	Equipment Description 2
2008 CHEV CG 33405	FULL SIZE VAN
2008 CHEV CG 33405	FULL SIZE VAN
2008 CHEV CG 33405	FULL SIZE VAN
2008 CHEV CG 33405	FULL SIZE VAN
2008 CHEV CG 33405	FULL SIZE VAN
2008 CHEV CG 13405	FULL SIZE VAN
2008 CHEV CG 13405	FULL SIZE VAN
2008 FORD E150	FULL SIZE - CARGO VAN
2008 FORD E150	FULL SIZE - CARGO VAN
1997 DODGE RAM 2500	FULL SIZE - CARGO VAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINIVAN
2001 FORD WINDSTAR	CARGO MINI VAN
2001 FORD WINDSTAR	CARGO MINI VAN
1993 REEDRILL TEXOMA	MINI DIGGER DERRICK
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2000 CHEV C2500	FULLSIZE EXTENDED CAB PICKUP
2003 STERLING M8500	DBL BUCKET - 46` CONVENTIONAL WITH JIB
2003 STERLING M8500	DBL BUCKET - 46` CONVENTIONAL WITH JIB
2003 STERLING M8500	DBL BUCKET - 46` CONVENTIONAL WITH JIB
2003 STERLING M8500	DBL BUCKET - 46` CONVENTIONAL WITH JIB
2003 STERLING M8500	DBL BUCKET - 46` CONVENTIONAL WITH JIB
2003 STERLING M8500	DBL BUCKET - 46` CONVENTIONAL WITH JIB

Equipment Description	Equipment Description 2
1992 FORD LTS8000	CRANE TRUCK
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
1994 FREIGHTLINER FL80	CRANE TRUCK
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE REGULAR CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE REGULAR CAB PICK UP
2001 CHEV C2500	FULL SIZE REGULAR CAB PICK UP
2001 CHEV C2500	FULL SIZE REGULAR CAB PICK UP
2001 CHEV C2500	FULL SIZE REGULAR CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE REGULAR CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2001 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2003 CHEV C2500	FULL SIZE EXTENDED CAB PICK UP
2005 STERLING M8500	DIGGER DERRICK
1986 NAVISTAR 1754	CRANE TRUCK
2002 STERLING M7500	SINGLE BUCKET
2002 STERLING M7500	SINGLE BUCKET
2002 STERLING M7500	SINGLE BUCKET - CONVENTIONAL BOOM
2007 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2002 STERLING M7500	SINGLE BUCKET CONVENTIONAL BOOM
2002 STERLING M7500	SINGLE BUCKET - 46` CONVENTIONAL WITH JI
2002 STERLING M7500	SINGLE BUCKET - 46` CONVENTIONAL WITH JI
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM

Equipment Description	Equipment Description 2
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2003 STERLING M8500	SINGLE BUCKET CONVENTIONAL BOOM
2005 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2005 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2005 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2005 STERLING M8500	SINGLE BUCKET - CONVENTIONAL BOOM
2007 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2007 GMC W5500	CUBE VAN - JOINTER`S TRUCK
1989 FORD F800	CRANE TRUCK - 26001 - 33000 KG 7.8L BRAZ
2000 GMC W4S042	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK

Equipment Description	Equipment Description 2
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2002 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2004 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2005 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2005 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2005 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2005 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2005 GMC W5500	CUBE VAN - JOINTER`S TRUCK
2006 GMC W5500	CUBE VAN - JOINTER`S TRUCK
1997 FORD AEROSTAR	CARGO (MINI) VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2008 DODGE CARAVAN	CARGO MINI VAN
2008 DODGE CARAVAN	CARGO MINI VAN
2007 DODGE CARAVAN	CARGO MINI VAN
2005 GMC CC5E042	LINE TRUCK - 10001-16000 KG
2005 GMC CC5E042	LINE TRUCK - 10001-16000 KG
2006 GMC CC5E042	LINE TRUCK - 10001-16000 KG
2000 CHEV CAVALIER	BI-FUEL COMPACT CAR
2000 CHEV CAVALIER	BI-FUEL COMPACT CAR
2000 CHEV CAVALIER	BI-FUEL COMPACT CAR
2000 CHEV CAVALIER	BI-FUEL COMPACT CAR
2000 CHEV CAVALIER	BI-FUEL COMPACT CAR
2001 TOYOTA PRIUS	ELECTRIC HYBRID CAR
2003 HONDA CIVIC	4DR SEDAN HYBRID VEHICLE
2003 HONDA CIVIC	4DR SEDAN HYBRID VEHICLE
2003 HONDA CIVIC	4 DR SEDAN HYBRID VEHICLE
2003 HONDA CIVIC	4 DR SEDAN HYBRID VEHICLE
2003 HONDA CIVIC	4 DR SEDAN HYBRID VEHICLE
2000 CHEV C2500	FULLSIZE REGULAR CAB PICKUP
2006 FORD F250	FULL SIZE EXTENDED CAB PICK UP
2006 FORD F250	FULL SIZE EXTENDED CAB PICK UP

Equipment Description	Equipment Description 2
1997 CHEV LT2500	FULL SIZE - CREW CAB
1997 CHEV LT2500	FULL SIZE PICK UP - CREW CAB
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 CHEV VENTURE	CARGO MINI VAN
2003 DODGE CARAVAN	WINDOW MINI VAN
2005 CHEV	CC 55E WELDING TRUCK
2007 FORD F550	CRANE TRUCK 10001-16000KG
2007 FORD F550	CRANE TRUCK 10001-16000KG
2008 KENWORTH MODEL T170	CRANE TRUCK 10001-16000KG
2008 STERLING ACT	CRANE TRUCK 16001 - 26000 KG
2006 CHEV 3500	FULL SIZE - CARGO VAN
2006 CHEV 3500	FULL SIZE - CARGO VAN
2006 CHEV 3500	FULL SIZE - CARGO VAN
2006 CHEV 3500	FULL SIZE - CARGO VAN
2006 CHEV 3500	FULL-SIZE CARGO VAN
2006 CHEV 3500	FULL SIZE - CARGO VAN
2006 FORD E250	FULL SIZE CARGO VAN
2006 FORD E250	FULL SIZE CARGO VAN
2006 FORD E250	FULL SIZE CARGO VAN
2009 STERLING ACTERRA M8500	DOUBLE BUCKET - 51' TO 64'
2009 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2009 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2009 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2007 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2009 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
2009 STERLING M8500	DOUBLE BUCKET - 51' TO 64'
1994 JDJ TRAILERS ENC	BOX TRAILERS
1987 TIMBERLAND DPT-30B	CABLE/REEL TRAILER
1991 YORK UTILITY C	STRINGING/TENSIONER
1987 TIMBERLAND DPT-30B	STRINGING/TENSIONER
1972 NYE UNKNOWN	CABLE/REEL
1980 JC TRAILERS 9TD	POLE
1996 JJ 001-P	POLE
1967 KING UNKNOWN	POLE
1994 TJ WELDING P-90	POLE TRAILER
1980 JC TRAILERS CUSTOM	CABLE/REEL TRAILER
1994 JDJ TRAILERS DU-6-10	DUMP TRAILER
2004 VERMEER BC1000XL	CHIPPER TRAILER

Equipment Description	Equipment Description 2
2004 VERMEER BC1000XL	CHIPPER TRAILER
1994 JDJ TRAILERS DU-6-10	DUMP TRAILER
1993 TIMBERLAND RC80-72	CABLE/REEL TRAILER
1972 KING 4SW	POLE TRAILER
1972 KING 3CT	CABLE/REEL TRAILER
1986 TJ WELDING 700	MISC. TRAILER
1988 HUTCHINSON UNKNOWN	STRINGING TENSIONER TRAILER
1992 HUTCHINSON UNKNOWN	MISC. TRAILER
1993 SHERMAN RIELLY PT-2766	STRINGING/TENSIONER
1960 HOME UNKNOWN	REEL TRAILER
1977 TJ WELDING UNKNOWN	POLE TRAILER
1989 REEDRILL 4040B	MISC. TRAILER
1989 BRIGGS&STRATTON 1100G	TRANSFORMER HOIST
1997 O.T.C. 12`EN	MISC. TRAILER
1989 TJ WELDING 600S	BOX TRAILER
1989 TJ WELDING 600S	BOX TRAILER
2007 PRAXAIR TRAILER WITH WELDER	MISC. TRAILER
1992 TJ WELDING 300S	MISC. TRAILER
1993 REEDRILL UNKNOWN	FLOAT
1958 HUTCH UNKNOWN	CART TRAILER
1991 KING 3CTH-108	CABLE/REEL TRAILER
1991 G AND C BECHARD G-C1	OIL FILTERING AND STORAGE TRAILER
1992 TJ WELDING 150	FLOAT
1992 MANAC 12232101	POLE
1994 ALTEC AD-108	CABLE/REEL TRAILER
1995 TIMBERLAND DPT-30B	STRINGING/TENSIONER TRAILER
1995 TIMBERLAND DPT-30B	STRINGING/TENSIONER TRAILER
1995 SONKIND S-1	CABLE / REEL TRAILER
1995 SONKIND UNKNOWN	CABLE / REEL TRAILER
1996 MANAC 12232101	POLE TRAILER
1985 TJ WELDING 700R	CABLE / REEL TRAILER
1979 STANMORE UNKNOWN	FLAT BED TILT TRAILER FOR KABOTA
1962 SMITH BROS UNKNOWN	CABLE / REEL TRAILER
1965 SMITH BROS UNKNOWN	MOBILE TX. TRAILER
1957 HUTCH UNKNOWN	POLE TRAILER
2005 NANDO FLATBED	TRAILER WITH GENERATOR
POSI PLUS 1400	2006 POSI PLUS 1400 CABLE
2006 POSI PLUS 1400	POSI PLUS 1400 CABLE
2006 POSI PLUS 1400	POSI PLUS 1400 CABLE
2005 TIMBERLAND DPT-30B	STRINGING/TENSIONER
2005 TIMBERLAND DPT-30B	STRINGING/TENSIONER
2005 TIMBERLAND DPT-30B	STRINGING/TENSIONER
2005 TIMBERLAND DPT-30B	STRINGING/TENSIONER

Equipment Description	Equipment Description 2
2005 TIMBERLAND DPT-30B	STRINGING/TENSIONER
2005 TIMBERLAND DPT-30B	STRINGING/TENSIONER
2009 SHERMAN REILLY MODEL DDH-75-T	UNDERGROUND PULLER/TRAILER
2009 SHERMAN REILLY MODEL DDH-75-T	UNDERGROUND PULLER/TRAILER
2009 RP Model CR8	CABLE / REEL TRAILER
2009 RP Model CR8	CABLE / REEL TRAILER
2009 RP Model CR8	CABLE / REEL TRAILER
2009 RP Model CR8	CABLE / REEL TRAILER

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INTERROGATORY 9:

Reference(s): Exhibit C1, Tab 4, Schedule 3

FES allocates its fleet costs to the business units of THESL and to affiliates based on the cost allocation model described in Exhibit C1, Tab 4, Schedule 3.

a) Provide a copy of Exhibit C1, Tab 4, Schedule 3.

RESPONSE:

Please refer to the Application provided.

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INTERROGATORY 10:

Reference(s): Exhibit C2 Tab 1 Schedule 2

"As part of THESL's new five-year Collective Agreement with CUPE effective February 1, 2009, a group incentive program was introduced for unionized employees in the critical front-line roles of Crew Leader and System Response Representative. This new Gain Sharing Program is a groundbreaking achievement, linking pay to successful delivery of specific results. The purpose of the program is to incent the right behaviours and advance the performance expectations for these employees to promote individual accountability and drive operational improvements. The new Gain Sharing Program has its own Scorecard linked to THESL's Scorecard and consists of four specific key performance indicators ("KPIs"):"

a) Provide an estimate of the number and list of Ontario utilities that have a similar gain sharing program for Unionized Employees**.**
b) How many Employees are eligible – provide a breakdown by group.
c) Provide an estimate of the annual cost of the program based on expected performance in 2009 and 2010 respectively.
d) Explain why Line 47 of Exhibit C2 Tab 1 Schedule2 Appendix A appears to show for Union employees, an increase in incentive pay in 2009 relative to 2008, but a decrease in incentive pay from 2009-2010. Reconcile this with the cost consequences from implementation of the Gain Sharing Program.
e) Provide the 2010 Scorecard for the Gain Sharing Program. Highlight any differences in the Scorecard or bonus calculation.

RESPONSE:

a) THESL is aware of four utilities that have gainsharing programs. They are:

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- Enbridge Gas Distribution Inc.
- EPCOR Utilities Inc.
- B.C. Hydro
- Union Gas Limited

b) Eighty-one Crew Leaders and 43 System Response Representatives will be eligible for 2009. An additional two System Response Representatives will be eligible for 2010.

c) The cost of the Gain Sharing Program is estimated to be $260,000 if participants achieve target for all four KPIs on the 2009 Gain Sharing Scorecard. The cost, based on the same premise for 2010, is estimated to be $270,000.

d) Line 47 is an average of incentive pay. For 2009, the union category includes 31 employees who were members of the Society of Energy Professionals (“SEP”) and receive incentive pay under THESL’s Compensation Program. For 2010, the union category includes 37 SEP employees plus the 124 employees in the Gain Sharing Program. While both programs are incentive pay programs, they are different in design and payout eligibility. The addition of 124 employees reduced the overall average.

e) The Gain Sharing Scorecard is a subset of the THESL Scorecard which has not yet been approved by THESL’s Board of Directors for 2010 and can be provided upon Board of Directors approval.

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INTERROGATORY 11:

Reference(s): **Exhibit C1 Tab 1 Schedule 4**
Exhibit C2 Tab 1 Schedule 6

a) Provide the 2010 Executive and Management Scorecards for THC and THESL.

b) Compare/ contrast the Scorecards and provide explanations for any material changes for 2010.

c) Compare the Scorecard to that for the Unionized Employees Gain Sharing plan and highlight the linkages and rationale for the main differences.

RESPONSE:

a) The 2010 Executive and Management Scorecards for 2010 have not yet been approved by the Board of Directors and can be provided upon Board of Directors approval.

b) See a) above.

c) See a) above.

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INTERROGATORY 12:

Reference(s): Exhibit C2 Tab 1 Schedule 2 Page 5

a) Please justify an increase in Total Compensation of over 13% for 2010 combined with an increase in Average compensation per employee from 123,490 to 125,650 or 1.8% when THESL customers are faced with losing their jobs or just getting by on their current compensation and businesses are closing and/or laying off employees?

b) Why would not THESL recognize that the economic situation remains dire and postpone or modify its expansion plans for 2010?

c) Provide the rationale and details of the calculations for the increase in the % of total compensation capitalized from ~42.9% in 2008 Board Approved to ~46.6% in 2010.

RESPONSE:

a) To attract new talent and retain current staff, including our seasoned employees, THESL's total compensation must be competitive with the market. THESL compensation system is performance-based therefore, any increase in base salary and payout of incentive pay is tied to achievement of business results. Extending this linkage of compensation to performance, THESL has also added Gain Sharing for key bargaining unit positions to drive productivity improvement. Payout of the Gain Sharing incentive pay will be based on attainment of Key Performance Indicators on THESL scorecard. The Total Compensation of approximately 11% for 2010 also includes the second year increase of a five-year collective agreement that will provide labour stability for the coming years. Furthermore, this increase captures the additional cost of hiring new full-time employees into THESL's workforce.

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b) THESL needs to carry out sustaining and emerging plans for 2010 to maintain system reliability, service quality, integration of present and anticipated distribution requirements, minimize long-run life-cycle costs, address government initiatives such as the GEGEA, Transit City expansion requests and other emerging requirements. These requirements are not dependent on the economy.

c) The increase in the percentage of total compensation capitalized from ~42.9% in 2008 Board-Approved to ~46.6% in 2010 attributed by the growing capital program in THESL.

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INTERROGATORY 13:

Reference(s): **Exhibits C2 Tab 1 Schedule 5**
Exhibits C2 Tab5 Schedule1 page 5-7 and Tables 2 and 3

Table 1 Shows 53 retirements in 2009 and 38 retirements in 2010

a) Provide an update of 2009 retirements and the impact of the variance on 2009 total compensation.

b) Show the 2010 forecast breakdown of retirements by type of position and level.

c) Provide a schedule of the forecast retirements by Quarter of 2010 and the associated impact on 2010 total compensation. Reconcile the estimated $ impact to the amounts shown at lines17-20 of C2 Tab1 Schedule 2 Appendix A.

RESPONSE:

a) In 2009, 30 employees have retired to date. It is expected that these employees will be replaced with no material impact to 2009 total compensation.

b) The table below outlines the 2010 forecasted retirements by employee category.

Employee Category	2010 Forecasted Retirements
Executive	
Mangerial	4
Management/Non-Union	3
Union	31
Total	38

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The table below outlines the 2010 forecasted retirement per quarter.

2010 Quarter	Forecasted Retirements
Q1 2010	15
Q2 2010	8
Q3 2010	7
Q4 2010	8
Total	38

It is expected that these employees will be replaced with no material impact to 2010 total compensation.

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INTERROGATORY 14:

Reference(s): **Exhibit C2 Tab1 Schedule 2 Appendix A**
Exhibit C2 Tab5 Schedule1 page 5-7 and Tables 2 and 3

In 2010, some 130 new employees will be hired into leadership, trades, technical and customer service positions, along with engaging contractors.

a) Reconcile the Union Head count average of 1265 in 2009 and 1326 for Union employees C2 Tab1 Schedule 2 Appendix A with C2 Tab5 Schedule1Tables 2 and 3.

b) Provide a schedule that shows by month the hiring plan for Union Employees by level and the associated $ impact on 2010 total compensation costs. Reconcile the total compensation cost to the amounts shown at line 31 of C2 Tab1 Schedule 2 Appendix A.

c) Provide a schedule that shows by month the hiring plan for non-union employees by level and the associated $ impact on 2010 total compensation costs. Reconcile the total compensation cost to the amounts shown at lines 29 and 30 of C2 Tab1 Schedule 2 Appendix A.

d) If delays in hiring occur (as appears to be the case in 2008 and 2009) estimate the impact on total compensation of a reduction in 10 FTEs for non-union employees and a reduction of 10 FTEs in union employees. State clearly your timing assumptions.

RESPONSE:

a) 1265 and 1326 in Exhibit C2, Tab1, Schedule 2 Appendix A are FTEs for the Union employee category, not average headcounts. In 2009, the Trades Apprentices staffing plan number of 82 on Table 2 is comprised of 76 underground/overhead line apprentices, four meter mechanic apprentices and two apprentice program graduates. In 2010, the 128 is comprised of 80 apprentices continuing in the program plus an

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additional 40 line apprentices, four meter mechanics and four stations apprentices to be hired in 2010. In 2010, the Technical Apprentice staffing plan number of 62 on Table 3 is comprised of 29 current apprentices plus 33 technical apprentices to be hired in 2010. The numbers shown in these Tables are headcounts, not FTEs.

b & c)

Table below shows by month the hiring plan for Managerial, Management/Non-Union and Union Employees with the associated $ impact on total compensation (Salary, Wages & Benefits).

Hiring Plan

Category	Jan	Feb	Mar	Jun	Aug	Total
Managerial	$ -	$ -	$ -	$ 192 k	$ -	$ 192 k
Mgmt / Non Union	$ 3,983 k	$ -	$ 1,247 k	$ 5,268 k	$ -	$ 10,498 k
Union	$ 5,151 k	$ 1,281 k	$ 656 k	$ 2,308 k	$ 596 k	$ 9,992 k
	$ 9,134 k	$ 1,281 k	$ 1,903 k	$ 7,767 k	$ 596 k	$ 20,681 k

Table below is the reconciliation between line 29, 30 and 31 "Total Compensation (Salary, Wages & Benefits)" as per Appendix A, C2-T1-S2.

Existing

Category	Jan	Feb	Mar	Jun	Aug	Total
Managerial	$ 9,073 k	$ -	$ -	$ -	$ -	$ 9,073 k
Mgmt / Non Union	$ 40,376 k	$ -	$ -	$ -	$ -	$ 40,376 k
Union	$ 129,986 k	$ -	$ -	$ -	$ -	$ 129,986 k
	$ 182,907 k	$ -	$ -	$ -	$ -	$ 182,907 k

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Hiring Plan & Existing

Category	Jan	Feb	Mar	Jun	Aug	Total
Managerial	$ 9,073 k	$ -	$ -	$ 192 k	$ -	$ 9,264 k
Mgmt / Non Union	$ 44,359 k	$ -	$ 1,247 k	$ 5,268 k	$ -	$ 50,874 k
Union	$ 135,137 k	$ 1,281 k	$ 656 k	$ 2,308 k	$ 596 k	$ 139,977 k
	$ 192,042 k	$ 1,281 k	$ 1,903 k	$ 7,767 k	$ 596 k	$ 203,588 k

d) Below is the estimated impact on total compensation of a reduction in 10 FTEs for non-union employees and a reduction of 10 FTEs in union employees for 12 months.

Category	Total
Mgmt / Non Union	$ 1,347 k
Union	$ 920 k

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INTERROGATORY 15:

Reference(s): Exhibit C2 Tab 2 Schedule 2 Table 1 Facilities Capital Plan

a) Provide a schedule based on Table 1 that shows the amounts expected to close to rate base in 2010 and 2011.

b) Assume that the expenditures are delayed by 6 months and revise the answer to part a) accordingly.

RESPONSE:

Please note that there was an error in costs provided in Exhibit C2, Tab 2, Schedule 2, Table 1. The error has no impact on rate base calculations as the figures were only incorrect for this Exhibit and were correct in the detailed calculations performed. The table should have been presented as such:

	2008 Historical	2009 Bridge	2010 Test
Administrative offices and operations centres	2.3	3.8	11.5
Substations	0.1	1.5	1.1
Environmental	0.1	0.2	0.2
Office Furniture	1.1	1.8	0.8
Total	3.5	7.3	13.6

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a) The amounts provided in Table 1 will impact rate base as such:

	2010 Test	2010 Rate Base	2011 Rate Base
Administrative offices and operations centres	11.5	4.9	6.6
Substations	1.1	0.5	0.6
Environmental	0.2	0.2	0.0
Office Furniture	0.8	0.6	0.2
Total	**13.6**	**6.2**	**7.4**

b) The estimated effect of a six-month delay would have the following impact on rate base assuming THESL could still complete the projects by 2011:

	2010 Test	2010 Rate Base	2011 Rate Base
Administrative offices and operations centres	11.5	0.0	11.5
Substations	1.1	0.0	1.1
Environmental	0.2	0.1	0.1
Office Furniture	0.8	0.1	0.7
Total	**13.6**	**0.2**	**13.4**

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INTERROGATORY 16:

Reference(s): **Exhibit D1 Tab 2 Schedule 1 Table 5**
Exhibit D1, Tab 4, Schedule 1

a) Provide a Schedule that shows details of the major additions to fixed assets in 2010.

RESPONSE:

Refer to Appendix A of this Schedule.

Appendix A: Fixed Asset Continuity Schedule ($ millions)
2010 Test

				Cost				Accumulated Depreciation				
CCA Class	OEB	Description	Depreciation Rate	Opening Balance	Additions	Disposals and Transfers	Closing Balance	Opening Balance	Additions	Disposals and Transfers	Closing Balance	Net Book Value
N/A	1805	Land	NA	2.2	-	-	2.2	-	-	-	-	2.2
CEC	1806	Land Rights	2.0%	-	-	-	-	-	-	-	-	-
47	1808	Buildings	2.0%	46.2	0.9	-	47.1	16.6	0.9	-	17.5	29.6
13	1810	Leasehold Improvements	10.0%	-	-	-	-	-	-	-	-	-
47	1815	Transformer Station Equipment >50 kV	2.5%	11.9	-	-	11.9	4.1	0.3	-	4.5	7.4
47	1820	Substation Equipment	3.3%	194.3	27.0	-	221.2	83.0	5.9	-	88.9	132.3
47	1825	Storage Battery Equipment	NA	-	-	-	-	-	-	-	-	-
47	1830	Poles, Towers & Fixtures	4.0%	335.7	28.1	0.0	363.7	158.3	12.8	-	171.2	192.6
47	1835	OH Conductors & Devices	4.0%	345.9	16.0	(0.0)	361.9	228.2	12.8	-	241.0	120.9
47	1840	UG Conduit	4.0%	1,111.6	85.3	(0.0)	1,197.0	547.7	42.4	-	590.2	606.8
47	1845	UG Conductors & Devices	4.0%	686.2	77.5	(0.0)	763.7	351.8	27.2	-	379.0	384.7
47	1850	Line Transformers	4.0%	639.4	50.8	(0.0)	690.2	333.3	23.4	-	356.6	333.6
47	1855	Services (OH & UG)	4.0%	64.2	13.9	-	78.1	9.2	2.8	-	12.0	66.0
47	1860	Meters	4.0%	138.0	0.5	-	138.5	106.3	8.9	-	115.2	23.3
47	1861	Smart Meters	6.7%	64.6	24.5	22.8	66.3	-	-	-	-	66.3
47	1861A	Smart Meters/Communication Systems	6.7%	-	-	-	-	-	-	-	-	-
N/A	1905	Land	NA	1.9	-	-	1.9	-	-	-	-	1.9
CEC	1906	Land Rights	2.0%	-	-	-	-	0.0	-	-	0.0	(0.0)
47	1908	Buildings & Fixtures	2.0%	104.6	6.8	0.0	111.4	36.8	1.9	-	38.7	72.7
13	1910	Leasehold Improvements	20.0%	19.5	0.6	-	20.1	9.4	3.5	-	12.9	7.1
8	1915	Office Furniture & Equipment 10yr	10.0%	25.6	1.0	-	26.6	19.9	0.9	-	20.8	5.8
8	1915B	Office Furniture & Equipment 5yr	10.0%	-	-	-	-	-	-	-	-	-
10	1920	Computer - Hardware	20.0%	51.1	6.0	2.1	55.0	43.3	3.7	-	47.0	7.9
45	1921	Computer - Hardware post Mar 22/04	20.0%	-	-	-	-	-	-	-	-	-
45.1	1921	Computer - Hardware post Mar 19/07	20.0%	-	-	-	-	-	-	-	-	-
12	1925	Computer Software	20.0%	167.8	23.7	0.0	191.4	120.7	16.6	-	137.3	54.2
10	1930A	Transportation Equipment - Automobiles	25.0%	2.0	-	-	2.0	1.6	0.2	-	1.8	0.2
10	1930B	Transportation Equipment - Trucks <3 tonnes	20.0%	9.8	1.8	-	11.6	7.8	0.9	-	8.7	2.9
10	1930C	Transportation Equipment - Trucks >3 tonnes	12.5%	53.4	8.8	-	62.2	34.9	4.0	-	38.9	23.3
10	1930D	Transportation Equipment - Work and Service	12.5%	2.5	-	-	2.5	1.9	0.1	-	2.0	0.5
8	1935	Stores Equipment	10.0%	5.5	-	-	5.5	5.5	0.0	-	5.5	0.0
8	1940	Tools, Shop & Garage Equipment	10.0%	32.6	1.6	-	34.3	23.8	1.4	-	25.3	9.0
8	1945	Measurement & Testing Equipment	10.0%	4.5	-	-	4.5	4.2	0.1	-	4.3	0.3
8	1950	Power operated Equipment	12.5%	-	-	-	-	-	-	-	-	-
8	1955	Communications Equipment	20.0%	30.6	0.3	-	31.0	25.2	1.9	-	27.1	3.8
8	1960	Graphics Equipment	10.0%	0.1	-	-	0.1	0.1	-	-	0.1	-
47	1965	Water Heater Rental Units	10.0%	-	-	-	-	-	-	-	-	-
47	1970	Load Management Controls	10.0%	14.8	-	-	14.8	7.7	1.3	-	9.1	5.8
47	1975	Load Management Controls Utility Premises	10.0%	0.6	-	-	0.6	0.6	-	-	0.6	-
47	1980	System Supervisor Equipment	6.7%	53.2	11.7	-	64.9	33.9	2.5	-	36.5	28.5
47	1985	Miscellaneous Fixed Assets	10.0%	-	-	-	-	0.0	-	-	0.0	(0.0)
47	1996	Hydro One S/S Contribution		-	-	-	-	-	-	-	-	-
47	1995	Contributions & Grants	4.0%	(252.0)	(17.9)	0.0	(269.9)	(43.4)	(9.7)	-	(53.1)	(216.8)
10	2005	Property Under Capital Lease	25%	0.9			0.9				-	0.9
		Total		3,969.2	368.8	24.8	4,313.1	2,172.4	167.0	-	2,339.4	1,973.7

Note 1: Components may not add up exactly to Total due to rounding.
Note 2: Depreciation for "2005 - Property under Capital Lease" is included in "1930 - transportation Equipment - Automobiles"

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INTERROGATORY 17:

Reference(s): **Exhibits D1 Tab 3 Schedule 1 Table 1**
Exhibit F1 Tab1 Schedule 1

a) Provide a version of Table 1 that separates Controllable O&M Expense from Amortization by inserting a line Subtotal Controllable O&M Expense.

b) Insert lines showing the annual year over year Increases and % increases for both Controllable O&M Expense and Amortization.

RESPONSE:

See Appendix A of this Schedule.

Appendix A
Distribution Expense Summary ($ millions)

						Year over Year Change							
	2008 Board-Approved	2008 Historical	2009 Board-Approved	2009 Bridge	2010 Test	2008 Approved vs. Actual	2008 Approved vs. Actual %	2008 Actual vs. 2009 Approved	2008 Actual vs. 2009 Approved %	2009 Approved vs. Bridge	2009 Approved vs. Bridge %	2009 Bridge vs. 2010 Test	2009 Bridge vs. 2010 Test %
Operations	57.2	45.8	59.2	51.5	64.6	- 11.4	-19.9%	13.4	29.3%	- 7.7	-13.0%	13.1	25.4%
Maintenance	46.5	41.3	48.8	44.5	43.5	- 5.2	-11.2%	7.5	18.2%	- 4.3	-8.8%	- 1.0	-2.2%
Billing and Collections	35.6	31.9	38.6	35.4	37.0	- 3.7	-10.4%	6.7	21.0%	- 3.2	-8.3%	1.6	4.5%
Community Relations	3.0	3.5	3.2	4.1	4.5	0.5	16.7%	- 0.3	-8.6%	0.9	28.1%	0.4	9.8%
Administrative and General	35.4	46.1	33.8	46.8	62.6	10.7	30.2%	- 12.3	-26.7%	13.0	38.5%	15.8	33.8%
Other Distribution Expenses	13.5	14.0	12.0	11.9	8.7	0.5	3.7%	- 2.0	-14.3%	- 0.1	-0.8%	- 3.2	-26.9%
Subtotal	**191.2**	**182.6**	**195.6**	**194.2**	**220.9**	**- 8.6**	**-4.5%**	**13.0**	**7.1%**	**- 1.4**	**-0.7%**	**26.7**	**13.7%**
Amortization Expense	146.9	149.0	154.4	158.4	167.0	2.1	1.4%	5.4	3.6%	4.0	2.6%	8.6	5.4%
Total	**338.1**	**331.6**	**350.0**	**352.6**	**387.9**	**- 6.5**	**-1.9%**	**18.4**	**5.5%**	**2.6**	**0.7%**	**35.3**	**10.0%**

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INTERROGATORY 18:

Reference(s): **Exhibit D1 Tab 3 Schedule 1 Table 1**
Exhibit F1 Tab1 Schedule1 Table 1

Trends in OM&A are important to understanding efficiency gains and comparisons to similar distributors

a) With regard to benchmarking THESL's historic OM&A costs, confirm/correct the base data for 2005 and 2007 shown in the file "Comparison of Distributors (EB-2006-0268)" found on the OEB web site: http://www.oeb.gov.on.ca/OEB/_Documents/EB-2006-0268/Comparison_of_Distributors_with_2007_data.xls

2007	2006	2005
$167,979,422	$154,607,722	$157,441,700

b) For the historic and bridge years 2008-2009 compute the THESL OM&A cost per customer.

c) Compute the OM&A per kilowatt hour of energy distributed for the years 2005-2009.

d) Compute the year over year percentage increases and discuss trends in OM&A per customer and per Kilowatt hr of energy distributed .2005-2009.

e) Compute the forecast metrics (OM&A/customer and per kWh distributed) for 2010 and discuss the changes relative to 2005-2009 and the implied trend.

RESPONSE:

a) 2008 EDR and 2010 EDR data is available for comparative purposes.

b) See Appendix A of this Schedule.

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c) See Appendix A of this Schedule.

d) See Appendix A of this Schedule. The overall trend in OM&A per Kilowatt hour (KWh) and per customer implies an increase from 2005-2009.

The increase in OM&A per KWh is partially driven by a decrease in load consumption since 2007 due to conservation activities and economic conditions. A steady increase in OM&A expenses since 2007 has contributed to the overall increase in OM&A per KWh.

THESL has continued to experience modest customer growth since 2007 impacted by the increase in suite meter customers. This has helped to offset the increase in OM&A per customer to some extent. A steady increase in OM&A expenses since 2007 has contributed to the overall increase in OM&A per customer.

e) See Appendix A of this schedule. The trend in 2010 OM&A costs per KWh and customer implies a year over year increase of 14.5% and 12.7%, respectively. Similar trends are observed in 2010 for KWh, customers and OM&A expenses as in 2005-2009. Refer to explanation above for further detail.

OM&A Expense, Customer and KWh Trending

	Reference	2005 Historical	2006 Historical	2007 Historical	2008 Historical	2009 Bridge	2010 Test
THESL OM&A Expense		**157.4**	**169.4**	**168.0**	**182.6**	**194.2**	**220.9**
Total Kilowatt hours	K1/T3/S1	26,336,651,977	25,519,951,665	25,755,440,781	25,142,336,053	25,038,061,786	24,865,322,485
Cost per Kilowatt hr		0.0060	0.007	0.007	0.007	0.008	0.009
change per kilowatt hr ($)			0.001	- 0.000	0.001	0.000	0.001
change per kilowatt hr (%)			11.0%	-1.7%	11.4%	6.8%	14.5%
Total Customers	K1/T4/S1	674,231	677,645	679,327	684,143	688,047	694,551
Cost per customer		233.5	250.0	247.3	266.9	282.2	318.0
change per customer ($)			16.5	- 2.7	19.6	15.3	35.8
change per customer (%)			7.1%	-1.1%	7.9%	5.7%	12.7%

Notes:

1. THESL OM&A Expense excludes Amortization Expense and is presented in $ millions.
2. 2006 historical amounts were obtained from previous rate filing (D1/T3/S1).
3. 2005 and 2007 historical amounts were obtained from the OEB web site mentioned in part a) of this IR.

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INTERROGATORY 19:

Reference(s): **Exhibit D1, Tab7 Schedule 1 Page 20**
Exhibit D1 Tab 10, Schedule 4. Page 6

a) Reconcile explain the amount of $423.6 million shown for 2010 CAPEX with the amount of $366.6 million shown in the Ten year Capital Plan (pages 6 and 43).

RESPONSE:

The summary of Capital Budget as shown on page 19 of 20 in Exhibit D1, Tab 7, Schedule 1 is correct. Line item labeled "Total Sustaining Capital" with $157.0 M is common and identical to both documents. Line items labeled "Reactive Work" with $22.5M, Customer Connections" with $32.5M, and "Customer Capital Contribution" with ($24.4M) are common and identical to both documents.

Line item "Asset Management" with $2.8M in Exhibit D1, Tab 7, Schedule 1 has been included in the Stations System Enhancement Exhibit D1, Tab 8, Schedule 10.

Line item "Engineering Capital" with $31.2M in Exhibit D1, Tab 7, Schedule 1 does not correspond to the line item "Engineering Capital" with $30.1M in Exhibit D1, Tab 8, Schedule 10. Engineering Capital is a function of Total Capital and the $30.1M represents a number derived from a previous iteration of a smaller capital. The Line Item "Engineering Capital" with $31.2M Exhibit D1, Tab 7, Schedule 1 will remain as is and the line item "Engineering Capital" with $30.1M in Exhibit D1, Tab 8, Schedule 10 will be revised to $31.2M.

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Line item “AFUDC” with $4.4Min Exhibit D1, Tab 7, Schedule 1 (Allowance for Funds Used During Construction) was not considered in the 2010-2019 Electrical Distribution Capital as it is a financial concept that does not need to be considered for Capital Construction Projects.All line items within General Plan, Customer Services and Information Technology in Exhibit D1, Tab 7, Schedule 1 (Total of $75.6M), are not captured in the 2010-2019 Electrical Distribution Capital Plan in Exhibit D1, Tab 8, Schedule 10.

Line items “Standardization”, Downtown Contigency”, “FESI 7 / WPF”, “Smart Grid Operations”, “Externally Initiated Plant Relocations”, and “Secondary Upgrade” are common and identical in both documents.

Line item “Stations System Enhancements” with $15.2M in Exhibit D1, Tab 7, Schedule 1 is short by $2.8M as explained earlier and once considered does equate to the $18.0M as shown in line item “Stations System Enhancements” in Exhibit D1, Tab 8, Schedule 10.

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INTERROGATORY 20:

Reference(s): **Exhibit D1, Tab7 Schedule 1 Page 20**

Exhibit D1 T9 S5 page 4 Table 1

a) Provide an explanation for the differences in the 2008 Historical and 2009 Bridge year figures for plant relocations.

b) If as stated, plant relocations are driven by City and TTC infrastructure development, please provide the details how cost sharing/recovery works and what the costs and recoveries are in 2009 and forecast for 2010.

c) Provide details of the $27.6 million cost in 2010 in terms of major projects >$1 million including costs of asset retirement/replacement and relocation.

RESPONSE:

a) In Exhibit D1, Tab 9, Schedule 5, below Table 1, it is noted that the 2008 Historical and 2009 Bridge Gross amounts are captured in the sustaining capital programs and are not shown separately in the summary table in Exhibit D1, Tab 7, Schedule 1. Starting 2010 THESL decided to identify these externally initiated plant relocation projects separately from other programs due to the large number of anticipated requests from external agencies (particularly due to various level of Governments stimulus package). Until then these projects were included within existing THESL sustaining capital programs.

b) The Government of Ontario’s *Public Service Works on Highway Act*, R.S.O. 1990, Chapter P.49, provides the formula on cost sharing/recovery arrangements between the Utilities and all road authorities (i.e., Government/City) on those projects that requires the Utilities plant relocation projects. This cost sharing/recovery act

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stipulates that THESL pay 100 percent of materials used on plant relocation projects. However, the associated labour and vehicle cost are shared 50:50. (50 percent by THESL and 50 percent by the requester). All TTC-initiated plant relocation projects are paid by the TTC 100 percent.

c) See response to Board Staff interrogatory #75 a).

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INTERROGATORY 21:

Reference(s): Exhibit D1 Tab 10 Schedule 4

a) Provide details of the impact on 2010 rate base and revenue requirement of 3 and 6 months delay in the go live date for the new CIS.

RESPONSE:

The correct reference for this interrogatory is Exhibit D1, Tab 8, Schedule 8-4.

In the event the implementation, currently set for June 2010, is delayed by 3 (or 6) months, the 2010 rate base would increase by approximately by 600K (or 1,200K) respectively. The increase in revenue requirement in 2010 would be approximately 50K (or 100K). However, measures are put in place to ensure no further delays affect this strategic initiative.

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INTERROGATORY 22:

Reference(s): **Exhibit D1, Tab 8, Schedule 8-5**
Exhibit F1, Tab 7, Schedule 1, Table 1, page 5

a) Provide more details of what improved customer services are being provided for an additional $1.8 million in 2010.

b) How is the cost/benefit of the new customer relationship program being measured? Provide details.

c) In the Summer windstorm of 2009 customers were unable to reach THESL by phone for an extended period and the automated outage reporting system also was inaccessible for a long period. What steps has THESL taken to rectify this situation in future emergencies?

RESPONSE:

a) In 2010, a $1.8 million increase in the operational budget is shown in Exhibit F1, Tab 7, Schedule 1, Table 1 under Customer Relationship Management. Additional resources are required to maintain customer service levels during the transition to TOU rates and the launch of the new customer information system. Staff will assist customers in understanding the tools available to proactively manage their energy use. Also resources will be allocated to manage AMI data and the introduction of customer self service features, using web-based technology.

b) The description of the IT component of the CRM program is presented in Exhibit D1, Tab 8, Schedule 8-5. The benefits will be measured and reported using the following metrics:

   1) Target average Call Centre response times (measuring Call Response and Quality) less than 30 seconds

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2) Improved customer satisfaction against benchmark surveys completed in 2008. Surveys will assess customer experience across key touch points: service reliability, customer service, service offerings and communications
3) Key Performance Indicators will set targets and track performance

c) THESL has made improvements to the Interactive Voice Response System (IVR) to increase the volume of calls that can simultaneously access our telephone and automated reporting system. Also, the location of the outage message has been moved, so customers can hear the information immediately. This reduces customer wait time and increases the capacity to handle customer calls. The number of staff trained to handle power outage and emergency calls has been increased, and a more efficient after-hours staff call-in process has been implemented.

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INTERROGATORY 23:

Reference(s): **Exhibit D1, Tab 9, Schedule 7**

a) Provide a Schedule showing all CAPEX and OM&A costs in 2010 related to remediation as a result of the Level III contact voltage remediation emergency.

b) Provide a copy of the multi-year CV remediation program.

RESPONSE:

a) In addition to this follow up work to the Level III contact voltage remediation emergency of $6.5 million, two capital programs have been proposed related to the standardization of equipment arising from the contact voltage remediation emergency:
Handwell standardization: $9.2 million (refer to Exhibit D1, Tab 9, Schedule 1) and distribution cable serving street lighting standardization: $5.2 million (refer to Exhibit D1, Tab 9, Schedule 1)

One OM&A program has been proposed related to the contact voltage remediation emergency:
Contact voltage scan in the predictive maintenance program: $4.4 million (refer to Exhibit F1, Tab 1, Schedule 4)

b) A three-year OM&A program is proposed for contact voltage scanning in the predictive maintenance program with Power Survey Company for the use of an approved proprietary system to scan the city for potential of contact voltage four times a year. The program is described in Exhibit F1, Tab 1, Schedule 4, pages 5 and 6.

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INTERROGATORY 24:

Reference(s): Exhibit E1 Tab1 Schedule1 page 3

a) Will THESL update the forecast coupon rate for the new debt issue and/or provide this as soon as available?

b) What happens to your answer to part a) if the Coupon rate is different from forecast but the Board has not issued its Decision?

c) Provide the basis of the proposed coupon rate of 5.75% - sources of forecast etc.

RESPONSE:

a) Please see response to Board Staff interrogatory #83.

b) THESL is prepared to update its cost of capital up to the time of rate finalization for actual debt issuances only. However, for obvious reasons, THESL cannot be expected to update forecast debt costs on an ongoing basis in a forward test year framework.

c) Please see response to BOMA interrogatory 45 e).

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INTERROGATORY 25:

Reference(s): **Exhibit E1 Tab4 Schedule1 and Schedule 2**

a) Provide the details of the calculation supporting the Long and Medium Term debt principle amount of $1,210.9 million for 2010 in Schedule 1 and reconcile this with the amount of average monthly debt of $1,277,491,219 shown in Schedule 2.

b) For Cost of Capital calculation purposes confirm that the amount in Schedule 1 ($1,210.9 million is the appropriate principle amount).

c) Show how the forecast LMT Debt average coupon rate of 5.60% was calculated.

d) Confirm that this coupon rate as well as the ST debt rate will be updated as soon as available.

RESPONSE:

a) The $1,210.9 million shown in Exhibit E1, Tab 4, Schedule 1 is the deemed long-term debt component of the capital structure. The $1,277,491,219 is the forecast actual average of monthly debt outstanding for the Test Year.

b) For computation of the overall cost of capital, the deemed capital structure – and deemed medium and long term debt component – is the value to use.

c) The 5.60% is calculated from the Total Carrying costs (7, Row 8) of $71,596,043 divided by the average of monthly debt outstanding (Exhibit E1, Tab 4, Schedule 2, Column 4, Row 8) of $1,277,491,219.

d) Please see response to Board Staff interrogatory #83. THESL will incorporate the Board-Approved ROE and Short-term Debt rate according to the established Cost of

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Capital Guidelines, when the information is available.

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INTERROGATORY 26:

Reference(s): Exhibit F1 Tab 1 Schedule 1, Table 2

Exhibit F1 Tab 1 Schedule 2 Table 1

The major increases between 2009 Bridge year and 2010 Test year can be attributed to the Contact Voltage Scan in the Maintenance Program, Time-of-Use in Customer Services and work force staffing in Operations Support.

a) How much of the increase in maintenance cost is related to the contact voltage scanning? Provide estimates of 2010 contractor costs and THESL in-house costs

b) Provide a copy of the PSC contract and/or the basis on which THESL is being charged $4.1 million for the services.

c) Exhibit F1 Tab 1Schedule 4 page 6 lists the 2010 scanning accomplishment as 630 square km. Explain why, since the scans are along streets/boulevards on the SEL system a better metric is not linear km scanned. List the basis of the contractor's charges – square km or linear km or other metric per the contract.

d) Explain why the preventative maintenance costs for street lighting asset verification (lines 18-20) be included in THESL[']s 2010 operating budget until the Board has made a determination that these are distribution assets.

e) Identify and list with references, all other operating and capital items related to THESI Street lighting assets in the 2010 budgets.

f) For the tree trimming operations budget provide the actual costs and accomplishment for 2008, 2009 and forecast 2010 based on feeder km trimmed

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RESPONSE:

a) Contact voltage scanning accounts for $4.4 million per year for the services of the Power Survey Company as explained in response to part b) below. An additional $1 million per year is required to fund the contract resources that perform real-time repair to any contact voltages that are detected.

b) This document contains information that THESL is contractually obligated to keep confidential. THESL is in discussion with the vendor about releasing this information. Release of the contract would be pursuant to the provisions of the OEB Practice Direction on Confidential information, section 6.

In addition, as noted at EB-2009-0243Transcript Volume 1, page 52 (the contact voltage proceeding) in an exchange between Mr. Buonaguro of VECC and the THESL witness panel, the amount of the contract is $4 million U.S. dollars. Using the updated 2010 exchange rate forecast of 1.092 found in Exhibit E1, Tab 5, Schedule 1 (revised November 30, 2009), the amount of the contract in Canadian dollars is $4.4 million. THESL will include this revised amount at the time of rate finalization.

c) The scanning of Toronto streets for contact voltage risks was completed on the basis of municipal map areas to ensure complete coverage of all areas. These map areas are best represented by an area measurement, as opposed to manually capturing distance travelled.

d) Please see Exhibit R1, Tab 9, Schedule 23, the response to SEC IR 23 (b)

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e) There are no capital and operating items related to THESI Street Lighting assets in the 2010 budgets.

f) Refer to Appendix A (Tree Trimming List for 2008, 2009 and 2010) for details of the circuit-kilometres scheduled for pruning each year. This program is fully completed each year and is on-track for completion in December 2009. Data related to budget and actual costs is expressed in cost per circuit. Publication of this data would disclose confidential vendor information. THESL is in discussion with the vendor about releasing this information. Release of this information would be pursuant to the provisions of the OEB Practice Direction on Confidential information, section 6.

toronto hydro electric system

Price Form 1
2008 Maintenance Pruning Circuit List and Quotation

Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)
ETNF1	ALLENBY MS	Y	1	2310 Islington Ave.	ETOBICOKE	4.16 kV	3.38		
ETNF2	ALLENBY MS	Y	2	2310 Islington Ave.	ETOBICOKE	4.16 kV	7.23		
ETNF3	ALLENBY MS	Y	3	2310 Islington Ave.	ETOBICOKE	4.16 kV	1.51		
NY53M24	BERMONDSEY II TS	N	4	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	4.17		
NY53M25	BERMONDSEY II TS	N	5	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	10.12		
NY53M26	BERMONDSEY II TS	N	6	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	6.92		
NY53M27	BERMONDSEY II TS	N	7	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	1.57		
NY53M28	BERMONDSEY II TS	N	8	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	3.9		
NYSS23F2	BOND MS	N	9	130 Bond Ave	NORTH YORK	4.16 kV	2.04		
ETWCF1	ELMHURST MS	Y	10	62 Elmhurst Dr	ETOBICOKE	4.16 kV	6.81		
ETWCF2	ELMHURST MS	Y	11	62 Elmhurst Dr	ETOBICOKE	4.16 kV	1.47		
ETWCF3	ELMHURST MS	Y	12	62 Elmhurst Dr	ETOBICOKE	4.16 kV	1.39		
NY53M1	BERMONDSEY I TS	N	13	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	2.06		
NY53M10	BERMONDSEY I TS	N	14	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	4.82		
NY53M2	BERMONDSEY I TS	N	15	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	1.06		
NY53M5	BERMONDSEY I TS	N	16	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	8.22		
NY53M6	BERMONDSEY I TS	N	17	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	9.16		
NY53M8	BERMONDSEY I TS	N	18	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	17.84		
NY53M9	BERMONDSEY I TS	N	19	178 BERMONDSEY RD.	NORTH YORK	27.6 kV	3.6		
ETZJF1	METEOR MS	Y	20	139 Carlingview Dr	ETOBICOKE	13.8 kV	0.97		
ETZJF2	METEOR MS	Y	21	139 Carlingview Dr	ETOBICOKE	13.8 kV	4.74		
ETLDF1	CLOVERDALE MALL MS	N	22	250 The East Mall	ETOBICOKE	4.16 kV	3.49		
ETUAF1	WATERCLIFFE MS	Y	23	40 A Watercliffe Rd	ETOBICOKE	4.16 kV	2.24		
ETUAF2	WATERCLIFFE MS	Y	24	40 A Watercliffe Rd	ETOBICOKE	4.16 kV	2.64		
ETUAF3	WATERCLIFFE MS	Y	25	40 A Watercliffe Rd	ETOBICOKE	4.16 kV	0.85		
ETEQF1	ENTERPRISE MS	Y	26	74 Leading Road	ETOBICOKE	13.8 kV	2.78		
ETEQF2	ENTERPRISE MS	Y	27	74 Leading Road	ETOBICOKE	13.8 kV	1.38		
ETEQF3	ENTERPRISE MS	Y	28	74 Leading Road	ETOBICOKE	13.8 kV	5.15		
ETNGF1	BRAEBURN MS	Y	29	15 Arcot Blvd	ETOBICOKE	4.16 kV	2.32		

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ETNGF2	BRAEBURN MS	Y	30	15 Arcot Blvd	ETOBICOKE	4.16 kV	0.6		
ETNGF3	BRAEBURN MS	Y	31	15 Arcot Blvd	ETOBICOKE	4.16 kV	1.06		
ETNGF4	BRAEBURN MS	Y	32	15 Arcot Blvd	ETOBICOKE	4.16 kV	0.81		
NYSS59F1	BROADLANDS MS	N	33	1 Broadlands Blvd	NORTH YORK	4.16 kV	3.33		
NYSS59F2	BROADLANDS MS	N	34	1 Broadlands Blvd	NORTH YORK	4.16 kV	2.31		
NYSS59F3	BROADLANDS MS	N	35	1 Broadlands Blvd	NORTH YORK	4.16 kV	2.04		
NYSS59F6	BROADLANDS MS	N	36	1 Broadlands Blvd	NORTH YORK	4.16 kV	0.93		
TOB10PQ	PARKDALE MS	N	37	1457 Queen St W	TORONTO	4.16 kV	0.96		
TOB2PQ	PARKDALE MS	N	38	1457 Queen St W	TORONTO	4.16 kV	0.64		
TOB3PQ	PARKDALE MS	N	39	1457 Queen St W	TORONTO	4.16 kV	2.42		
TOB4PQ	PARKDALE MS	N	40	1457 Queen St W	TORONTO	4.16 kV	0.36		
TOB5PQ	PARKDALE MS	N	41	1457 Queen St W	TORONTO	4.16 kV	2.06		
TOB6PQ	PARKDALE MS	N	42	1457 Queen St W	TORONTO	4.16 kV	1.25		
TOB7PQ	PARKDALE MS	N	43	1457 Queen St W	TORONTO	4.16 kV	0.02		
TOB8PQ	PARKDALE MS	N	44	1457 Queen St W	TORONTO	4.16 kV	2.02		
TOB9PQ	PARKDALE MS	N	45	1457 Queen St W	TORONTO	4.16 kV	1.5		
TOA200E	CARLAW TS	N	46	369 Carlaw Ave	TORONTO	13.8 kV	6.47		
TOA201E	CARLAW TS	N	47	369 Carlaw Ave	TORONTO	13.8 kV	7.23		
TOA480E	CARLAW TS	N	48	369 Carlaw Ave	TORONTO	13.8 kV	0.04		
TOB108E	CARLAW TS	N	49	369 Carlaw Ave	TORONTO	4.16 kV	2.78		
NYSS11F2	CUMMER MS	N	50	38 Cummer Ave	NORTH YORK	4.16 kV	0.07		
NYSS11F3	CUMMER MS	N	51	38 Cummer Ave	NORTH YORK	4.16 kV	0.87		
ETMGF1	ALBION MS	Y	52	2 Rampart Rd	ETOBICOKE	4.16 kV	4.49		
ETMGF2	ALBION MS	Y	53	2 Rampart Rd	ETOBICOKE	4.16 kV	1.12		
ETMGF3	ALBION MS	Y	54	2 Rampart Rd	ETOBICOKE	4.16 kV	0.85		
ETMGF4	ALBION MS	Y	55	2 Rampart Rd	ETOBICOKE	4.16 kV	0.83		
ETR29M1	REXDALE TS	Y	56	90 Westmore Dr	ETOBICOKE	27.6 kV	8.22		
ETR29M2	REXDALE TS	Y	57	90 Westmore Dr	ETOBICOKE	27.6 kV	6.32		
ETR29M3	REXDALE TS	Y	58	90 Westmore Dr	ETOBICOKE	27.6 kV	16.63		

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ETR29M33	REXDALE TS	Y	59	90 Westmore Dr	ETOBICOKE	27.6 kV	5.71		
ETR29M34	REXDALE TS	Y	60	90 Westmore Dr	ETOBICOKE	27.6 kV	3.14		
ETR29M35	REXDALE TS	Y	61	90 Westmore Dr	ETOBICOKE	27.6 kV	4.81		
ETR29M36	REXDALE TS	Y	62	90 Westmore Dr	ETOBICOKE	27.6 kV	5.96		
ETR29M4	REXDALE TS	Y	63	90 Westmore Dr	ETOBICOKE	27.6 kV	4.91		
ETR29M5	REXDALE TS	Y	64	90 Westmore Dr	ETOBICOKE	27.6 kV	7.97		
ETR29M6	REXDALE TS	Y	65	90 Westmore Dr	ETOBICOKE	27.6 kV	7.25		
ETARF1	ROYALCREST MS	Y	66	Martin Grove Rd. S. oF Steeles Ave.	ETOBICOKE	4.16 kV	0.19		
ETARF3	ROYALCREST MS	Y	67	Martin Grove Rd. S. oF Steeles Ave.	ETOBICOKE	4.16 kV	0.58		
ETARF4	ROYALCREST MS	Y	68	Martin Grove Rd. S. oF Steeles Ave.	ETOBICOKE	4.16 kV	0.76		
ETLGF1	GUNTON MS	Y	69	39 Gunton Dr	ETOBICOKE	4.16 kV	2.8		
ETLGF3	GUNTON MS	Y	70	39 Gunton Dr	ETOBICOKE	4.16 kV	0.8		
ETLGF4	GUNTON MS	Y	71	39 Gunton Dr	ETOBICOKE	4.16 kV	1.2		
ETZDF1	BELFIELD MS	Y	72	121 Belfield Rd	ETOBICOKE	4.16 kV	1.79		
ETZDF2	BELFIELD MS	Y	73	121 Belfield Rd	ETOBICOKE	4.16 kV	1.72		
ETZDF3	BELFIELD MS	Y	74	121 Belfield Rd	ETOBICOKE	4.16 kV	1.62		
ETZDF4	BELFIELD MS	Y	75	121 Belfield Rd	ETOBICOKE	4.16 kV	0.85		
NYSS44F1	SLOANE MS	N	76	180 Sloane Ave	NORTH YORK	4.16 kV	1.3		
NYSS44F2	SLOANE MS	N	77	180 Sloane Ave	NORTH YORK	4.16 kV	1.87		
NYSS44F3	SLOANE MS	N	78	180 Sloane Ave	NORTH YORK	4.16 kV	1.26		
ETVAF1	THISTLETOWN MS	Y	79	55 Thistledown Blvd	ETOBICOKE	4.16 kV	3.25		
ETVAF2	THISTLETOWN MS	Y	80	55 Thistledown Blvd	ETOBICOKE	4.16 kV	3.72		
ETVAF3	THISTLETOWN MS	Y	81	55 Thistledown Blvd	ETOBICOKE	4.16 kV	3.79		
ETVAF4	THISTLETOWN MS	Y	82	55 Thistledown Blvd	ETOBICOKE	4.16 kV	2.11		
TOB1CD	COLLEGE MS	N	83	955 College St	TORONTO	4.16 kV	0.36		
TOB2CD	COLLEGE MS	N	84	955 College St	TORONTO	4.16 kV	3.36		
TOB4CD	COLLEGE MS	N	85	955 College St	TORONTO	4.16 kV	1.12		
TOB5CD	COLLEGE MS	N	86	955 College St	TORONTO	4.16 kV	1.48		
TOB7CD	COLLEGE MS	N	87	955 College St	TORONTO	4.16 kV	1.5		

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TOA63H	HIGH LEVEL MS	N	88	292-296 Mac Pherson Ave	TORONTO	13.8 kV	0.02		
ETNFF1	MARMAC MS	Y	89	25 McLachlan Rd	ETOBICOKE	13.8 kV	4.4		
ETNFF2	MARMAC MS	Y	90	25 McLachlan Rd	ETOBICOKE	13.8 kV	2.25		
ETNFF3	MARMAC MS	Y	91	25 McLachlan Rd	ETOBICOKE	13.8 kV	2.83		
ETEHF1	CONSTELLATION MS	Y	92	367 Carlingview Dr	ETOBICOKE	13.8 kV	1.63		
ETEHF2	CONSTELLATION MS	Y	93	367 Carlingview Dr	ETOBICOKE	13.8 kV	1.71		
ETBRF1	HUMBERLINE MS	Y	94	267 Humberline Dr (FIREHALL #11)	ETOBICOKE	13.8 kV	5.39		
ETBRF2	HUMBERLINE MS	Y	95	267 Humberline Dr (FIREHALL #11)	ETOBICOKE	13.8 kV	4.45		
ETBRF3	HUMBERLINE MS	Y	96	267 Humberline Dr (FIREHALL #11)	ETOBICOKE	13.8 kV	0.28		
ETCAF1	REDCLIFF MS	Y	97	2130 Kipling Ave	ETOBICOKE	4.16 kV	3.99		
ETCAF2	REDCLIFF MS	Y	98	2130 Kipling Ave	ETOBICOKE	4.16 kV	1.32		
ETCAF3	REDCLIFF MS	Y	99	2130 Kipling Ave	ETOBICOKE	4.16 kV	0.43		
ETCAF4	REDCLIFF MS	Y	100	2130 Kipling Ave	ETOBICOKE	4.16 kV	1.77		
ETCAF5	REDCLIFF MS	Y	101	2130 Kipling Ave	ETOBICOKE	4.16 kV	2.3		
ETBQF2	WESTMORE MS	N	102	127 Westmore Rd	ETOBICOKE	13.8 kV	3.07		
ETD6M1	WOODBRIDGE TS	Y	103	5839 HWY#7(1km EAST OF HWY#27)	ETOBICOKE	27.6 kV	3.31		
ETD6M4	WOODBRIDGE TS	Y	104	5839 HWY#7(1km EAST OF HWY#27)	ETOBICOKE	27.6 kV	5.68		
ETYJF1	CHALLENGE MS	Y	105	196 Bethridge Rd	ETOBICOKE	4.16 kV	2		
ETYJF3	CHALLENGE MS	Y	106	196 Bethridge Rd	ETOBICOKE	4.16 kV	2.48		
ETYJF4	CHALLENGE MS	Y	107	196 Bethridge Rd	ETOBICOKE	4.16 kV	2.06		
ETYCF1	TAYSHAM MS	Y	108	153 Taysham Crescent	ETOBICOKE	4.16 kV	1.13		
ETYCF2	TAYSHAM MS	Y	109	153 Taysham Crescent	ETOBICOKE	4.16 kV	0.68		
ETYCF3	TAYSHAM MS	Y	110	153 Taysham Crescent	ETOBICOKE	4.16 kV	4.94		
ETAQF1	ANNABELLE MS	Y	111	1 Annabelle Dr	ETOBICOKE	4.16 kV	1.41		
ETAQF2	ANNABELLE MS	Y	112	1 Annabelle Dr	ETOBICOKE	4.16 kV	1.73		
ETAQF3	ANNABELLE MS	Y	113	1 Annabelle Dr	ETOBICOKE	4.16 kV	2.15		
ETAQF4	ANNABELLE MS	Y	114	1 Annabelle Dr	ETOBICOKE	4.16 kV	0.93		
ETPFF1	DELAMERE MS	Y	115	2094 Martin Grove Rd	ETOBICOKE	4.16 kV	1.87		
ETPFF2	DELAMERE MS	Y	116	2094 Martin Grove Rd	ETOBICOKE	4.16 kV	1.77		

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ETPFF3	DELAMERE MS	Y	117	2094 Martin Grove Rd	ETOBICOKE	4.16 kV	0.37		
ETKGF1	TIDEMORE MS	Y	118	307 Rexdale Blvd	ETOBICOKE	4.16 kV	1.31		
ETKGF2	TIDEMORE MS	Y	119	307 Rexdale Blvd	ETOBICOKE	4.16 kV	0.89		
ETKGF3	TIDEMORE MS	Y	120	307 Rexdale Blvd	ETOBICOKE	4.16 kV	1.39		
ETKGF4	TIDEMORE MS	Y	121	307 Rexdale Blvd	ETOBICOKE	4.16 kV	2.81		
NYSS38F1	BURBANK MS	N	122	165 Burbank Dr	NORTH YORK	4.16 kV	0.46		
ETDBF3	EVANS MS	N	123	194 Evans Ave	ETOBICOKE	4.16 kV	0.05		
YK88M12	RICHVIEW TS	N	124	65 Kelfield St	YORK	27.6 kV	22.61		
NYSS63F1	ESTELLE MS	N	125	639 Conacher Dr	NORTH YORK	4.16 kV	3.67		
EY53M3	BERMONDSEY I TS	N	126	178 Bermondsey Rd.	EAST YORK	27.6 kV	6.31		
EY53M7	BERMONDSEY I TS	N	127	179 Bermondsey Rd.	EAST YORK	27.6 kV	18.28		
EY34M1	LEASIDE TS	N	128	1080 Millwood Ave.	EAST YORK	27.6 kV	13.94		
EY34M2	LEASIDE TS	N	129	1080 Millwood Ave.	EAST YORK	27.6 kV	14.8		
EY34M3	LEASIDE TS	N	130	1080 Millwood Ave.	EAST YORK	27.6 kV	4.71		
EY34M4	LEASIDE TS	N	131	1080 Millwood Ave.	EAST YORK	27.6 kV	31.51		
EY34M8	LEASIDE TS	N	132	1080 Millwood Ave.	EAST YORK	27.6 kV	15.13		
TOB102KS	KEELE & ST. CLAIR MS	N	133	1860 St Clair Ave W	TORONTO	4.16 kV	0.2		
TOB1KS	KEELE & ST. CLAIR MS	N	134	1860 St Clair Ave W	TORONTO	4.16 kV	2.43		
TOB2KS	KEELE & ST. CLAIR MS	N	135	1860 St Clair Ave W	TORONTO	4.16 kV	2.55		
TOB3KS	KEELE & ST. CLAIR MS	N	136	1860 St Clair Ave W	TORONTO	4.16 kV	0.19		
TOB4KS	KEELE & ST. CLAIR MS	N	137	1860 St Clair Ave W	TORONTO	4.16 kV	2.56		
TOB5KS	KEELE & ST. CLAIR MS	N	138	1860 St Clair Ave W	TORONTO	4.16 kV	0.04		
NY34M5	LEASIDE TS	N	139	1080 Millwood Ave.	NORTH YORK	27.6 kV	4.56		
NY34M6	LEASIDE TS	N	140	1080 Millwood Ave.	NORTH YORK	27.6 kV	12.4		
NY34M7	LEASIDE TS	N	141	1080 Millwood Ave.	NORTH YORK	27.6 kV	18.15		
SCGF1	PROGRESS MARKHAM MS	N	142	895 Progress Ave	SCARBOROUGH	4.16 kV	0.7		
SCGF2	PROGRESS MARKHAM MS	N	143	895 Progress Ave	SCARBOROUGH	4.16 kV	0.8		
SCGF3	PROGRESS MARKHAM MS	N	144	895 Progress Ave	SCARBOROUGH	4.16 kV	1.11		
EY43M21	WARDEN TS	N	145	699 Warden Ave	EAST YORK	27.6 kV	3.96		

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EY43M31	WARDEN TS	N	146	699 Warden Ave	EAST YORK	27.6 kV	16.22		
EY43M32	WARDEN TS	N	147	699 Warden Ave	EAST YORK	27.6 kV	16.44		
SCR4323	WARDEN TS	N	148	699 Warden Ave	SCARBOROUGH	27.6 kV	20.43		
SCR4324	WARDEN TS	N	149	699 Warden Ave	SCARBOROUGH	27.6 kV	23.35		
SCR4325	WARDEN TS	N	150	699 Warden Ave	SCARBOROUGH	27.6 kV	6.27		
SCR4326	WARDEN TS	N	151	699 Warden Ave	SCARBOROUGH	27.6 kV	10.68		
SCR4327	WARDEN TS	N	152	699 Warden Ave	SCARBOROUGH	27.6 kV	21.58		
SCR4328	WARDEN TS	N	153	699 Warden Ave	SCARBOROUGH	27.6 kV	26.32		
SCR4329	WARDEN TS	N	154	699 Warden Ave	SCARBOROUGH	27.6 kV	18.45		
SCR4330	WARDEN TS	N	155	699 Warden Ave	SCARBOROUGH	27.6 kV	24.78		
NYSS27F1	WINFIELD MS	N	156	331 York Mills Rd	NORTH YORK	4.16 kV	2.04		
NYSS27F2	WINFIELD MS	N	157	331 York Mills Rd	NORTH YORK	4.16 kV	0.65		
NYSS27F3	WINFIELD MS	N	158	331 York Mills Rd	NORTH YORK	4.16 kV	1.56		
SCGE1	GALLOWAY DEARHAMWOOD	N	159	37 Galloway	SCARBOROUGH	4.16 kV	4.53		
SCGE2	GALLOWAY DEARHAMWOOD	N	160	37 Galloway	SCARBOROUGH	4.16 kV	2.49		
SCGE3	GALLOWAY DEARHAMWOOD	N	161	37 Galloway	SCARBOROUGH	4.16 kV	7.62		
TOB1SA	SPADINA MS	N	162	555 Spadina Rd	TORONTO	4.16 kV	4.29		
TOB3SA	SPADINA MS	N	163	555 Spadina Rd	TORONTO	4.16 kV	2.72		
TOA250DN	DUFFERIN TS	N	164	1045 Dufferin St	TORONTO	13.8 kV	7.1		
TOA251DN	DUFFERIN TS	N	165	1045 Dufferin St	TORONTO	13.8 kV	6.19		
TOA252DN	DUFFERIN TS	N	166	1045 Dufferin St	TORONTO	13.8 kV	7.35		
TOA253DN	DUFFERIN TS	N	167	1045 Dufferin St	TORONTO	13.8 kV	6.09		
TOA255DN	DUFFERIN TS	N	168	1045 Dufferin St	TORONTO	13.8 kV	4.79		
TOA256DN	DUFFERIN TS	N	169	1045 Dufferin St	TORONTO	13.8 kV	8.1		
TOA257DN	DUFFERIN TS	N	170	1045 Dufferin St	TORONTO	13.8 kV	6.57		
TOA258DN	DUFFERIN TS	N	171	1045 Dufferin St	TORONTO	13.8 kV	2.31		
TOA271DN	DUFFERIN TS	N	172	1045 Dufferin St	TORONTO	13.8 kV	7.42		
TOA273DN	DUFFERIN TS	N	173	1045 Dufferin St	TORONTO	13.8 kV	7.37		
TOA285DN	DUFFERIN TS	N	174	1045 Dufferin St	TORONTO	13.8 kV	7.24		

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TOA490DN	DUFFERIN TS	N	175	1045 Dufferin St	TORONTO	13.8 kV	2.65		
TOB1W	WILTSHIRE TS	N	176	13-19 Wiltshire Ave	TORONTO	4.16 kV	1.69		
TOB2W	WILTSHIRE TS	N	177	13-19 Wiltshire Ave	TORONTO	4.16 kV	2.71		
TOB3W	WILTSHIRE TS	N	178	13-19 Wiltshire Ave	TORONTO	4.16 kV	1.37		
TOB5W	WILTSHIRE TS	N	179	13-19 Wiltshire Ave	TORONTO	4.16 kV	3.35		
TOB6W	WILTSHIRE TS	N	180	13-19 Wiltshire Ave	TORONTO	4.16 kV	0.03		
TOB7W	WILTSHIRE TS	N	181	13-19 Wiltshire Ave	TORONTO	4.16 kV	0.07		
NYSS68F1	LESLIE MS	N	182	5733 Leslie St	NORTH YORK	13.8 kV	2.72		
NYSS68F10	LESLIE MS	N	183	5733 Leslie St	NORTH YORK	13.8 kV	2.24		
NYSS68F2	LESLIE MS	N	184	5733 Leslie St	NORTH YORK	13.8 kV	4.64		
NYSS68F3	LESLIE MS	N	185	5733 Leslie St	NORTH YORK	13.8 kV	5.59		
NYSS68F4	LESLIE MS	N	186	5733 Leslie St	NORTH YORK	13.8 kV	4.08		
NYSS68F5	LESLIE MS	N	187	5733 Leslie St	NORTH YORK	13.8 kV	7.41		
NYSS68F6	LESLIE MS	N	188	5733 Leslie St	NORTH YORK	13.8 kV	6.33		
NYSS68F7	LESLIE MS	N	189	5733 Leslie St	NORTH YORK	13.8 kV	5.59		
NYSS68F8	LESLIE MS	N	190	5733 Leslie St	NORTH YORK	13.8 kV	0.41		
NYSS68F9	LESLIE MS	N	191	5733 Leslie St	NORTH YORK	13.8 kV	5.49		
SCXG1	EAST AVE TUDOR GLEN MS	N	192	221 East Ave	SCARBOROUGH	13.8 kV	2.9		
SCXG2	EAST AVE TUDOR GLEN MS	N	193	221 East Ave	SCARBOROUGH	13.8 kV	2.98		
SCXG3	EAST AVE TUDOR GLEN MS	N	194	221 East Ave	SCARBOROUGH	13.8 kV	9.2		
TOB1MD	MILLWOOD MS	N	195	640 Millwood St	TORONTO	4.16 kV	0.04		
TOB2MD	MILLWOOD MS	N	196	640 Millwood St	TORONTO	4.16 kV	3.87		
TOB3MD	MILLWOOD MS	N	197	640 Millwood St	TORONTO	4.16 kV	3.22		
TOB109J	JUNCTION MS	N	198	26 Ruskin Ave	TORONTO	4.16 kV	2.11		
TOB10J	JUNCTION MS	N	199	26 Ruskin Ave	TORONTO	4.16 kV	1.64		
TOB115J	JUNCTION MS	N	200	26 Ruskin Ave	TORONTO	4.16 kV	3.74		
TOB11J	JUNCTION MS	N	201	26 Ruskin Ave	TORONTO	4.16 kV	2.73		
TOB14J	JUNCTION MS	N	202	26 Ruskin Ave	TORONTO	4.16 kV	5.65		
TOB15J	JUNCTION MS	N	203	26 Ruskin Ave	TORONTO	4.16 kV	6.32		

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TOB2J	JUNCTION MS	N	204	26 Ruskin Ave	TORONTO	4.16 kV	1.97		
TOB3J	JUNCTION MS	N	205	26 Ruskin Ave	TORONTO	4.16 kV	2.33		
TOB5J	JUNCTION MS	N	206	26 Ruskin Ave	TORONTO	4.16 kV	1.89		
TOB62J	JUNCTION MS	N	207	26 Ruskin Ave	TORONTO	4.16 kV	0.32		
TOB8J	JUNCTION MS	N	208	26 Ruskin Ave	TORONTO	4.16 kV	0.45		
TOB9J	JUNCTION MS	N	209	26 Ruskin Ave	TORONTO	4.16 kV	4.59		
SCKH1	BRIMLEY SHEPPARD MS	N	210	1994 Brimley Rd	SCARBOROUGH	13.8 kV	7.78		
SCKH2	BRIMLEY SHEPPARD MS	N	211	1994 Brimley Rd	SCARBOROUGH	13.8 kV	3.32		
SCKH3	BRIMLEY SHEPPARD MS	N	212	1994 Brimley Rd	SCARBOROUGH	13.8 kV	3.18		
SC4713	SHEPPARD EAST TS	N	213	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	8.17		
SC4714	SHEPPARD EAST TS	N	214	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	9.52		
SC4715	SHEPPARD EAST TS	N	215	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	12.26		
SC4716	SHEPPARD EAST TS	N	216	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	5.92		
SC4717	SHEPPARD EAST TS	N	217	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	9.84		
SC4718	SHEPPARD EAST TS	N	218	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	13.19		
NY80M21	FAIRCHILD II TS	N	219	5750 YONGE ST.	NORTH YORK	27.6 kV	7.04		
NY80M22	FAIRCHILD II TS	N	220	5750 YONGE ST.	NORTH YORK	27.6 kV	1.59		
NY80M23	FAIRCHILD II TS	N	221	5750 YONGE ST.	NORTH YORK	27.6 kV	0.12		
NY80M27	FAIRCHILD II TS	N	222	5750 YONGE ST.	NORTH YORK	27.6 kV	1.84		
NY80M28	FAIRCHILD II TS	N	223	5750 YONGE ST.	NORTH YORK	27.6 kV	4.31		
NY80M29	FAIRCHILD II TS	N	224	5750 YONGE ST.	NORTH YORK	27.6 kV	13.52		
NY80M30	FAIRCHILD II TS	N	225	5750 YONGE ST.	NORTH YORK	27.6 kV	10.56		
NY80M31	FAIRCHILD II TS	N	226	5750 YONGE ST.	NORTH YORK	27.6 kV	0.09		
NY80M32	FAIRCHILD II TS	N	227	5750 YONGE ST.	NORTH YORK	27.6 kV	0.37		
EYA11L	LEASIDE MS	N	228	1080 MILLWOOD AVE	EAST YORK	13.8 kV	9.46		
EYA12L	LEASIDE MS	N	229	1080 MILLWOOD AVE	EAST YORK	13.8 kV	13.88		
EYA13L	LEASIDE MS	N	230	1080 MILLWOOD AVE	EAST YORK	13.8 kV	16.88		
EYA14L	LEASIDE MS	N	231	1080 MILLWOOD AVE	EAST YORK	13.8 kV	8.17		
EYA16L	LEASIDE MS	N	232	1080 MILLWOOD AVE	EAST YORK	13.8 kV	1.12		

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Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)
EYA17L	LEASIDE MS	N	233	1080 MILLWOOD AVE	EAST YORK	13.8 kV	1.12		
EYA1L	LEASIDE MS	N	234	1080 MILLWOOD AVE	EAST YORK	13.8 kV	0.01		
EYA2L	LEASIDE MS	N	235	1080 MILLWOOD AVE	EAST YORK	13.8 kV	0.05		
SCH921	ELLESMERE TS	N	236	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	5.71		
SCH922	ELLESMERE TS	N	237	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	2.8		
SCH923	ELLESMERE TS	N	238	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	5.88		
SCH924	ELLESMERE TS	N	239	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	2.14		
SCH925	ELLESMERE TS	N	240	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	8.97		
SCH926	ELLESMERE TS	N	241	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	6		
SCH927	ELLESMERE TS	N	242	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	3.84		
SCH928	ELLESMERE TS	N	243	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	5.15		
SCH929	ELLESMERE TS	N	244	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	8.21		
SCH930	ELLESMERE TS	N	245	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	32.19		
SCH931	ELLESMERE TS	N	246	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	3.17		
SCH932	ELLESMERE TS	N	247	2501 Ellesmere Rd	SCARBOROUGH	27.6 kV	2.86		
SCPJ1	CENTENNIAL DARCY MAGEE	N	248	191 Centennial Rd	SCARBOROUGH	13.8 kV	4.04		
SCPJ2	CENTENNIAL DARCY MAGEE	N	249	191 Centennial Rd	SCARBOROUGH	13.8 kV	6.21		
SCPJ3	CENTENNIAL DARCY MAGEE	N	250	191 Centennial Rd	SCARBOROUGH	13.8 kV	3.27		
NY51M3	LESLIE I TS	N	251	5733 Leslie St	NORTH YORK	27.6 kV	4.35		
NY51M4	LESLIE I TS	N	252	5733 Leslie St	NORTH YORK	27.6 kV	6.47		
NY51M5	LESLIE I TS	N	253	5733 Leslie St	NORTH YORK	27.6 kV	8.01		
NY51M6	LESLIE I TS	N	254	5733 Leslie St	NORTH YORK	27.6 kV	5.04		
NY51M7	LESLIE I TS	N	255	5733 Leslie St	NORTH YORK	27.6 kV	15.15		
NY51M8	LESLIE I TS	N	256	5733 Leslie St	NORTH YORK	27.6 kV	20.84		
SCE51	SCARBOROUGH WEST TS	N	257	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	3.88		
SCE510	SCARBOROUGH WEST TS	N	258	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	6.73		
SCE52	SCARBOROUGH WEST TS	N	259	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	4.56		
SCE53	SCARBOROUGH WEST TS	N	260	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	16.64		
SCE54	SCARBOROUGH WEST TS	N	261	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	10.62		

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Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)
SCE55	SCARBOROUGH WEST TS	N	262	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	5.31		
SCE56	SCARBOROUGH WEST TS	N	263	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	17.12		
SCE58	SCARBOROUGH WEST TS	N	264	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	12.41		
SCE59	SCARBOROUGH WEST TS	N	265	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	7.19		
NY80M1	FAIRCHILD I TS	N	266	5750 YONGE ST.	NORTH YORK	27.6 kV	20.9		
NY80M10	FAIRCHILD I TS	N	267	5750 YONGE ST.	NORTH YORK	27.6 kV	11.83		
NY80M2	FAIRCHILD I TS	N	268	5750 YONGE ST.	NORTH YORK	27.6 kV	14.8		
NY80M3	FAIRCHILD I TS	N	269	5750 YONGE ST.	NORTH YORK	27.6 kV	5.49		
NY80M4	FAIRCHILD I TS	N	270	5750 YONGE ST.	NORTH YORK	27.6 kV	16.17		
NY80M5	FAIRCHILD I TS	N	271	5750 YONGE ST.	NORTH YORK	27.6 kV	11.09		
NY80M6	FAIRCHILD I TS	N	272	5750 YONGE ST.	NORTH YORK	27.6 kV	21.46		
NY80M7	FAIRCHILD I TS	N	273	5750 YONGE ST.	NORTH YORK	27.6 kV	3.89		
NY80M8	FAIRCHILD I TS	N	274	5750 YONGE ST.	NORTH YORK	27.6 kV	9.02		
NY80M9	FAIRCHILD I TS	N	275	5750 YONGE ST.	NORTH YORK	27.6 kV	5.46		
SCYG1	MARKHAM PANDORA MS	N	276	920 Markham Rd	SCARBOROUGH	4.16 kV	2.59		
SCYG2	MARKHAM PANDORA MS	N	277	920 Markham Rd	SCARBOROUGH	4.16 kV	3.13		
SCYG3	MARKHAM PANDORA MS	N	278	920 Markham Rd	SCARBOROUGH	4.16 kV	2.46		
NYSS46F2	LESMILL MS	N	279	1857 Leslie St	NORTH YORK	4.16 kV	2.8		
NYSS46F3	LESMILL MS	N	280	1857 Leslie St	NORTH YORK	4.16 kV	2.12		
TOA202BN	BASIN TS	N	281	23-25 Basin St	TORONTO	13.8 kV	9.11		
TOA203BN	BASIN TS	N	282	23-25 Basin St	TORONTO	13.8 kV	11.08		
TOA204BN	BASIN TS	N	283	23-25 Basin St	TORONTO	13.8 kV	5.24		
SCRJ1	MORNINGSIDE CORONATION	N	284	160 Morningside Ave	SCARBOROUGH	4.16 kV	4.06		
SCRJ2	MORNINGSIDE CORONATION	N	285	160 Morningside Ave	SCARBOROUGH	4.16 kV	5.44		
SCRJ3	MORNINGSIDE CORONATION	N	286	160 Morningside Ave	SCARBOROUGH	4.16 kV	2.68		
SCUA1	KINGSTON MCCOWAN MS	N	287	160 Morningside Ave	SCARBOROUGH	4.16 kV	4.61		

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
NYSS33F1	PEMBERTON MS	1	85 Pemberton Ave	NORTH YORK	4.16 kV	1.39			
NYSS33F2	PEMBERTON MS	2	85 Pemberton Ave	NORTH YORK	4.16 kV	4.06			
NYSS33F3	PEMBERTON MS	3	85 Pemberton Ave	NORTH YORK	4.16 kV	1.28			
SCSA1	KINGSTON MORNINGSIDE MS	4	4446 Kingston Rd	SCARBOROUGH	4.16 kV	4.67			
SCSA2	KINGSTON MORNINGSIDE MS	5	4446 Kingston Rd	SCARBOROUGH	4.16 kV	5.84			
SCSA3	KINGSTON MORNINGSIDE MS	6	4446 Kingston Rd	SCARBOROUGH	4.16 kV	1.76			
ET88M1	RICHVIEW TS	7	65 Kelfield St	ETOBICOKE	27.6 kV	7.95			
ET88M11	RICHVIEW TS	8	65 Kelfield St	ETOBICOKE	27.6 kV	11.89			
ET88M13	RICHVIEW TS	9	65 Kelfield St	ETOBICOKE	27.6 kV	9.75			
ET88M14	RICHVIEW TS	10	65 Kelfield St	ETOBICOKE	27.6 kV	8.06			
ET88M15	RICHVIEW TS	11	65 Kelfield St	ETOBICOKE	27.6 kV	10.26			
ET88M16	RICHVIEW TS	12	65 Kelfield St	ETOBICOKE	27.6 kV	6.09			
ET88M17	RICHVIEW TS	13	65 Kelfield St	ETOBICOKE	27.6 kV	6.68			
ET88M18	RICHVIEW TS	14	65 Kelfield St	ETOBICOKE	27.6 kV	11.32			
ET88M2	RICHVIEW TS	15	65 Kelfield St	ETOBICOKE	27.6 kV	5.35			
ET88M3	RICHVIEW TS	16	65 Kelfield St	ETOBICOKE	27.6 kV	5.81			
ET88M43	RICHVIEW TS	17	65 Kelfield St	ETOBICOKE	27.6 kV	9.74			
ET88M44	RICHVIEW TS	18	65 Kelfield St	ETOBICOKE	27.6 kV	4.17			
ET88M45	RICHVIEW TS	19	65 Kelfield St	ETOBICOKE	27.6 kV	17.18			
ET88M46	RICHVIEW TS	20	65 Kelfield St	ETOBICOKE	27.6 kV	12.76			
ET88M6	RICHVIEW TS	21	65 Kelfield St	ETOBICOKE	27.6 kV	4.42			
ET88M8	RICHVIEW TS	22	65 Kelfield St	ETOBICOKE	27.6 kV	4.66			
TOB109DA	DANFORTH MS	23	2357 Danforth Ave	TORONTO	4.16 kV	0.41			
TOB1DA	DANFORTH MS	24	2357 Danforth Ave	TORONTO	4.16 kV	1.95			
TOB2DA	DANFORTH MS	25	2357 Danforth Ave	TORONTO	4.16 kV	0.98			
TOB4DA	DANFORTH MS	26	2357 Danforth Ave	TORONTO	4.16 kV	1.45			
TOB6DA	DANFORTH MS	27	2357 Danforth Ave	TORONTO	4.16 kV	0.07			
TOB7DA	DANFORTH MS	28	2357 Danforth Ave	TORONTO	4.16 kV	3.78			
TOB8DA	DANFORTH MS	29	2357 Danforth Ave	TORONTO	4.16 kV	0.2			
TOB9DA	DANFORTH MS	30	2357 Danforth Ave	TORONTO	4.16 kV	4.83			
TOB2RD	RUNNYMEDE MS	31	518 Runneymede Rd	TORONTO	4.16 kV	2.05			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
TOB3RD	RUNNYMEDE MS	32	518 Runneymede Rd	TORONTO	4.16 kV	0.93			
TOB4RD	RUNNYMEDE MS	33	518 Runneymede Rd	TORONTO	4.16 kV	5.64			
TOB5RD	RUNNYMEDE MS	34	518 Runneymede Rd	TORONTO	4.16 kV	1.94			
TOB6RD	RUNNYMEDE MS	35	518 Runneymede Rd	TORONTO	4.16 kV	1.56			
ETWFF1	HUNTING RIDGE MS	36	63 Hunting Ridge	ETOBICOKE	4.16 kV	1.45			
ETWFF2	HUNTING RIDGE MS	37	63 Hunting Ridge	ETOBICOKE	4.16 kV	0.45			
ETWFF3	HUNTING RIDGE MS	38	63 Hunting Ridge	ETOBICOKE	4.16 kV	0.44			
TOB1KY	KINGSWAY MS	39	South Kingsway at Armadale Ave.	TORONTO	4.16 kV	3.68			
ETMLF4	FIELDGATE MS	40	10 Willowridge Rd	ETOBICOKE	4.16 kV	2.01			
NYSS21F1	NORTHDALE MS	41	58 Northdale Rd	NORTH YORK	4.16 kV	2.19			
NYSS21F3	NORTHDALE MS	42	58 Northdale Rd	NORTH YORK	4.16 kV	2.7			
NY51M21	LESLIE II TS	43	5733 Leslie St	NORTH YORK	27.6 kV	24.8			
NY51M22	LESLIE II TS	44	5733 Leslie St	NORTH YORK	27.6 kV	0.79			
NY51M23	LESLIE II TS	45	5733 Leslie St	NORTH YORK	27.6 kV	3.03			
NY51M24	LESLIE II TS	46	5733 Leslie St	NORTH YORK	27.6 kV	1.73			
NY51M25	LESLIE II TS	47	5733 Leslie St	NORTH YORK	27.6 kV	3.65			
NY51M26	LESLIE II TS	48	5733 Leslie St	NORTH YORK	27.6 kV	3.49			
NY51M27	LESLIE II TS	49	5733 Leslie St	NORTH YORK	27.6 kV	3.79			
NY51M28	LESLIE II TS	50	5733 Leslie St	NORTH YORK	27.6 kV	4.48			
NY51M29	LESLIE II TS	51	5733 Leslie St	NORTH YORK	27.6 kV	4.46			
NY51M30	LESLIE II TS	52	5733 Leslie St	NORTH YORK	27.6 kV	4.06			
NY51M31	LESLIE II TS	53	5733 Leslie St	NORTH YORK	27.6 kV	1.54			
NY51M32	LESLIE II TS	54	5733 Leslie St	NORTH YORK	27.6 kV	2.57			
ETRBF1	WESTMOUNT MS	55	174 Dixon Rd	ETOBICOKE	4.16 kV	0.85			
ETRBF2	WESTMOUNT MS	56	174 Dixon Rd	ETOBICOKE	4.16 kV	2.43			
ETRBF3	WESTMOUNT MS	57	174 Dixon Rd	ETOBICOKE	4.16 kV	5.4			
TOB1QU	QUEENSWAY MS	58	5 Southport St	TORONTO	4.16 kV	1.07			
TOB2QU	QUEENSWAY MS	59	5 Southport St	TORONTO	4.16 kV	3.29			
ETJDF1	DUNSANY MS	60	64 Dunsany Crescent	ETOBICOKE	4.16 kV	2.44			
ETJDF2	DUNSANY MS	61	64 Dunsany Crescent	ETOBICOKE	4.16 kV	2.61			
ETJDF3	DUNSANY MS	62	64 Dunsany Crescent	ETOBICOKE	4.16 kV	0.84			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
ETHDF1	HARTSDALE MS	63	191 The Westway	ETOBICOKE	4.16 kV	0.99			
ETHDF2	HARTSDALE MS	64	191 The Westway	ETOBICOKE	4.16 kV	3.8			
ETHDF3	HARTSDALE MS	65	191 The Westway	ETOBICOKE	4.16 kV	2.13			
ETTAF1	HIGHBURY MS	66	18 Warbeck Pl	ETOBICOKE	4.16 kV	2.93			
ETTAF2	HIGHBURY MS	67	18 Warbeck Pl	ETOBICOKE	4.16 kV	3.72			
ETTAF3	HIGHBURY MS	68	18 Warbeck Pl	ETOBICOKE	4.16 kV	2.28			
ETTAF4	HIGHBURY MS	69	18 Warbeck Pl	ETOBICOKE	4.16 kV	3.55			
SCGG1	LIVINGSTON GUILDWOOD MS	70	74 Livingston Rd	SCARBOROUGH	4.16 kV	6.35			
SCGG2	LIVINGSTON GUILDWOOD MS	71	74 Livingston Rd	SCARBOROUGH	4.16 kV	0.26			
SCGG3	LIVINGSTON GUILDWOOD MS	72	74 Livingston Rd	SCARBOROUGH	4.16 kV	0.36			
TOB3DN	DUFFERIN TS	73	1045 Dufferin St	TORONTO	4.16 kV	1.47			
TOB4DN	DUFFERIN TS	74	1045 Dufferin St	TORONTO	4.16 kV	0.62			
TOB5DN	DUFFERIN TS	75	1045 Dufferin St	TORONTO	4.16 kV	3.62			
TOB1RK	RENNIE PARK MS	76	Rear of Field House	TORONTO	4.16 kV	5.46			
TOB2RK	RENNIE PARK MS	77	Rear of Field House	TORONTO	4.16 kV	3.96			
NYSS37F2	DON MILLS WEST MS	78	802 Lawrence Ave E	NORTH YORK	4.16 kV	7.33			
NYSS37F4	DON MILLS WEST MS	79	802 Lawrence Ave E	NORTH YORK	4.16 kV	2.14			
SCTA1	SAUNDERS KINGSTON MS	80	4 Saunders Rd	SCARBOROUGH	4.16 kV	1.71			
SCTA2	SAUNDERS KINGSTON MS	81	4 Saunders Rd	SCARBOROUGH	4.16 kV	1.15			
SCTA3	SAUNDERS KINGSTON MS	82	4 Saunders Rd	SCARBOROUGH	4.16 kV	2.79			
SCDC1	BELLAMY LAWRENCE MS	83	510 Bellamy Rd N	SCARBOROUGH	4.16 kV	9.35			
SCDC2	BELLAMY LAWRENCE MS	84	510 Bellamy Rd N	SCARBOROUGH	4.16 kV	5.83			
SCDC3	BELLAMY LAWRENCE MS	85	510 Bellamy Rd N	SCARBOROUGH	4.16 kV	2.6			
ETEBF1	CHAPMAN MS	86	1 Duffield Rd	ETOBICOKE	4.16 kV	4.53			
ETEBF2	CHAPMAN MS	87	1 Duffield Rd	ETOBICOKE	4.16 kV	1.37			
ETEBF3	CHAPMAN MS	88	1 Duffield Rd	ETOBICOKE	4.16 kV	2.93			
SCUC1	SCARBOROUGH GOLF CLUB R	89	1000 Scarborough Golf Rd	SCARBOROUGH	4.16 kV	7.6			
SCUC2	SCARBOROUGH GOLF CLUB R	90	1000 Scarborough Golf Rd	SCARBOROUGH	4.16 kV	0.88			
SCUC3	SCARBOROUGH GOLF CLUB R	91	1000 Scarborough Golf Rd	SCARBOROUGH	4.16 kV	1.89			
NYSS64F2	RUDDINGTON MS	92	1 Wyvern Rd	NORTH YORK	4.16 kV	3.23			
NYSS64F3	RUDDINGTON MS	93	1 Wyvern Rd	NORTH YORK	4.16 kV	1.7			

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SCDJ1	ORTON PARK MERKLEY SQUAI	94	150 Orton Park	SCARBOROUGH	4.16 kV	0.87			
SCDJ2	ORTON PARK MERKLEY SQUAI	95	150 Orton Park	SCARBOROUGH	4.16 kV	4.83			
SCDJ3	ORTON PARK MERKLEY SQUAI	96	150 Orton Park	SCARBOROUGH	4.16 kV	3.97			
EYHF1	STATION H MS	97	Next to 3 Dohme Ave.	EAST YORK	4.16 kV	2.27			
EYHF2	STATION H MS	98	Next to 3 Dohme Ave.	EAST YORK	4.16 kV	2.3			
EYHF3	STATION H MS	99	Next to 3 Dohme Ave.	EAST YORK	4.16 kV	0.7			
EYDF1	STATION D MS	100	Next to 3 Dohme Ave.	EAST YORK	4.16 kV	3.26			
EYDF2	STATION D MS	101	Next to 3 Dohme Ave.	EAST YORK	4.16 kV	1.11			
EYDF3	STATION D MS	102	Next to 3 Dohme Ave.	EAST YORK	4.16 kV	1.74			
ETUFF1	WINDSOR MS	103	298 Dixon Rd	ETOBICOKE	4.16 kV	3.3			
ETUFF2	WINDSOR MS	104	298 Dixon Rd	ETOBICOKE	4.16 kV	3.66			
ETUFF3	WINDSOR MS	105	298 Dixon Rd	ETOBICOKE	4.16 kV	0.57			
ETUFF4	WINDSOR MS	106	298 Dixon Rd	ETOBICOKE	4.16 kV	0.57			
SCEC4	LAWRENCE SCAR GOLF CLUB	107	3782 Lawrence Ave E	SCARBOROUGH	4.16 kV	2.37			
SCEC5	LAWRENCE SCAR GOLF CLUB	108	3782 Lawrence Ave E	SCARBOROUGH	4.16 kV	4.34			
SCEC6	LAWRENCE SCAR GOLF CLUB	109	3782 Lawrence Ave E	SCARBOROUGH	4.16 kV	2.31			
ETVCF1	BLACKFRIAR MS	110	95 Kingsview Blvd	ETOBICOKE	4.16 kV	3.04			
ETVCF2	BLACKFRIAR MS	111	95 Kingsview Blvd	ETOBICOKE	4.16 kV	1.15			
ETVCF3	BLACKFRIAR MS	112	95 Kingsview Blvd	ETOBICOKE	4.16 kV	2.61			
SCEC1	LAWRENCE SCAR GOLF CLUB	113	3782 Lawrence Ave E	SCARBOROUGH	4.16 kV	0.56			
SCEC2	LAWRENCE SCAR GOLF CLUB	114	3782 Lawrence Ave E	SCARBOROUGH	4.16 kV	1.57			
SCEC3	LAWRENCE SCAR GOLF CLUB	115	3782 Lawrence Ave E	SCARBOROUGH	4.16 kV	6.29			
ETFQF1	MOUNTBATTEN MS	116	746 Scarlett Rd	ETOBICOKE	4.16 kV	1.13			
ETFQF2	MOUNTBATTEN MS	117	746 Scarlett Rd	ETOBICOKE	4.16 kV	1.2			
ETFQF3	MOUNTBATTEN MS	118	746 Scarlett Rd	ETOBICOKE	4.16 kV	3.59			
ETFQF4	MOUNTBATTEN MS	119	746 Scarlett Rd	ETOBICOKE	4.16 kV	3.57			
SCFJ1	MARKHAM EGLINTON MS	120	210 Markham Rd	SCARBOROUGH	4.16 kV	0.59			
SCFJ2	MARKHAM EGLINTON MS	121	210 Markham Rd	SCARBOROUGH	4.16 kV	1.02			
SCFJ3	MARKHAM EGLINTON MS	122	210 Markham Rd	SCARBOROUGH	4.16 kV	0.11			
SCDE1	BRIMLEY BERNADINE MS	123	1221 Brimley Rd	SCARBOROUGH	4.16 kV	7.85			
SCDE2	BRIMLEY BERNADINE MS	124	1221 Brimley Rd	SCARBOROUGH	4.16 kV	3.26			

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SCDE3	BRIMLEY BERNADINE MS	125	1221 Brimley Rd	SCARBOROUGH	4.16 kV	4.4			
SCQG1	SUNDERLAND BELLAMY MS	126	52 Sunderland Cress	SCARBOROUGH	4.16 kV	1.69			
SCQG2	SUNDERLAND BELLAMY MS	127	52 Sunderland Cress	SCARBOROUGH	4.16 kV	1.2			
SCQG3	SUNDERLAND BELLAMY MS	128	52 Sunderland Cress	SCARBOROUGH	4.16 kV	3.51			
SCSC4	KENNEDY EGLINTON T2 MS	129	750 Kennedy Rd	SCARBOROUGH	4.16 kV	1.58			
SCSC5	KENNEDY EGLINTON T2 MS	130	750 Kennedy Rd	SCARBOROUGH	4.16 kV	0.5			
SCSC6	KENNEDY EGLINTON T2 MS	131	750 Kennedy Rd	SCARBOROUGH	4.16 kV	1.02			
ETLFF1	MILL MS	132	119 Mill Road	ETOBICOKE	4.16 kV	0.79			
ETLFF2	MILL MS	133	119 Mill Road	ETOBICOKE	4.16 kV	1.27			
ETLFF3	MILL MS	134	119 Mill Road	ETOBICOKE	4.16 kV	0.94			
ETLFF4	MILL MS	135	119 Mill Road	ETOBICOKE	4.16 kV	0.87			
TO38M29	MANBY TS	136	850 Kipling Ave	TORONTO	27.6 kV	8.51			
YK11M1	RUNNYMEDE TS	137	99 Woolner Ave	YORK	27.6 kV	11.33			
YK11M2	RUNNYMEDE TS	138	99 Woolner Ave	YORK	27.6 kV	18.41			
YK11M3	RUNNYMEDE TS	139	99 Woolner Ave	YORK	27.6 kV	6.58			
YK11M5	RUNNYMEDE TS	140	99 Woolner Ave	YORK	27.6 kV	32.37			
YK11M6	RUNNYMEDE TS	141	99 Woolner Ave	YORK	27.6 kV	2.54			
YK11M7	RUNNYMEDE TS	142	99 Woolner Ave	YORK	27.6 kV	10.99			
YK11M8	RUNNYMEDE TS	143	99 Woolner Ave	YORK	27.6 kV	39.03			
NY55M1	FINCH I TS	144	1 SIGNET DR.	NORTH YORK	27.6 kV	8.02			
NY55M10	FINCH I TS	145	1 SIGNET DR.	NORTH YORK	27.6 kV	3.04			
NY55M2	FINCH I TS	146	1 SIGNET DR.	NORTH YORK	27.6 kV	6.53			
NY55M3	FINCH I TS	147	1 SIGNET DR.	NORTH YORK	27.6 kV	2.66			
NY55M5	FINCH I TS	148	1 SIGNET DR.	NORTH YORK	27.6 kV	3.37			
NY55M7	FINCH I TS	149	1 SIGNET DR.	NORTH YORK	27.6 kV	21.89			
NY55M8	FINCH I TS	150	1 SIGNET DR.	NORTH YORK	27.6 kV	8.86			
NY55M9	FINCH I TS	151	1 SIGNET DR.	NORTH YORK	27.6 kV	5.91			
ETBAF1	NEILSON DR MS	152	4237 Bloor St W	ETOBICOKE	4.16 kV	2.54			
ETBAF2	NEILSON DR MS	153	4237 Bloor St W	ETOBICOKE	4.16 kV	1.66			
ETBAF3	NEILSON DR MS	154	4237 Bloor St W	ETOBICOKE	4.16 kV	4.36			
ETBAF4	NEILSON DR MS	155	4237 Bloor St W	ETOBICOKE	4.16 kV	1.99			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
NY55M21	FINCH II TS	156	1 SIGNET DR.	NORTH YORK	27.6 kV	7.32			
NY55M22	FINCH II TS	157	1 SIGNET DR.	NORTH YORK	27.6 kV	11.54			
NY55M23	FINCH II TS	158	1 SIGNET DR.	NORTH YORK	27.6 kV	14.45			
NY55M24	FINCH II TS	159	1 SIGNET DR.	NORTH YORK	27.6 kV	3.54			
NY55M25	FINCH II TS	160	1 SIGNET DR.	NORTH YORK	27.6 kV	17.67			
NY55M26	FINCH II TS	161	1 SIGNET DR.	NORTH YORK	27.6 kV	9.53			
NY55M27	FINCH II TS	162	1 SIGNET DR.	NORTH YORK	27.6 kV	13.31			
NY55M28	FINCH II TS	163	1 SIGNET DR.	NORTH YORK	27.6 kV	28.27			
NY55M29	FINCH II TS	164	1 SIGNET DR.	NORTH YORK	27.6 kV	3.25			
NY55M30	FINCH II TS	165	1 SIGNET DR.	NORTH YORK	27.6 kV	1.27			
NY55M31	FINCH II TS	166	1 SIGNET DR.	NORTH YORK	27.6 kV	7.09			
NY55M32	FINCH II TS	167	1 SIGNET DR.	NORTH YORK	27.6 kV	4.25			
NY85M1	BATHURST I TS	168	165 Goddard St.	NORTH YORK	27.6 kV	20.08			
NY85M10	BATHURST I TS	169	165 Goddard St.	NORTH YORK	27.6 kV	13.88			
NY85M2	BATHURST I TS	170	165 Goddard St.	NORTH YORK	27.6 kV	6.29			
NY85M3	BATHURST I TS	171	165 Goddard St.	NORTH YORK	27.6 kV	3.54			
NY85M4	BATHURST I TS	172	165 Goddard St.	NORTH YORK	27.6 kV	8.72			
NY85M5	BATHURST I TS	173	165 Goddard St.	NORTH YORK	27.6 kV	21.88			
NY85M6	BATHURST I TS	174	165 Goddard St.	NORTH YORK	27.6 kV	15.33			
NY85M7	BATHURST I TS	175	165 Goddard St.	NORTH YORK	27.6 kV	4.53			
NY85M8	BATHURST I TS	176	165 Goddard St.	NORTH YORK	27.6 kV	11.11			
NY85M9	BATHURST I TS	177	165 Goddard St.	NORTH YORK	27.6 kV	6.62			
TOA230DX	DUPLEX TS	178	400 Duplex St	TORONTO	13.8 kV	9.11			
TOA240DX	DUPLEX TS	179	400 Duplex St	TORONTO	13.8 kV	4.96			
ETBHF1	LONGFIELD MS	180	1 Longfield Rd	ETOBICOKE	4.16 kV	11.78			
ETBHF2	LONGFIELD MS	181	1 Longfield Rd	ETOBICOKE	4.16 kV	4.1			
ETBHF3	LONGFIELD MS	182	1 Longfield Rd	ETOBICOKE	4.16 kV	2.25			
ETBHF4	LONGFIELD MS	183	1 Longfield Rd	ETOBICOKE	4.16 kV	0.24			
NY85M23	BATHURST II TS	184	165 Goddard St.	NORTH YORK	27.6 kV	22.64			
NY85M24	BATHURST II TS	185	165 Goddard St.	NORTH YORK	27.6 kV	7			
NY85M25	BATHURST II TS	186	165 Goddard St.	NORTH YORK	27.6 kV	20.53			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
NY85M26	BATHURST II TS	187	165 Goddard St.	NORTH YORK	27.6 kV	20.55			
NY85M27	BATHURST II TS	188	165 Goddard St.	NORTH YORK	27.6 kV	13.36			
NY85M30	BATHURST II TS	189	165 Goddard St.	NORTH YORK	27.6 kV	1.62			
NY85M31	BATHURST II TS	190	165 Goddard St.	NORTH YORK	27.6 kV	4.42			
NY85M32	BATHURST II TS	191	165 Goddard St.	NORTH YORK	27.6 kV	2.63			
ETJLF2	CENTENNIAL MS	192	56 Centennial Park Rd	ETOBICOKE	4.16 kV	2.27			
TOB2I	ISLAND MS	193	Island Filtration Plant	TORONTO	4.16 kV	6.18			
ET55M4	FINCH I TS	194	1 SIGNET DR.	ETOBICOKE	27.6 kV	9.29			
ET55M6	FINCH I TS	195	1 SIGNET DR.	ETOBICOKE	27.6 kV	10.01			
YK35M1	FAIRBANKS II TS	196	950 Roselawn Ave	YORK	27.6 kV	18.93			
YK35M10	FAIRBANKS II TS	197	950 Roselawn Ave	YORK	27.6 kV	25.39			
YK35M2	FAIRBANKS II TS	198	950 Roselawn Ave	YORK	27.6 kV	11.24			
YK35M4	FAIRBANKS II TS	199	950 Roselawn Ave	YORK	27.6 kV	13.29			
YK35M9	FAIRBANKS II TS	200	950 Roselawn Ave	YORK	27.6 kV	14.34			
TOA231B	BRIDGMAN TS	201	NE Corner MacPherson & Huron St's	TORONTO	13.8 kV	3.33			
TOA232B	BRIDGMAN TS	202	NE Corner MacPherson & Huron St's	TORONTO	13.8 kV	1.53			
TOB1HW	HAZELWOOD MS	203	144-146 Hazelwood Ave	TORONTO	4.16 kV	1.93			
TOB2HW	HAZELWOOD MS	204	144-146 Hazelwood Ave	TORONTO	4.16 kV	2.52			
TOB3HW	HAZELWOOD MS	205	144-146 Hazelwood Ave	TORONTO	4.16 kV	3.82			
TOB4HW	HAZELWOOD MS	206	144-146 Hazelwood Ave	TORONTO	4.16 kV	0.02			
TOB5HW	HAZELWOOD MS	207	144-146 Hazelwood Ave	TORONTO	4.16 kV	3.09			
TOB6HW	HAZELWOOD MS	208	144-146 Hazelwood Ave	TORONTO	4.16 kV	2.66			
TOB7HW	HAZELWOOD MS	209	144-146 Hazelwood Ave	TORONTO	4.16 kV	2.18			
TOB8HW	HAZELWOOD MS	210	144-146 Hazelwood Ave	TORONTO	4.16 kV	4.17			
SCE521	SCARBOROUGH EAST TS	211	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	4.88			
SCE522	SCARBOROUGH EAST TS	212	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	6.44			
SCE523	SCARBOROUGH EAST TS	213	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	5.33			
SCE524	SCARBOROUGH EAST TS	214	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	5.77			
SCE525	SCARBOROUGH EAST TS	215	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	4.84			
SCE526	SCARBOROUGH EAST TS	216	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	4.31			
SCE527	SCARBOROUGH EAST TS	217	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	5.35			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
SCE528	SCARBOROUGH EAST TS	218	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	0.44			
SCE529	SCARBOROUGH EAST TS	219	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	5.42			
SCE530	SCARBOROUGH EAST TS	220	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	2.73			
TOB102EG	EGLINTON MS	221	60 Eglinton Ave W	TORONTO	4.16 kV	0.4			
TOB2EG	EGLINTON MS	222	60 Eglinton Ave W	TORONTO	4.16 kV	1.54			
TOB3EG	EGLINTON MS	223	60 Eglinton Ave W	TORONTO	4.16 kV	2.99			
TOB4EG	EGLINTON MS	224	60 Eglinton Ave W	TORONTO	4.16 kV	1.47			
TOB5EG	EGLINTON MS	225	60 Eglinton Ave W	TORONTO	4.16 kV	1.3			
TOB6EG	EGLINTON MS	226	60 Eglinton Ave W	TORONTO	4.16 kV	3.58			
TOB71EG	EGLINTON MS	227	60 Eglinton Ave W	TORONTO	4.16 kV	4.69			
TOB72EG	EGLINTON MS	228	60 Eglinton Ave W	TORONTO	4.16 kV	2.2			
NYSS47F1	GOULDING MS	229	169 Goulding Ave	NORTH YORK	4.16 kV	2.47			
NYSS47F2	GOULDING MS	230	169 Goulding Ave	NORTH YORK	4.16 kV	1.9			
NYSS47F4	GOULDING MS	231	169 Goulding Ave	NORTH YORK	4.16 kV	3.07			
ETABF1	RAVENSBOURNE MS	232	1720 Islington Ave	ETOBICOKE	4.16 kV	1.75			
ETABF2	RAVENSBOURNE MS	233	1720 Islington Ave	ETOBICOKE	4.16 kV	1.78			
ETABF3	RAVENSBOURNE MS	234	1720 Islington Ave	ETOBICOKE	4.16 kV	2.49			
ETABF4	RAVENSBOURNE MS	235	1720 Islington Ave	ETOBICOKE	4.16 kV	1.79			
TOB1MR	MERTON MS	236	394 Mt Pleasant Road	TORONTO	4.16 kV	3.73			
TOB2MR	MERTON MS	237	394 Mt Pleasant Road	TORONTO	4.16 kV	3.21			
TOB3MR	MERTON MS	238	394 Mt Pleasant Road	TORONTO	4.16 kV	4.53			
TOB5MR	MERTON MS	239	394 Mt Pleasant Road	TORONTO	4.16 kV	3.6			
ETKDF1	RENFORTH MS	240	40 Torrington Dr	ETOBICOKE	4.16 kV	3.67			
ETKDF2	RENFORTH MS	241	40 Torrington Dr	ETOBICOKE	4.16 kV	3.17			
ETKDF3	RENFORTH MS	242	40 Torrington Dr	ETOBICOKE	4.16 kV	2.98			
ET38M1	MANBY TS	243	850 Kipling Ave	ETOBICOKE	27.6 kV	10.85			
ET38M10	MANBY TS	244	850 Kipling Ave	ETOBICOKE	27.6 kV	4.3			
ET38M12	MANBY TS	245	850 Kipling Ave	ETOBICOKE	27.6 kV	6.38			
ET38M13	MANBY TS	246	850 Kipling Ave	ETOBICOKE	27.6 kV	8.3			
ET38M16	MANBY TS	247	850 Kipling Ave	ETOBICOKE	27.6 kV	6.86			
ET38M20	MANBY TS	248	850 Kipling Ave	ETOBICOKE	27.6 kV	5.69			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
ET38M21	MANBY TS	249	850 Kipling Ave	ETOBICOKE	27.6 kV	1.4			
ET38M23	MANBY TS	250	850 Kipling Ave	ETOBICOKE	27.6 kV	7.99			
ET38M24	MANBY TS	251	850 Kipling Ave	ETOBICOKE	27.6 kV	4.46			
ET38M25	MANBY TS	252	850 Kipling Ave	ETOBICOKE	27.6 kV	11.95			
ET38M27	MANBY TS	253	850 Kipling Ave	ETOBICOKE	27.6 kV	5.73			
ET38M3	MANBY TS	254	850 Kipling Ave	ETOBICOKE	27.6 kV	2.37			
ET38M4	MANBY TS	255	850 Kipling Ave	ETOBICOKE	27.6 kV	2.14			
ET38M5	MANBY TS	256	850 Kipling Ave	ETOBICOKE	27.6 kV	3.98			
ET38M6	MANBY TS	257	850 Kipling Ave	ETOBICOKE	27.6 kV	2.16			
ET38M7	MANBY TS	258	850 Kipling Ave	ETOBICOKE	27.6 kV	19.29			
ET38M8	MANBY TS	259	850 Kipling Ave	ETOBICOKE	27.6 kV	3.17			
ET38M9	MANBY TS	260	850 Kipling Ave	ETOBICOKE	27.6 kV	1.49			
TOB109DF	DEFOE MS	261	120-124 Tecumseth St	TORONTO	4.16 kV	0.9			
TOB2DF	DEFOE MS	262	120-124 Tecumseth St	TORONTO	4.16 kV	2.98			
TOB3DF	DEFOE MS	263	120-124 Tecumseth St	TORONTO	4.16 kV	1.64			
TOB4DF	DEFOE MS	264	120-124 Tecumseth St	TORONTO	4.16 kV	1.27			
TOB5DF	DEFOE MS	265	120-124 Tecumseth St	TORONTO	4.16 kV	0.79			
TOB6DF	DEFOE MS	266	120-124 Tecumseth St	TORONTO	4.16 kV	0.74			
TOB7DF	DEFOE MS	267	120-124 Tecumseth St	TORONTO	4.16 kV	1.57			
TOB8DF	DEFOE MS	268	120-124 Tecumseth St	TORONTO	4.16 kV	4.09			
TOB9DF	DEFOE MS	269	120-124 Tecumseth St	TORONTO	4.16 kV	3.46			
ETFHF1	EDENBRIDGE MS	270	294 Scarlett Rd	ETOBICOKE	4.16 kV	1.63			
ETFHF2	EDENBRIDGE MS	271	294 Scarlett Rd	ETOBICOKE	4.16 kV	1.49			
ETFHF3	EDENBRIDGE MS	272	294 Scarlett Rd	ETOBICOKE	4.16 kV	1.86			
ETFHF4	EDENBRIDGE MS	273	294 Scarlett Rd	ETOBICOKE	4.16 kV	2.05			
NYSS60F2	CHURCHILL MS	274	283 Churchill Ave	NORTH YORK	4.16 kV	4.02			
NYSS60F3	CHURCHILL MS	275	283 Churchill Ave	NORTH YORK	4.16 kV	4.97			
SCRE1	SHEPPARD KENNEDY MS	276	3762 Sheppard Ave E	SCARBOROUGH	13.8 kV	1.24			
SCRE2	SHEPPARD KENNEDY MS	277	3762 Sheppard Ave E	SCARBOROUGH	13.8 kV	5.84			
SCRE3	SHEPPARD KENNEDY MS	278	3762 Sheppard Ave E	SCARBOROUGH	13.8 kV	6.68			
TOB1CP	CHAPLIN MS	279	325 Chaplin Cress	TORONTO	4.16 kV	1.89			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
TOB3CP	CHAPLIN MS	280	325 Chaplin Cress	TORONTO	4.16 kV	5.97			
TOB4CP	CHAPLIN MS	281	325 Chaplin Cress	TORONTO	4.16 kV	4.14			
TOB51CP	CHAPLIN MS	282	325 Chaplin Cress	TORONTO	4.16 kV	2.67			
TOB52CP	CHAPLIN MS	283	325 Chaplin Cress	TORONTO	4.16 kV	0.75			
TOB6CP	CHAPLIN MS	284	325 Chaplin Cress	TORONTO	4.16 kV	2.56			
SCCE1	PHARMACY CPR MS	285	7 Trestleside Grove	SCARBOROUGH	4.16 kV	1.44			
SCCE2	PHARMACY CPR MS	286	7 Trestleside Grove	SCARBOROUGH	4.16 kV	2.57			
SCCE3	PHARMACY CPR MS	287	7 Trestleside Grove	SCARBOROUGH	4.16 kV	5.3			
ETTF1	BERRY RD MS	288	132 Berry Rd	ETOBICOKE	4.16 kV	3.52			
ETTF2	BERRY RD MS	289	132 Berry Rd	ETOBICOKE	4.16 kV	1.46			
ETTF3	BERRY RD MS	290	132 Berry Rd	ETOBICOKE	4.16 kV	3.02			
ETTF4	BERRY RD MS	291	132 Berry Rd	ETOBICOKE	4.16 kV	2.17			
ETEAF1	YORK MS	292	714 Royal York Rd	ETOBICOKE	4.16 kV	3.01			
ETEAF2	YORK MS	293	714 Royal York Rd	ETOBICOKE	4.16 kV	3.43			
ETEAF3	YORK MS	294	714 Royal York Rd	ETOBICOKE	4.16 kV	3.43			
ETSBF1	ROSETHORNE MS	295	1442 Islington Ave	ETOBICOKE	4.16 kV	6.84			
ETSBF2	ROSETHORNE MS	296	1442 Islington Ave	ETOBICOKE	4.16 kV	0.7			
ETSBF3	ROSETHORNE MS	297	1442 Islington Ave	ETOBICOKE	4.16 kV	2.91			
ETSBF4	ROSETHORNE MS	298	1442 Islington Ave	ETOBICOKE	4.16 kV	3.83			
TOB10E	CARLAW TS	299	369 Carlaw Ave	TORONTO	4.16 kV	1.14			
TOB11E	CARLAW TS	300	369 Carlaw Ave	TORONTO	4.16 kV	1.65			
TOB12E	CARLAW TS	301	369 Carlaw Ave	TORONTO	4.16 kV	1.24			
TOB13E	CARLAW TS	302	369 Carlaw Ave	TORONTO	4.16 kV	2.06			
TOB14E	CARLAW TS	303	369 Carlaw Ave	TORONTO	4.16 kV	3.19			
TOB15E	CARLAW TS	304	369 Carlaw Ave	TORONTO	4.16 kV	0.23			
TOB1E	CARLAW TS	305	369 Carlaw Ave	TORONTO	4.16 kV	3.54			
TOB4E	CARLAW TS	306	369 Carlaw Ave	TORONTO	4.16 kV	1.57			
TOB5E	CARLAW TS	307	369 Carlaw Ave	TORONTO	4.16 kV	2.62			
TOB8E	CARLAW TS	308	369 Carlaw Ave	TORONTO	4.16 kV	3.35			
ETWBF1	HARDWICK MS	309	33 Hardwick Crt	ETOBICOKE	4.16 kV	1.44			
ETWBF2	HARDWICK MS	310	33 Hardwick Crt	ETOBICOKE	4.16 kV	4.75			

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Circuit	Substation Name	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
ETWBF3	HARDWICK MS	311	33 Hardwick Crt	ETOBICOKE	4.16 kV	6.12			
ETUEF1	OBERON MS	312	8 Newell Crt	ETOBICOKE	4.16 kV	2.26			
ETUEF2	OBERON MS	313	8 Newell Crt	ETOBICOKE	4.16 kV	4.4			
ETUEF3	OBERON MS	314	8 Newell Crt	ETOBICOKE	4.16 kV	1.17			
NYSS51F1	MILVAN MS	315	4 Milvan Dr	NORTH YORK	4.16 kV	1.83			
	Total Feeder Length Trimmed					1522.29			

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Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
SCR2621	MALVERN TS	N	1	1702 Neilson Rd	SCARBOROUGH	27.6 kV	8.46			
SCR2631	MALVERN TS	N	2	1702 Neilson Rd	SCARBOROUGH	27.6 kV	2.59			
SCR2632	MALVERN TS	N	3	1702 Neilson Rd	SCARBOROUGH	27.6 kV	3.59			
SCR2633	MALVERN TS	N	4	1702 Neilson Rd	SCARBOROUGH	27.6 kV	1.53			
SCR2635	MALVERN TS	N	5	1702 Neilson Rd	SCARBOROUGH	27.6 kV	8.23			
SCR2636	MALVERN TS	N	6	1702 Neilson Rd	SCARBOROUGH	27.6 kV	12.74			
SCTC1	CORONATION BENNETT MS	N	7	590 Coronation Rd	SCARBOROUGH	4.16 kV	8.96			
SCTC3	CORONATION BENNETT MS	N	8	590 Coronation Rd	SCARBOROUGH	4.16 kV	1.93			
TOA210GL	GLENGROVE TS	N	9	2829 Yonge St	TORONTO	13.8 kV	13.31			
TOA220GL	GLENGROVE TS	N	10	2829 Yonge St	TORONTO	13.8 kV	8.16			
TOA230GL	GLENGROVE TS	N	11	2829 Yonge St	TORONTO	13.8 kV	8.97			
TOA240GL	GLENGROVE TS	N	12	2829 Yonge St	TORONTO	13.8 kV	10.62			
TOB1OV	OVERDALE MS	N	13	85 Elm Ridge Dr	TORONTO	4.16 kV	2			
TOB2OV	OVERDALE MS	N	14	85 Elm Ridge Dr	TORONTO	4.16 kV	1.61			
TOB5OV	OVERDALE MS	N	15	85 Elm Ridge Dr	TORONTO	4.16 kV	1.93			
TOB6OV	OVERDALE MS	N	16	85 Elm Ridge Dr	TORONTO	4.16 kV	2.77			
TOB1HS	HAMMERSMITH MS	N	17	130 Hammersmith Ave	TORONTO	4.16 kV	2.68			
TOB2HS	HAMMERSMITH MS	N	18	130 Hammersmith Ave	TORONTO	4.16 kV	5.04			
TOB32HS	HAMMERSMITH MS	N	19	130 Hammersmith Ave	TORONTO	4.16 kV	2.79			
TOB4HS	HAMMERSMITH MS	N	20	130 Hammersmith Ave	TORONTO	4.16 kV	5.58			
TOB5HS	HAMMERSMITH MS	N	21	130 Hammersmith Ave	TORONTO	4.16 kV	3.64			
TOB62HS	HAMMERSMITH MS	N	22	130 Hammersmith Ave	TORONTO	4.16 kV	1.3			
TOB7HS	HAMMERSMITH MS	N	23	130 Hammersmith Ave	TORONTO	4.16 kV	4.63			
NYSS26F1	BRENTHALL MS	N	24	18 Brenthall Ave	NORTH YORK	4.16 kV	0.93			
NYSS26F2	BRENTHALL MS	N	25	18 Brenthall Ave	NORTH YORK	4.16 kV	2.56			
NYSS26F3	BRENTHALL MS	N	26	18 Brenthall Ave	NORTH YORK	4.16 kV	0.99			
SCLE1	BRIMLEY SEMINOLE MS	N	27	657 Brimley Rd	SCARBOROUGH	4.16 kV	5.23			
SCLE2	BRIMLEY SEMINOLE MS	N	28	657 Brimley Rd	SCARBOROUGH	4.16 kV	2.28			
SCLE3	BRIMLEY SEMINOLE MS	N	29	657 Brimley Rd	SCARBOROUGH	4.16 kV	3.15			
SCQE1	GREENCEDAR LAWRENCE MS	N	30	29 Greencedar Circuit	SCARBOROUGH	4.16 kV	1.12			
SCQE2	GREENCEDAR LAWRENCE MS	N	31	29 Greencedar Circuit	SCARBOROUGH	4.16 kV	0.61			
SCQE3	GREENCEDAR LAWRENCE MS	N	32	29 Greencedar Circuit	SCARBOROUGH	4.16 kV	8.97			
SCYH1	MILITARY TRIAL MORNINGSIDE M	N	33	720 Military Trail	SCARBOROUGH	4.16 kV	0.78			

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Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
SCYH2	MILITARY TRIAL MORNINGSIDE M	N	34	720 Military Trail	SCARBOROUGH	4.16 kV	0.01			
SCYH3	MILITARY TRIAL MORNINGSIDE M	N	35	720 Military Trail	SCARBOROUGH	4.16 kV	1.77			
SCXJ1	MORRISH RD ELLESMERE MS	N	36	351 Morrish Rd	SCARBOROUGH	13.8 kV	6.47			
SCXJ2	MORRISH RD ELLESMERE MS	N	37	351 Morrish Rd	SCARBOROUGH	13.8 kV	6.97			
SCXJ3	MORRISH RD ELLESMERE MS	N	38	351 Morrish Rd	SCARBOROUGH	13.8 kV	4.78			
TOA241MN	MAIN TS	N	39	131 Stephenson Ave	TORONTO	13.8 kV	8			
TOA242MN	MAIN TS	N	40	131 Stephenson Ave	TORONTO	13.8 kV	7.08			
TOA243MN	MAIN TS	N	41	131 Stephenson Ave	TORONTO	13.8 kV	3.03			
SCEJ1	CANADINE MIDLAND MS	N	42	2 Canadine Rd	SCARBOROUGH	4.16 kV	3.09			
SCEJ2	CANADINE MIDLAND MS	N	43	2 Canadine Rd	SCARBOROUGH	4.16 kV	1.25			
SCEJ3	CANADINE MIDLAND MS	N	44	2 Canadine Rd	SCARBOROUGH	4.16 kV	4.42			
SCHB4	BRIMLEY SHADDOCK T2 MS	N	45	531 Brimley Rd	SCARBOROUGH	4.16 kV	1.64			
SCHB5	BRIMLEY SHADDOCK T2 MS	N	46	531 Brimley Rd	SCARBOROUGH	4.16 kV	1.21			
SCHB6	BRIMLEY SHADDOCK T2 MS	N	47	531 Brimley Rd	SCARBOROUGH	4.16 kV	1.37			
TOB1SE	SHERBOURNE MS	N	48	147 Isabella St	TORONTO	4.16 kV	3.88			
TOB2SE	SHERBOURNE MS	N	49	147 Isabella St	TORONTO	4.16 kV	2.06			
TOB4SE	SHERBOURNE MS	N	50	147 Isabella St	TORONTO	4.16 kV	2.98			
TOB5SE	SHERBOURNE MS	N	51	147 Isabella St	TORONTO	4.16 kV	1.43			
TOB6SE	SHERBOURNE MS	N	52	147 Isabella St	TORONTO	4.16 kV	2.03			
SCNH1	MALAMUTE SHEPPARD MS	N	53	46 Malamute Crescent	SCARBOROUGH	13.8 kV	2.46			
SCNH2	MALAMUTE SHEPPARD MS	N	54	46 Malamute Crescent	SCARBOROUGH	13.8 kV	0.84			
SCNH3	MALAMUTE SHEPPARD MS	N	55	46 Malamute Crescent	SCARBOROUGH	13.8 kV	5.62			
SCQJ1	HUNTINGWOOD BIRCHMOUNT M	N	56	754 Huntingwood Dr	SCARBOROUGH	13.8 kV	0.76			
SCQJ2	HUNTINGWOOD BIRCHMOUNT M	N	57	754 Huntingwood Dr	SCARBOROUGH	13.8 kV	0.55			
SCQJ3	HUNTINGWOOD BIRCHMOUNT M	N	58	754 Huntingwood Dr	SCARBOROUGH	13.8 kV	1.11			
ETCBF1	PORTERFIELD MS	Y	59	2 Guiness Ave	ETOBICOKE	4.16 kV	4.23			
ETCBF2	PORTERFIELD MS	Y	60	2 Guiness Ave	ETOBICOKE	4.16 kV	2.53			
ETCBF3	PORTERFIELD MS	Y	61	2 Guiness Ave	ETOBICOKE	4.16 kV	2.27			
ETCBF4	PORTERFIELD MS	Y	62	2 Guiness Ave	ETOBICOKE	4.16 kV	3.98			
SCPE1	BRIMLEY ANSON MS	N	63	90/92 Brimley Rd	SCARBOROUGH	4.16 kV	2.4			
SCPE2	BRIMLEY ANSON MS	N	64	90/92 Brimley Rd	SCARBOROUGH	4.16 kV	0.47			
SCPE3	BRIMLEY ANSON MS	N	65	90/92 Brimley Rd	SCARBOROUGH	4.16 kV	4.27			
SCGB1	CIVIC SINNOTT MS	N	66	61 Civic Rd	SCARBOROUGH	4.16 kV	3.1			

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SCVF1	BIRCHMOUNT FOXRIDGE MS	N	67	694 Birchmount Rd	SCARBOROUGH	4.16 kV	0.02			
SCVF2	BIRCHMOUNT FOXRIDGE MS	N	68	694 Birchmount Rd	SCARBOROUGH	4.16 kV	3.02			
SCVF3	BIRCHMOUNT FOXRIDGE MS	N	69	694 Birchmount Rd	SCARBOROUGH	4.16 kV	1.01			
SC471	SHEPPARD WEST TS	N	70	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	5.31			
SC472	SHEPPARD WEST TS	N	71	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	2.1			
SC473	SHEPPARD WEST TS	N	72	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	3.88			
SC475	SHEPPARD WEST TS	N	73	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	0.07			
SC476	SHEPPARD WEST TS	N	74	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	5.01			
SC477	SHEPPARD WEST TS	N	75	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	10.54			
SC478	SHEPPARD WEST TS	N	76	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	4.32			
SC6311	AGINCOURT TS	N	77	107 Milliken Blvd	SCARBOROUGH	27.6 kV	3.21			
SC6312	AGINCOURT TS	N	78	107 Milliken Blvd	SCARBOROUGH	27.6 kV	5.85			
SC633	AGINCOURT TS	N	79	107 Milliken Blvd	SCARBOROUGH	27.6 kV	0.04			
SC634	AGINCOURT TS	N	80	107 Milliken Blvd	SCARBOROUGH	27.6 kV	3.75			
SC635	AGINCOURT TS	N	81	107 Milliken Blvd	SCARBOROUGH	27.6 kV	7.02			
SC636	AGINCOURT TS	N	82	107 Milliken Blvd	SCARBOROUGH	27.6 kV	12.83			
SC638	AGINCOURT TS	N	83	107 Milliken Blvd	SCARBOROUGH	27.6 kV	4.92			
SCDB1	ELLESMERE KENNEDY T1 MS	N	84	867 Ellesmere Rd	SCARBOROUGH	4.16 kV	1.54			
SCDB2	ELLESMERE KENNEDY T1 MS	N	85	867 Ellesmere Rd	SCARBOROUGH	4.16 kV	0.94			
SCDB3	ELLESMERE KENNEDY T1 MS	N	86	867 Ellesmere Rd	SCARBOROUGH	4.16 kV	0.18			
SCFK1	FINCH WARDEN MS	N	87	3200 Finch Ave	SCARBOROUGH	13.8 kV	5.69			
SCFK2	FINCH WARDEN MS	N	88	3200 Finch Ave	SCARBOROUGH	13.8 kV	1.55			
SCFK3	FINCH WARDEN MS	N	89	3200 Finch Ave	SCARBOROUGH	13.8 kV	1.12			
SCDB4	ELLESMERE KENNEDY T2 MS	N	90	867 Ellesmere Rd	SCARBOROUGH	4.16 kV	5.02			
SCDB5	ELLESMERE KENNEDY T2 MS	N	91	867 Ellesmere Rd	SCARBOROUGH	4.16 kV	1.35			
SCDB6	ELLESMERE KENNEDY T2 MS	N	92	867 Ellesmere Rd	SCARBOROUGH	4.16 kV	4.21			
SC50221	CAVANAUGH TS	N	93	105 Milliken Blvd	SCARBOROUGH	27.6 kV	0.76			
SC50222	CAVANAUGH TS	N	94	105 Milliken Blvd	SCARBOROUGH	27.6 kV	6.81			
SC50223	CAVANAUGH TS	N	95	105 Milliken Blvd	SCARBOROUGH	27.6 kV	4.21			
SC50224	CAVANAUGH TS	N	96	105 Milliken Blvd	SCARBOROUGH	27.6 kV	11.21			
SC50225	CAVANAUGH TS	N	97	105 Milliken Blvd	SCARBOROUGH	27.6 kV	0.04			
SC50226	CAVANAUGH TS	N	98	105 Milliken Blvd	SCARBOROUGH	27.6 kV	7.19			
SC50228	CAVANAUGH TS	N	99	105 Milliken Blvd	SCARBOROUGH	27.6 kV	7.59			

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SC50229	CAVANAUGH TS	N	100	105 Milliken Blvd	SCARBOROUGH	27.6 kV	5.67			
SCHG1	MIDLAND DANFORTH MS	N	101	676 Midland Ave	SCARBOROUGH	4.16 kV	3.08			
SCHG2	MIDLAND DANFORTH MS	N	102	676 Midland Ave	SCARBOROUGH	4.16 kV	4.96			
SCHG3	MIDLAND DANFORTH MS	N	103	676 Midland Ave	SCARBOROUGH	4.16 kV	3.2			
SCBE1	ST. CLAIR WARDEN MS	N	104	S-E Corner St Clair & Warden	SCARBOROUGH	4.16 kV	0.54			
SCBE2	ST. CLAIR WARDEN MS	N	105	S-E Corner St Clair & Warden	SCARBOROUGH	4.16 kV	0.18			
SCBE3	ST. CLAIR WARDEN MS	N	106	S-E Corner St Clair & Warden	SCARBOROUGH	4.16 kV	1.27			
SCYB1	PALMDALE SHEPPARD MS	N	107	300 Palmdale Dr	SCARBOROUGH	13.8 kV	6.79			
SCEA1	COMSTOCK FAULKLANDS MS	N	108	57 Comstock Rd	SCARBOROUGH	4.16 kV	1.2			
SCEA2	COMSTOCK FAULKLANDS MS	N	109	57 Comstock Rd	SCARBOROUGH	4.16 kV	1.95			
SCEA3	COMSTOCK FAULKLANDS MS	N	110	57 Comstock Rd	SCARBOROUGH	4.16 kV	0.55			
SCJG1	ROSSCOWAN PHARMACY MS	N	111	1 Rosscowan Gate	SCARBOROUGH	13.8 kV	0.24			
SCJG2	ROSSCOWAN PHARMACY MS	N	112	1 Rosscowan Gate	SCARBOROUGH	13.8 kV	1.71			
SCJG3	ROSSCOWAN PHARMACY MS	N	113	1 Rosscowan Gate	SCARBOROUGH	13.8 kV	0.31			
SCFB4	LAWRENCE KENNEDY T2 MS	N	114	2355 Lawrence Ave E	SCARBOROUGH	4.16 kV	3.52			
SCFB5	LAWRENCE KENNEDY T2 MS	N	115	2355 Lawrence Ave E	SCARBOROUGH	4.16 kV	1.25			
SCFB6	LAWRENCE KENNEDY T2 MS	N	116	2355 Lawrence Ave E	SCARBOROUGH	4.16 kV	1.7			
SCZE1	MIDLAND LAWRENCE MS	N	117	1365 Midland Ave	SCARBOROUGH	4.16 kV	0.72			
SCZE2	MIDLAND LAWRENCE MS	N	118	1365 Midland Ave	SCARBOROUGH	4.16 kV	0.68			
SCZE3	MIDLAND LAWRENCE MS	N	119	1365 Midland Ave	SCARBOROUGH	4.16 kV	6.53			
SCWB1	KINGSTON PARKCREST MS	N	120	3375 Kingston Rd	SCARBOROUGH	4.16 kV	0.53			
SCWB2	KINGSTON PARKCREST MS	N	121	3375 Kingston Rd	SCARBOROUGH	4.16 kV	0.53			
SCWB3	KINGSTON PARKCREST MS	N	122	3375 Kingston Rd	SCARBOROUGH	4.16 kV	0.66			
SCFB1	LAWRENCE KENNEDY T1 MS	N	123	2355 Lawrence Ave E	SCARBOROUGH	4.16 kV	1.1			
SCFB2	LAWRENCE KENNEDY T1 MS	N	124	2355 Lawrence Ave E	SCARBOROUGH	4.16 kV	4.26			
SCFB3	LAWRENCE KENNEDY T1 MS	N	125	2355 Lawrence Ave E	SCARBOROUGH	4.16 kV	3.8			
SCSG1	MIDLAND HUNTINGWOOD MS	N	126	2753 Midland Ave	SCARBOROUGH	13.8 kV	2.45			
SCSG2	MIDLAND HUNTINGWOOD MS	N	127	2753 Midland Ave	SCARBOROUGH	13.8 kV	2.65			
SCSG3	MIDLAND HUNTINGWOOD MS	N	128	2753 Midland Ave	SCARBOROUGH	13.8 kV	6.28			
TOA220GD	GEORGE & DUKE MS	N	129	233 Adelaide St E	TORONTO	13.8 kV	6.93			
TOA230GD	GEORGE & DUKE MS	N	130	233 Adelaide St E	TORONTO	13.8 kV	3.33			
TOA240GD	GEORGE & DUKE MS	N	131	233 Adelaide St E	TORONTO	13.8 kV	6.32			
TOA250GD	GEORGE & DUKE MS	N	132	233 Adelaide St E	TORONTO	13.8 kV	5.6			

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SCHB1	BRIMLEY SHADDOCK T1 MS	N	133	531 Brimley Rd	SCARBOROUGH	4.16 kV	5.01			
SCHB2	BRIMLEY SHADDOCK T1 MS	N	134	531 Brimley Rd	SCARBOROUGH	4.16 kV	1.12			
SCHB3	BRIMLEY SHADDOCK T1 MS	N	135	531 Brimley Rd	SCARBOROUGH	4.16 kV	2.91			
SCCJ1	LAWRENCE MCCOWAN MS	N	136	3060 Lawrence Ave E	SCARBOROUGH	4.16 kV	3.57			
SCCJ2	LAWRENCE MCCOWAN MS	N	137	3060 Lawrence Ave E	SCARBOROUGH	4.16 kV	1.95			
SCCJ3	LAWRENCE MCCOWAN MS	N	138	3060 Lawrence Ave E	SCARBOROUGH	4.16 kV	8.76			
SCAE1	BELLAMY EGLINTON MS	N	139	119 Bellamy Rd N	SCARBOROUGH	4.16 kV	3.62			
SCAE2	BELLAMY EGLINTON MS	N	140	119 Bellamy Rd N	SCARBOROUGH	4.16 kV	0.46			
SCAE3	BELLAMY EGLINTON MS	N	141	119 Bellamy Rd N	SCARBOROUGH	4.16 kV	2.65			
NYSS63F1	ESTELLE MS	N	142	639 Conacher Dr	NORTH YORK	4.16 kV	3.67			
YK88M12	RICHVIEW TS	N	143	65 Kelfield St	YORK	27.6 kV	22.61			
EY53M3	BERMONDSEY I TS	N	144	178 Bermondsey Rd.	EAST YORK	27.6 kV	6.31			
EY53M7	BERMONDSEY I TS	N	145	178 Bermondsey Rd.	EAST YORK	27.6 kV	18.28			
NY53M24	BERMONDSEY II TS	N	146	178 Bermondsey Rd.	NORTH YORK	27.6 kV	4.17			
NY53M25	BERMONDSEY II TS	N	147	178 Bermondsey Rd.	NORTH YORK	27.6 kV	10.12			
NY53M26	BERMONDSEY II TS	N	148	178 Bermondsey Rd.	NORTH YORK	27.6 kV	6.92			
NY53M27	BERMONDSEY II TS	N	149	178 Bermondsey Rd.	NORTH YORK	27.6 kV	1.57			
NY53M28	BERMONDSEY II TS	N	150	178 Bermondsey Rd.	NORTH YORK	27.6 kV	3.9			
SCR4323	WARDEN TS	N	151	699 Warden Ave	SCARBOROUGH	27.6 kV	20.43			
SCR4324	WARDEN TS	N	152	699 Warden Ave	SCARBOROUGH	27.6 kV	23.35			
SCR4325	WARDEN TS	N	153	699 Warden Ave	SCARBOROUGH	27.6 kV	6.27			
SCR4326	WARDEN TS	N	154	699 Warden Ave	SCARBOROUGH	27.6 kV	10.68			
SCR4327	WARDEN TS	N	155	699 Warden Ave	SCARBOROUGH	27.6 kV	21.58			
SCR4328	WARDEN TS	N	156	699 Warden Ave	SCARBOROUGH	27.6 kV	26.32			
SCR4329	WARDEN TS	N	157	699 Warden Ave	SCARBOROUGH	27.6 kV	18.45			
SCR4330	WARDEN TS	N	158	699 Warden Ave	SCARBOROUGH	27.6 kV	24.78			
NYSS23F2	BOND MS	N	159	130 Bond Ave	NORTH YORK	4.16 kV	2.04			
EY34M1	LEASIDE TS	N	160	1080 Millwood Ave.	EAST YORK	27.6 kV	13.94			
EY34M2	LEASIDE TS	N	161	1080 Millwood Ave.	EAST YORK	27.6 kV	14.8			
EY34M3	LEASIDE TS	N	162	1080 Millwood Ave.	EAST YORK	27.6 kV	4.71			
EY34M4	LEASIDE TS	N	163	1080 Millwood Ave.	EAST YORK	27.6 kV	31.51			
EY34M8	LEASIDE TS	N	164	1080 Millwood Ave.	EAST YORK	27.6 kV	15.13			
TOB102KS	KEELE & ST. CLAIR MS	N	165	1860 St Clair Ave W	TORONTO	4.16 kV	0.2			

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TOB1KS	KEELE & ST. CLAIR MS	N	166	1860 St Clair Ave W	TORONTO	4.16 kV	2.43			
TOB2KS	KEELE & ST. CLAIR MS	N	167	1860 St Clair Ave W	TORONTO	4.16 kV	2.55			
TOB3KS	KEELE & ST. CLAIR MS	N	168	1860 St Clair Ave W	TORONTO	4.16 kV	0.19			
TOB4KS	KEELE & ST. CLAIR MS	N	169	1860 St Clair Ave W	TORONTO	4.16 kV	2.56			
TOB5KS	KEELE & ST. CLAIR MS	N	170	1860 St Clair Ave W	TORONTO	4.16 kV	0.04			
NY34M5	LEASIDE TS	N	171	1080 Millwood Ave.	NORTH YORK	27.6 kV	4.56			
NY34M6	LEASIDE TS	N	172	1080 Millwood Ave.	NORTH YORK	27.6 kV	12.4			
NY34M7	LEASIDE TS	N	173	1080 Millwood Ave.	NORTH YORK	27.6 kV	18.15			
SCGF1	PROGRESS MARKHAM MS	N	174	895 Progress Ave	SCARBOROUGH	4.16 kV	0.7			
SCGF2	PROGRESS MARKHAM MS	N	175	895 Progress Ave	SCARBOROUGH	4.16 kV	0.8			
SCGF3	PROGRESS MARKHAM MS	N	176	895 Progress Ave	SCARBOROUGH	4.16 kV	1.11			
TOB1SA	SPADINA MS	N	177	555 Spadina Rd	TORONTO	4.16 kV	4.29			
TOB3SA	SPADINA MS	N	178	555 Spadina Rd	TORONTO	4.16 kV	2.72			
EY43M21	WARDEN TS	N	179	699 Warden Ave	EAST YORK	27.6 kV	3.96			
EY43M31	WARDEN TS	N	180	699 Warden Ave	EAST YORK	27.6 kV	16.22			
EY43M32	WARDEN TS	N	181	699 Warden Ave	EAST YORK	27.6 kV	16.44			
ETNF1	ALLENBY MS	Y	182	2310 Islington Ave.	ETOBICOKE	4.16 kV	3.38			
ETNF2	ALLENBY MS	Y	183	2310 Islington Ave.	ETOBICOKE	4.16 kV	7.23			
ETNF3	ALLENBY MS	Y	184	2310 Islington Ave.	ETOBICOKE	4.16 kV	1.51			
SCXG1	EAST AVE TUDOR GLEN MS	N	185	221 East Ave	SCARBOROUGH	13.8 kV	2.9			
SCXG2	EAST AVE TUDOR GLEN MS	N	186	221 East Ave	SCARBOROUGH	13.8 kV	2.98			
SCXG3	EAST AVE TUDOR GLEN MS	N	187	221 East Ave	SCARBOROUGH	13.8 kV	9.2			
NY35M11	FAIRBANKS I TS	N	188	950 Roselawn Ave	NORTH YORK	27.6 kV	13.33			
NY35M12	FAIRBANKS I TS	N	189	950 Roselawn Ave	NORTH YORK	27.6 kV	16.04			
NY35M3	FAIRBANKS I TS	N	190	950 Roselawn Ave	NORTH YORK	27.6 kV	13.45			
NY35M5	FAIRBANKS I TS	N	191	950 Roselawn Ave	NORTH YORK	27.6 kV	23.76			
NY35M7	FAIRBANKS I TS	N	192	950 Roselawn Ave	NORTH YORK	27.6 kV	4.34			
NY35M8	FAIRBANKS I TS	N	193	950 Roselawn Ave	NORTH YORK	27.6 kV	12.48			
NY53M1	BERMONDSEY I TS	N	194	178 Bermondsey Rd.	NORTH YORK	27.6 kV	2.06			
NY53M10	BERMONDSEY I TS	N	195	178 Bermondsey Rd.	NORTH YORK	27.6 kV	4.82			
NY53M2	BERMONDSEY I TS	N	196	178 Bermondsey Rd.	NORTH YORK	27.6 kV	1.06			
NY53M5	BERMONDSEY I TS	N	197	178 Bermondsey Rd.	NORTH YORK	27.6 kV	8.22			
NY53M6	BERMONDSEY I TS	N	198	178 Bermondsey Rd.	NORTH YORK	27.6 kV	9.16			

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NY53M8	BERMONDSEY I TS	N	199	178 Bermondsey Rd.	NORTH YORK	27.6 kV	17.84			
NY53M9	BERMONDSEY I TS	N	200	178 Bermondsey Rd.	NORTH YORK	27.6 kV	3.6			
ETLDF1	CLOVERDALE MALL MS	N	201	250 The East Mall	ETOBICOKE	4.16 kV	3.49			
SC4713	SHEPPARD EAST TS	N	202	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	8.17			
SC4714	SHEPPARD EAST TS	N	203	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	9.52			
SC4715	SHEPPARD EAST TS	N	204	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	12.26			
SC4716	SHEPPARD EAST TS	N	205	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	5.92			
SC4717	SHEPPARD EAST TS	N	206	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	9.84			
SC4718	SHEPPARD EAST TS	N	207	9002 Sheppard Ave E	SCARBOROUGH	27.6 kV	13.19			
NYSS27F1	WINFIELD MS	N	208	331 York Mills Rd	NORTH YORK	4.16 kV	2.04			
NYSS27F2	WINFIELD MS	N	209	331 York Mills Rd	NORTH YORK	4.16 kV	0.65			
NYSS27F3	WINFIELD MS	N	210	331 York Mills Rd	NORTH YORK	4.16 kV	1.56			
NY80M21	FAIRCHILD II TS	N	211	5750 Yonge St.	NORTH YORK	27.6 kV	7.04			
NY80M22	FAIRCHILD II TS	N	212	5750 Yonge St.	NORTH YORK	27.6 kV	1.59			
NY80M23	FAIRCHILD II TS	N	213	5750 Yonge St.	NORTH YORK	27.6 kV	0.12			
NY80M27	FAIRCHILD II TS	N	214	5750 Yonge St.	NORTH YORK	27.6 kV	1.84			
NY80M28	FAIRCHILD II TS	N	215	5750 Yonge St.	NORTH YORK	27.6 kV	4.31			
NY80M29	FAIRCHILD II TS	N	216	5750 Yonge St.	NORTH YORK	27.6 kV	13.52			
NY80M30	FAIRCHILD II TS	N	217	5750 Yonge St.	NORTH YORK	27.6 kV	10.56			
NY80M31	FAIRCHILD II TS	N	218	5750 Yonge St.	NORTH YORK	27.6 kV	0.09			
NY80M32	FAIRCHILD II TS	N	219	5750 Yonge St.	NORTH YORK	27.6 kV	0.37			
SCPJ1	CENTENNIAL DARCY MAGEE MS	N	220	191 Centennial Rd	SCARBOROUGH	13.8 kV	4.04			
SCPJ2	CENTENNIAL DARCY MAGEE MS	N	221	191 Centennial Rd	SCARBOROUGH	13.8 kV	6.21			
SCPJ3	CENTENNIAL DARCY MAGEE MS	N	222	191 Centennial Rd	SCARBOROUGH	13.8 kV	3.27			
SCGE1	GALLOWAY DEARHAMWOODS M	N	223	37 Galloway	SCARBOROUGH	4.16 kV	4.53			
SCGE2	GALLOWAY DEARHAMWOODS M	N	224	37 Galloway	SCARBOROUGH	4.16 kV	2.49			
SCGE3	GALLOWAY DEARHAMWOODS M	N	225	37 Galloway	SCARBOROUGH	4.16 kV	7.62			
SCE51	SCARBOROUGH WEST TS	N	226	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	3.88			
SCE510	SCARBOROUGH WEST TS	N	227	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	6.73			
SCE52	SCARBOROUGH WEST TS	N	228	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	4.56			
SCE53	SCARBOROUGH WEST TS	N	229	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	16.64			
SCE54	SCARBOROUGH WEST TS	N	230	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	10.62			
SCE55	SCARBOROUGH WEST TS	N	231	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	5.31			

toronto hydro electric system

Price Form 1
2010 Maintenance Pruning Circuit List and Quotation

Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
SCE56	SCARBOROUGH WEST TS	N	232	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	17.12			
SCE58	SCARBOROUGH WEST TS	N	233	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	12.41			
SCE59	SCARBOROUGH WEST TS	N	234	2411 Lawrence Ave E	SCARBOROUGH	27.6 kV	7.19			
TOA250DN	DUFFERIN TS	N	235	1045 Dufferin St	TORONTO	13.8 kV	7.1			
TOA251DN	DUFFERIN TS	N	236	1045 Dufferin St	TORONTO	13.8 kV	6.19			
TOA252DN	DUFFERIN TS	N	237	1045 Dufferin St	TORONTO	13.8 kV	7.35			
TOA253DN	DUFFERIN TS	N	238	1045 Dufferin St	TORONTO	13.8 kV	6.09			
TOA255DN	DUFFERIN TS	N	239	1045 Dufferin St	TORONTO	13.8 kV	4.79			
TOA256DN	DUFFERIN TS	N	240	1045 Dufferin St	TORONTO	13.8 kV	8.1			
TOA257DN	DUFFERIN TS	N	241	1045 Dufferin St	TORONTO	13.8 kV	6.57			
TOA258DN	DUFFERIN TS	N	242	1045 Dufferin St	TORONTO	13.8 kV	2.31			
TOA271DN	DUFFERIN TS	N	243	1045 Dufferin St	TORONTO	13.8 kV	7.42			
TOA273DN	DUFFERIN TS	N	244	1045 Dufferin St	TORONTO	13.8 kV	7.37			
TOA285DN	DUFFERIN TS	N	245	1045 Dufferin St	TORONTO	13.8 kV	7.24			
TOA490DN	DUFFERIN TS	N	246	1045 Dufferin St	TORONTO	13.8 kV	2.65			
TOB1W	WILTSHIRE TS	N	247	13-19 Wiltshire Ave	TORONTO	4.16 kV	1.69			
TOB2W	WILTSHIRE TS	N	248	13-19 Wiltshire Ave	TORONTO	4.16 kV	2.71			
TOB3W	WILTSHIRE TS	N	249	13-19 Wiltshire Ave	TORONTO	4.16 kV	1.37			
TOB5W	WILTSHIRE TS	N	250	13-19 Wiltshire Ave	TORONTO	4.16 kV	3.35			
TOB6W	WILTSHIRE TS	N	251	13-19 Wiltshire Ave	TORONTO	4.16 kV	0.03			
TOB7W	WILTSHIRE TS	N	252	13-19 Wiltshire Ave	TORONTO	4.16 kV	0.07			
NY80M1	FAIRCHILD I TS	N	253	5750 Yonge St.	NORTH YORK	27.6 kV	20.9			
NY80M10	FAIRCHILD I TS	N	254	5750 Yonge St.	NORTH YORK	27.6 kV	11.83			
NY80M2	FAIRCHILD I TS	N	255	5750 Yonge St.	NORTH YORK	27.6 kV	14.8			
NY80M3	FAIRCHILD I TS	N	256	5750 Yonge St.	NORTH YORK	27.6 kV	5.49			
NY80M4	FAIRCHILD I TS	N	257	5750 Yonge St.	NORTH YORK	27.6 kV	16.17			
NY80M5	FAIRCHILD I TS	N	258	5750 Yonge St.	NORTH YORK	27.6 kV	11.09			
NY80M6	FAIRCHILD I TS	N	259	5750 Yonge St.	NORTH YORK	27.6 kV	21.46			
NY80M7	FAIRCHILD I TS	N	260	5750 Yonge St.	NORTH YORK	27.6 kV	3.89			
NY80M8	FAIRCHILD I TS	N	261	5750 Yonge St.	NORTH YORK	27.6 kV	9.02			
NY80M9	FAIRCHILD I TS	N	262	5750 Yonge St.	NORTH YORK	27.6 kV	5.46			
NYSS58F1	SENTINEL MS	Y	263	1508 Sentinel Rd	NORTH YORK	13.8 kV	10.83			
NYSS58F2	SENTINEL MS	Y	264	1508 Sentinel Rd	NORTH YORK	13.8 kV	1.45			

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Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
NYSS58F3	SENTINEL MS	Y	265	1508 Sentinel Rd	NORTH YORK	13.8 kV	2.61			
NYSS58F4	SENTINEL MS	Y	266	1508 Sentinel Rd	NORTH YORK	13.8 kV	3.21			
NYSS58F5	SENTINEL MS	Y	267	1508 Sentinel Rd	NORTH YORK	13.8 kV	4.57			
NYSS68F1	LESLIE MS	N	268	5733 Leslie St	NORTH YORK	13.8 kV	2.72			
NYSS68F10	LESLIE MS	N	269	5733 Leslie St	NORTH YORK	13.8 kV	2.24			
NYSS68F2	LESLIE MS	N	270	5733 Leslie St	NORTH YORK	13.8 kV	4.64			
NYSS68F3	LESLIE MS	N	271	5733 Leslie St	NORTH YORK	13.8 kV	5.59			
NYSS68F4	LESLIE MS	N	272	5733 Leslie St	NORTH YORK	13.8 kV	4.08			
NYSS68F5	LESLIE MS	N	273	5733 Leslie St	NORTH YORK	13.8 kV	7.41			
NYSS68F6	LESLIE MS	N	274	5733 Leslie St	NORTH YORK	13.8 kV	6.33			
NYSS68F7	LESLIE MS	N	275	5733 Leslie St	NORTH YORK	13.8 kV	5.59			
NYSS68F8	LESLIE MS	N	276	5733 Leslie St	NORTH YORK	13.8 kV	0.41			
NYSS68F9	LESLIE MS	N	277	5733 Leslie St	NORTH YORK	13.8 kV	5.49			
ETRAF1	THORNTON MS	N	278	59 Glen Agar Dr	ETOBICOKE	4.16 kV	2.13			
ETRAF2	THORNTON MS	N	279	59 Glen Agar Dr	ETOBICOKE	4.16 kV	4.62			
ETRAF3	THORNTON MS	N	280	59 Glen Agar Dr	ETOBICOKE	4.16 kV	4.54			
TOA202BN	BASIN TS	N	281	23-25 Basin St	TORONTO	13.8 kV	9.11			
TOA203BN	BASIN TS	N	282	23-25 Basin St	TORONTO	13.8 kV	11.08			
TOA204BN	BASIN TS	N	283	23-25 Basin St	TORONTO	13.8 kV	5.24			
ETWCF1	ELMHURST MS	Y	284	62 Elmhurst Dr	ETOBICOKE	4.16 kV	6.81			
ETWCF2	ELMHURST MS	Y	285	62 Elmhurst Dr	ETOBICOKE	4.16 kV	1.47			
ETWCF3	ELMHURST MS	Y	286	62 Elmhurst Dr	ETOBICOKE	4.16 kV	1.39			
SCHA1	WEXFORD SURREY MS	N	287	46 Wexford Dr	SCARBOROUGH	4.16 kV	5.13			
SCHA2	WEXFORD SURREY MS	N	288	46 Wexford Dr	SCARBOROUGH	4.16 kV	1.53			
SCHA3	WEXFORD SURREY MS	N	289	46 Wexford Dr	SCARBOROUGH	4.16 kV	4.14			
ETAF1	WEST ISLINGTON MS	N	290	55 Ashbourne Dr	ETOBICOKE	4.16 kV	2.03			
ETAF2	WEST ISLINGTON MS	N	291	55 Ashbourne Dr	ETOBICOKE	4.16 kV	1.77			
ETAF6	WEST ISLINGTON MS	N	292	55 Ashbourne Dr	ETOBICOKE	4.16 kV	3.7			
NYSS59F1	BROADLANDS MS	N	293	1 Broadlands Blvd	NORTH YORK	4.16 kV	3.33			
NYSS59F2	BROADLANDS MS	N	294	1 Broadlands Blvd	NORTH YORK	4.16 kV	2.31			
NYSS59F3	BROADLANDS MS	N	295	1 Broadlands Blvd	NORTH YORK	4.16 kV	2.04			
NYSS59F6	BROADLANDS MS	N	296	1 Broadlands Blvd	NORTH YORK	4.16 kV	0.93			
SCRJ1	MORNINGSIDE CORONATION MS	N	297	160 Morningside Ave	SCARBOROUGH	4.16 kV	4.06			

Price Form 1
2010 Maintenance Pruning Circuit List and Quotation

Circuit	Substation Name	ALB Yes or No	Priority	Substation Address	Former Municipality	Voltage	Circuit Length (Km)	Approx. # of Units	Quote (Standard Prunning)	Quote (Storm Hardening)
SCRJ2	MORNINGSIDE CORONATION MS	N	298	160 Morningside Ave	SCARBOROUGH	4.16 kV	5.44			
SCRJ3	MORNINGSIDE CORONATION MS	N	299	160 Morningside Ave	SCARBOROUGH	4.16 kV	2.68			
ETNGF1	BRAEBURN MS	Y	300	15 Arcot Blvd	ETOBICOKE	4.16 kV	2.32			
ETNGF2	BRAEBURN MS	Y	301	15 Arcot Blvd	ETOBICOKE	4.16 kV	0.6			
ETNGF3	BRAEBURN MS	Y	302	15 Arcot Blvd	ETOBICOKE	4.16 kV	1.06			
ETNGF4	BRAEBURN MS	Y	303	15 Arcot Blvd	ETOBICOKE	4.16 kV	0.81			
TOA63H	HIGH LEVEL MS	N	304	292-296 Mac Pherson Ave	TORONTO	13.8 kV	0.02			
ETDBF3	EVANS MS	N	305	194 Evans Ave	ETOBICOKE	4.16 kV	0.05			
	Total Feeder Length Trimmed						1637.53			

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INTERROGATORY 27:

Reference(s): **Exhibit F1 Tab1 Schedule 6 page 3**

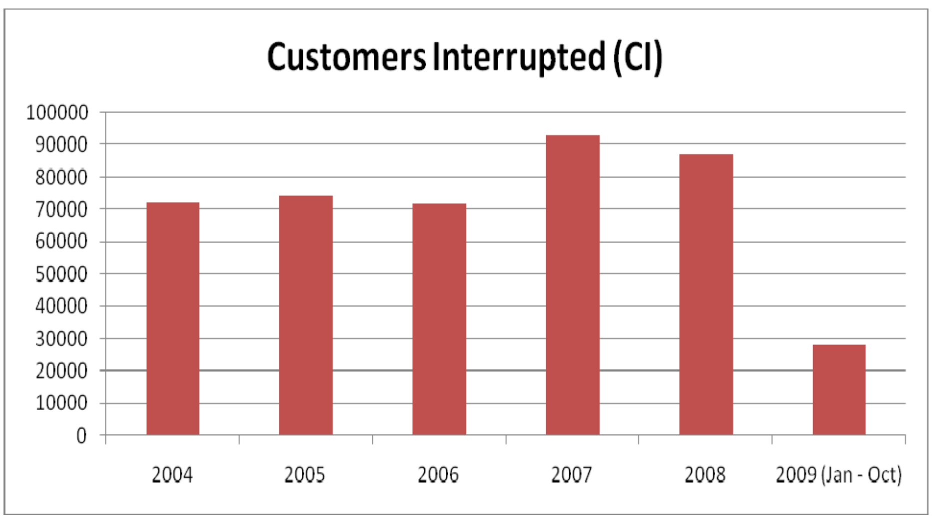
a) Provide the cost and update the 2009 estimate of Emergency costs to reflect the Summer 2009 windstorm emergency.

b) Update the Chart on page 3 to reflect 2009 YTD CI.

RESPONSE:

a) The summer 2009 windstorm event of August 20-21 resulted in emergency maintenance costs totaling $686,542.30 for this event alone. The cumulative 2009 emergency maintenance costs amount to $1,028,226.71 as of November 12, 2009.

b) The updated chart on page 3 to reflect 2009 YTD CI is shown below. The original chart in Exhibit F1, Tab 1, Schedule 6 was shown with Customer Hour Interrupted ("CHI"). The trends between the two charts are consistent as explained in the original narrative.



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INTERROGATORY 28:

Reference(s): **Exhibit F1 Tab3 Schedule 1 page 2**

"Facilities Services allocates its costs to the business units based on the cost allocation model described in Exhibit C1, Tab 4, Schedule 3."

a) Provide a copy of Exhibit C1 Tab 4 Schedule 3 as it pertains to costing allocation of facility costs.

b) Show the calculation of the costing/allocation of Facilities costs for 2010. Reconcile the result to the total costs in Table 1 page 3 and also provide the amounts charged to affiliates (THC and THESI) in the years 2008-2010 and the basis of these charges based on the costing model.

RESPONSE:

a) Please see the excerpt below from Exhibit C1, Tab 4, Schedule 3 which pertains to costing allocation of facility costs:

FACILITIES

The allocation of Facilities costs to business units is done to optimize the use of space within THESL's facilities. The allocation is based on square-footage and type of space. The allocation provides for a transfer of operating costs from the Facilities group to the business units.

The costs included in the Facilities allocation mainly consist of:

- Compensation costs;
- Property leases;
- Maintenance costs;

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- Facilities overhead;
- Utilities costs; and
- Property taxes.

Facilities costs allocated to unregulated affiliates include a component for depreciation and return on assets.

b) Please see Appendix A of this Schedule.

THESL - 2010 Budget Facilities Allocation ($ millions)

Table 1 Per Square Footage Charge rates

		Calculated Rates by Space Type						
		Office	**Station**	**Warehouse**	**Shop**	**Covered Parking**	**Outdoor**	**Total**
Space Type Allocations Facilities OPEX	A	47%	25%	20%	0%	0%	8%	
Facilities Allocation Total (in millions)	C=BxA	$ (11.9)	$ (6.3)	$ (5.1)	$ -	$ -	$ (2.0)	$ (25.3)
Square Feet	D	671,829	802,000	468,758	-	-	4,361,499	
Rate ($ / sq. feet)	E=C/D	$ 17.7	$ 7.9	$ 10.8	$ -	$ -	$ 0.5	

Table 2 Reconciliation (F1/T3/S1)

		2010 Test
Facilities Costs		**$ 25.8**
Less: Facilities Allocation	B	$ (25.3)
Total Costs (net of recoveries)		**$ 0.5**
Add: Facilities Allocation		$ 25.3
Total Costs		**$ 25.8**

Notes

-The Occupancy charges to cost centres are based on the sq ft used by each cost centre multiplied by a calculated sq ft rate.

-The facilities allocations are designed to recoup all costs of the RC5200 - Facilities cost centre and reallocate those costs to the cost centres occuping the space to help promote efficient use of space by each cost centre.

Table 3 Affiliate Occupancy Charges

Affiliates	**Actual 2008**	**Bridge 2009**	**Test 2010**
THC	591,309	549,087	52,245
THESI	-	-	-
Total Affiliate Occupancy charges	591,309	549,087	52,245

Notes

Note: For 2010, occupancy charged to THC was minimal due to the reorganization

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INTERROGATORY 29:

Reference(s): Exhibit F1, Tab7, Schedule 1, page 6
Exhibit F1, Tab 7, Schedule 4, page 4

a) Provide the history of bad debt expense and the # of delinquent accounts 2008-2009 and the forecast for 2010.

b) Indicate how many delinquent accounts were/are estimated to be put onto a[n] arrears management program.

c) How many disconnections occurred in 2008, YTD 2009 and forecast 2010.

RESPONSE:

a) Final bad debt calculations occur in the year following the delinquency. Therefore, 2008 is a forecasted amount as the final write-offs have not been completed.

	2008 Forecast	2009 Forecast	2010 Forecast
Bad debt expense	$7.1 million	$7.3 million	$7.9 million
Number of customer write-offs	23,700	24,200	25,400

b) In 2008, 153,000 customers received 413,000 delinquent account notifications and were on an arrears management program. In 2009, it is projected that 173,000 customers will receive 431,000 delinquent account notifications and will be on an arrears management program. In 2010, it is forecasted that 187,000 customers will receive 460,000 delinquent account notifications and will be on an arrears management program.

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c) In 2008, there were 9,067 disconnects; as of October 30, 2009, there are 7,601, projected to be 9,800 by year end; the number of disconnects forecasted for 2010 is 10,800.

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INTERROGATORY 30:

Reference(s): Exhibit F2 Tab2 Schedule1 page 1-2

a) Provide a schedule that shows the increase in 2010 in-house costs resulting from repatriation of Governance Responsibility Centre A&G functions from THC to THESL. For payroll related costs indicate the number of FTEs.

b) Compare this cost to and reconcile with the reduction in affiliate charges from THC.

RESPONSE:

a) See Appendix A of this Schedule.

b) See Appendix A of this Schedule.

Appendix A
Increase in cost due to repatriation of THC ($ millions)

Response Part (a)				
	Payroll Costs		4.9	34 FTE
	Vehicle Costs and Fleet Charges		0.0	
	Inventory and Direct Purchases		0.0	
	External Contract Services		2.6	
	Utilities and Communications		0.0	
	Office Supplies and Postage		0.0	
	Employee Expenses		0.3	
	Other Support Costs		0.0	
	Total Before Allocations and Recoveries		7.9	
	Total Usage Charges		0.5	
	Operating Expenses		**8.4**	
Response Part (b)	Decrease in Shared Services costs in THESL per 2010 Budget		-5.7	
	Additional decrease estimated from governance reduction ($160K) (Ex. R1, Tab 11, Schedule 3, part a)		-0.2	
	Expected savings on Shared Services based on 2010 Rates	a	-2.9	
	Residual Cost/(Savings)		**-0.4**	

<u>**Expected savings on Shared Services based on 2010 Rates**</u>

2009 Budget Shared Service Costs	8.5	
2009 Shared Service Cost Weighted at 2010 Rate	11.4	
Expected increase in 2010 Shared Services has THC not been repatriated	**-2.9**	a

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INTERROGATORY 31:

Reference(s): **Exhibit F2 Tab3 Schedule1 page 1**

a) Provide the A&G amount included in the 2010 budget for the Low Income Energy Assistance Program and provide a breakdown of the amount.

b) Given that LEAP has been delayed/postponed what treatment of these costs does THESL suggest as appropriate?

RESPONSE:

a) Please refer to the response to Board Staff interrogatory #25.

b) THESL has not incurred any costs as the LEAP program has not been implemented. THESL will make an adjustment to remove the excess $500,000 at the time of rate finalization.

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INTERROGATORY 32:

Reference(s): Exhibit F2 Tab 6 Schedule1 page 3

a) Please provide a breakdown of the total $1.6 million increase in the 2010 Test year versus 2008 Historical for Treasury, Rates and Regulatory Affairs.

b) Which Treasury functions were performed by THC in 2008 and 2009.

c) Provide the 2008 and 2009 THC Treasury costs incurred on behalf of THESL together with THESL in house costs and give an explanation of how the 2010 treasury services and costs differ from prior years.

d) Provide a breakdown of THESL's 2010 regulatory costs and compare these to the historic Board-Approved and Bridge year estimate.

RESPONSE:

a) Provided below is a breakdown of the total $1.6 million increase:

2008 Historical	**7.2**
Treasury	
Foreign Exchange Conversion (credit in 2008, budgeted at zero for 2010)	0.5
External Contracted Services: mainly due to consulting Legal Fees for OEB filing	0.2
Rates & Regulatory Group	
Increase primarily due to addition of staff in Rates group	0.4
Labour recovery for employee time that was previously charged to the CIS and CC&B company wide projects	0.2
OEB Annual Fixed Costs increase	0.4
2010 Test	**8.8**

b) Treasury functions are performed by THESL employees. The specific functions performed are described on page 1 of the referenced exhibit. No changes in function have occurred over the 2008 to 2009 period.

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c) Treasury functions are performed by THESL employees. There are no Treasury costs in THC in 2008 or 2009.

d) Please see response to Board Staff interrogatory # 27 b).

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INTERROGATORY 33:

Reference(s): **Exhibit F2 Tab 6 Schedule1 page 4**

With respect to customer deposits, THESL is also required to pay interest at prime less 2 percent on these amounts. In 2010, the forecast cost is $0.8 million. Customer deposits are not segregated from the other cash accounts of THESL, so to the extent that they can earn interest, the interest amounts are already refunded to customers through revenue offsets (of which interest income is a component). Therefore, the interest component is being refunded to customers twice, and not recovered by THESL. The current cost of capital mechanism makes no allowance for these costs to be funded, and the significance of the amount in the Test Year warrants its inclusion in the revenue requirement.

a) Explain why, unlike prior years, customer deposits are now a cost to THESL. In your answer consider the spread between THESL ST borrowing at Board Approved rates and the amount paid on Customer Deposits.

b) Provide an estimate of the value of Customer Deposits on hand (average) in 2008, YTD 2009 and 2010 forecast.

c) Why cannot Customer Deposits not be segregated and interest paid at Board prescribed rates, thus reducing other ST borrowing (line of credit against accounts receivable or other) to prevent double charging (if that is the reason for the increased cost in 2010)?

d) What Impact has postponement of Amendments to Customer Service provisions under LEAP had? Please discuss in detail.

RESPONSE:

a) THESL believes that this has been an issue in previous years. It was only in developing the evidence for this case that THESL realized it has been paying

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customers twice for interest on deposits. Currently, the spread between what THESL can invest the customer deposits for (0.4%) and the OEB prescribed rate on customer deposits (0.25%) is minimal.

b) Average customer deposits in each of 2008, 2009, and 2010 is as follows:

2008: $41.3M
2009: $39.6M
2010: $40.4M

c) THESL has not previously segregated the funds because of the inherent inefficiency in setting up a completely separate bank account and related accounting records for just such a purpose, and because, in any case, THESL maintains detailed accounting records linked to each customer that makes a deposit. However, if the funds were kept separate, the interest income received should not be included as a revenue offset, since the income would be applied towards the repayments.

d) Currently, there is not enough information to be able to determine the impact, if any, the LEAP program may have on customer deposit balances or interest costs or income.

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INTERROGATORY 34:

Reference(s): **Exhibit G1 Tab1 Schedule 1 page 1**

The Board in its June 16, 2009 SG Guidelines provided for Deferral Accounts for renewable Generation Connection and Smart Grid Development Expenditures for recording incremental investments or expenses.

a) Has THESL established or is requesting a GEA Deferral Account or GEA funding adder?

b) Why should THESL recover the $9,770, 000 in capital costs and $450, 000 operating costs in 2010 rates, as opposed to recording in a Deferral account (with without GEA rate adder)? Please explain whether the proposed regulatory treatment conforms to the Board's Guidelines.

c) Is/will THESL seeking to allocate GEA initiatives only to its ratepayers (or otherwise- as per Reg. 330). If not please indicate the amount to be recovered under the Reg. and whether this is incremental to the costs to be recovered from THESL ratepayers.

RESPONSE:

a) THESL has not established and is not requesting a GEA Deferral Account or funding adder for its proposed GEA investments. Rather, THESL is requesting that its specific and incremental Smart Grid investments be recovered through rates effective May 1, 2010.

b) On page 2 of G-2009-0087, Guidelines: Deemed Conditions of Licence: Distribution System Planning from June 16 2009, the Board states, "Distributors may make expenditures relating to renewable generation connections and smart grid

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development that they consider appropriate without a Board-approved plan or a funding adder. The prudence of those expenditures and recovery of their cost will be subject to a Board review in the normal course." THESL considers its 2010 EDR application to be an appropriate forum for the Board to test the prudence of its proposed 2010 smart grid investments.

c) THESL is seeking to allocate GEA initiatives only to its ratepayers. None of the costs will be allocated to provincial ratepayers as per Reg. 330.

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INTERROGATORY 35:

Reference(s): Exhibit G1 Tab 1 Schedule 1 Pages 7-12 and Tables 2 and 3

The three-year plan of the smart grid roadmap is intended to establish Toronto's Smart Community, which is a demonstration area where prioritized initiatives can be tested, processes developed, customer acceptance understood, and operating procedures created. Expected benefits will be demonstrated, measured, and used to support potential full scale deployment.

a) Explain why customer satisfaction seems to be the last phase of the Road Map Figure 1 i.e., Customers (*other than the few participating in demonstrations*) will be paying big cost increases for years but it appears that broad based customer benefits will not occur until late in the plan? Perhaps Figure 1 needs to be revised – please comment.
b) Provide details of how benefits in each category will be forecast, tracked and assessed.
c) Is there a Business Case, including a Benefits Realization Plan. If so provide a copy.
d) How many of the projects (e.g., automatic fault recovery) are in the 10 year capital plan? Provide a list and the original time frame for these.
e) Since the 3 year plan is predicated on Demonstration, are all the projects in Table 2 located in North York? If not indicate which are NY specific and which are system wide.
f) Are all the projects in Table 3 based on demonstration in North York? If not indicate which are NY specific and which are system wide.
g) Indicate whether THESL employees will participate as end users in demonstration projects or whether all demonstration participants will be non-employees.
h) How will participants in demonstrations be selected? Provide the screening/selection criteria and differentiate as needed for each type of project.

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RESPONSE:

a) Customer satisfaction is not the last phase of the roadmap in Figure 1 of Exhibit G1, Tab 1, Schedule 1, page 9. Initiatives relating to the three objective areas – climate protection, energy security, and customer satisfaction – are developed simultaneously under the time periods of 3, 3-10, and 10-25 year plans.

b) Benefits in each category will be assessed based on the demonstration projects' outcome. They will form an integral part of the economic assessment of the deployment projects essential for evaluating their business cases. These benefits will be defined by use cases and forecasted based on past performance and the design of the new technology. A benefits realization plan will also be developed to define the mechanism for tracking and assessing these benefits as they are realized.

c) Each of the smart grid projects has been subject to a business case analysis. THESL's efforts have been dedicated to actively explore the needs of developing the smart grid in compliance with provincial mandate and in meeting utility and distributed generation requirements. THESL also has the responsibility to explore, be familiarized with, and apply new technologies considering the uniqueness of its customer base and infrastructure. However the projects have not gone through an economic assessment as explicit benefits and costs have yet to be measured. The primarily purpose of the demonstration is to learn about the technology, its impact to THESL operations, and to collect information which will enable THESL to further evaluate the potentials of project deployment.

The value proposition and rationale for each of the 2010 initiatives are discussed in

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Exhibit G1, Tab 1, Schedules 2 and 3., Each project is fully aligned with the smart grid objectives as described in Exhibit G1, Tab 1, Schedule 1, page 5.

d) All smart grid operations projects as listed in Exhibit G1, Tab 1, Schedule 1, Table 2 are included in the ten-year capital plan, with the timeline provided in Exhibit D1, Tab 8, Schedule 10, Table 12.

e) All smart grid operations projects as listed in Exhibit G1, Tab 1, Schedule 1, Table 2, other than the secondary network automation and environmental projection initiative, are located in the Smart Community area in North York. The secondary network automation initiative is located in former Toronto. The environmental protection initiative is studies based and demonstrations are only deployed as needed by the study. No initiatives are deployed system-wide.

f) Not all of the IT&S projects, listed in Table 3, are based on the demonstration area in North York. Some of these projects will require changes in the back-office and some are system-wide applicable such as:

1. Integration Architecture and Design;
2. Internal Network Readiness;
3. Smart Grid Network Security; and
4. Some customer-facing pilots.

g) Demonstration participants must be a THESL customer with a smart meter and high speed internet access. Programs will be open to both THESL employees and non-employees.

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

h) Participants will be enrolled on a volunteer basis, based on the criteria identified in part g) as well as on geography.

INTERROGATORIES OF VULNERABLE ENERGY CONSUMERS COALITION

INTERROGATORY 36:

Reference(s): **Exhibit G1 Tab 1 Schedule 1 Page 11**

In its SG Guidelines issued June 16, 2009 the Board stated that if LDCs conduct or commission smart grid pilots/studies they should not duplicate efforts elsewhere in North America and should explore cost sharing partnerships.

a) Provide a copy of the referenced report Connecting the Smart Grid.

b) Did THESL coordinate its SG work with Hydro One or other GTA utilities? Please describe the collaboration.

RESPONSE:

a) Refer to Appendix A for report.

b) THESL has been and will continue to be coordinating with distributors and transmitters with regard to Smart Grid initiatives, through ongoing discussions and collaborations at the Ontario Smart Grid Forum, Electricity Distributors Association, Canadian Electricity Association, CEATI, Utilities Telecom Council, and Institute of Electrical and Electronics Engineers. Moreover THESL will continue to actively participate at various conferences and seminars to share results and lessons learned.

toronto hydro
electric system

CONNECTING THE SMART GRID

STRATEGIC DEPLOYMENT OF TORONTO'S ELECTRICITY NETWORK OF THE FUTURE

March 20 2009

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EXECUTIVE SUMMARY

Electricity has been a primary driver for change in the 20th century. Toronto's electricity network (the "grid") has been built to service the City of Toronto for over 95 years, providing a fundamental necessity of life, for comfort, security, entertainment, and upholding the economy in this financial capital of Canada. Our society has become increasingly dependent on reliable, high quality electricity, and this has made the electricity grid a critical and necessary infrastructure.

However, the electric grid cannot be assumed to continue delivering its services indefinitely without a significant change. The grid is faced with an abundance of risks that are increasing in size, scale, and complexity. The infrastructure is aging and demands are increasing, making it ever more difficult to maintain reliability and integrity after years of underinvestment. Simultaneously, customers in the digital era are accustomed to highly reliable, real time services, with abundant information exchange, options, control, and instant feedback. Additionally, customer loads have increased substantially with little additional investment in the existing distribution infrastructure. Finally, environmental protection has become a key priority in the political agenda and in the minds of the public.

These growing pressures are now presenting a convergence of risks that overlays all of a utility's strategic decisions regarding the future. It is calling for an immense task for innovative alternatives and creative problem solving. It requires a shift in the industry that requires everyone's collaborative efforts.

This effort, coined as "smart grid", is a paradigm shift that represents the single greatest transformation in the history of the electric utility, an evolution of how it functions in its social, economical and environmental contexts. The vision is here, and the challenge now lies in translating that vision into action. The grid must be strategically renewed and prudently invested, applying innovative concepts and technologies, to deliver the service that is needed in the 21st century.

Defining the Smart Grid

A smart grid can be defined as the strategic application of advanced information, communications, and electrical/electronics technology, to optimize the operation and control of the electric infrastructure, to meet customer requirements and enhance their experience, and to promote environmental sustainability. It refers to a network of intelligence, through smart systems, smart processes, and smart people. It is not a one-time installation program, but a continuously evolving grid, keeping abreast of technological advances and seeking opportunities for the betterment of the grid. Smart grid is also about being connected, connecting the grid with its customers, new technologies, and the environment.

The Case for Change

The vision of smart grid is based on the realities that the electricity industry is facing today. Utilities must respond to these realities to continue providing services for its customers, the society, and the environment. The key drivers for change include:

- **The Ontario Green Energy Act** – provincial initiative that can enable Ontario to become a North American leader in renewable energy and green economy.
- **City of Toronto's Climate Change Plan** – commitment for Toronto to become the renewable energy capital of Canada.
- **Electrification of transportation** – shift in the transportation industry to plug-in electric and hybrid electric vehicles (PHEVs), as well as expansion of electric public transit.
- **Energy security** – a convergence of risks with an aging infrastructure, congestion, price volatility, system losses, cyber and physical security risks, and need for workforce renewal.
- **Customer expectations in a digital era** – focus on community values and environmental actions, need for tools to manage electricity use, preferences to install distributed generation, need for consistent high power quality to meet digital electronics requirements, and the demand for better experience with the utility.

Toronto's smart grid is seen as the plug that connects environmentally mindful customers to the grid in a digital era. Benefits of the smart grid, summarized at a high level, include:

- **Customer benefits** – access to timely information, control, and options to better manage their energy use and carbon footprint, as well as improved experience with the utility.
- **Social and economic benefits** – job creation, economic growth through infrastructure investments, opportunities for coordination and shared services, and increase in public safety and quality of life.
- **Environmental benefits** – cultivate culture of conservation, promote green generation, and reduced environmental footprint.
- **Utility benefits** – improved reliability, "digital grade" power quality, ensuring security of supply, better management of assets, operational efficiencies, accommodate distributed energies, deferral of infrastructure expansions, improved revenue management, and protection against security threats.

Challenges and Costs of Deployment

While the smart grid has significant potential to deliver value, it represents a significant endeavour. Research and development is needed to break through knowledge and technology barriers. Technology solutions will take time to develop, mature, and be ready for commercialization. Communication and engineering standards will need to converge.

Building Toronto Hydro's smart grid will require a framework of intelligence, energy, communications, strategy, legislation, regulation, and stakeholders' commitment. A coordinated innovation effort will consist of a solid integration and synchronization of decentralized systems, processes and organizational structure. The workforce will require new competencies. Security measures must be put in place. Business processes, operating procedures, and work protection will have to incorporate the new paradigm of a smart grid.

Progressive and timely legislation and regulation will be instrumental towards its success. Disincentives from rates must be removed to recognize the benefits of conservation and energy efficiency, as well as accounting for socioeconomic and environmental factors. Customer education and adoption of new technologies will further need to be assisted by retailers and service providers. Utilities will have to approach customers with transparency and address their specific yet evolving needs.

The costs and time required, as well as the benefits attained, will depend on the scope and pace of implementation, technology trends, and customer acceptance and adoption, and is thus not straightforward to quantify. Costs and benefits are typically shared amongst a wide mix of projects rather than in isolation, investments are made to account for future requirements, and benefits often extend into socioeconomic and environmental contexts.

Careful investments and guiding strategies will be utilized to mitigate the risks of initial deployments and ensure that early benefits are attained. Given that investments in the Advanced Metering Infrastructure (AMI) have been mandated by the government, and that some of the building blocks for the smart grid are already in progress and maturing within Toronto Hydro, it is expected that additional costs for smart grid deployment will include incremental spending to accelerate maturing of the in-progress building blocks, implementation of new smart grid solutions, and in integrating various programs/solutions.

Vision and Mission

The vision for smart grid is ***an intelligent, continually innovative electricity network***. Intelligence refers to the “smartness” of the grid, including self-healing, robustness, fast, reliable, and having optimized solutions. This smartness is harnessed through continual innovation, where new solutions and methods are strategically applied to the electric system and its services.

In addition, the mission is *to* ***modernize to deliver value in meeting customer needs and expectations of the 21st century***. This includes modernizing the infrastructure, communications, and even processes, culture, and the services it provides to customers.

Smart Grid Objectives

Toronto’s smart grid has three key objectives. The first objective is in ***climate protection and sustainable energy***, in particular to meet the requirements of the Ontario Green Energy and Green Economy Act, City of Toronto’s Climate Change, Clean Air, and Sustainable Energy Action Plan, and Canada’s Kyoto Protocol targets. We need to achieve the following:

1. Targeted reduction of environmental footprint, working towards a zero carbon, zero waste organization by closely monitoring, tracking, and controlling our and helping our customers manage their environmental footprint.
2. Accommodate a large variety and high penetration of distributed generation and storage options.
3. Provide customers with programs and streamlined processes for the connection of renewables, clean generation, and conservation efforts.
4. Support the reliable connection of microgrids, community energy, and virtual power plants in the Toronto Hydro system.
5. Enable an electrified transportation infrastructure, including full and plug-in electric hybrid vehicles, subway systems, and electric trains.

The second objective is to ensure ***energy security***, to deliver electricity that is safe, reliable, and efficient. Thus we need to:

1. Invest prudently in an aging infrastructure to manage risks and to provide high levels of reliability.
2. Provide the visibility and control throughout the network, working towards a self healing and fault anticipatory network, and connect high levels of distributed energy sources.
3. Monitor and manage power quality levels and its impact to customers.
4. Improve the efficiency and effectiveness of utility operations.
5. Incorporate physical and cyber security measures.

The third objective is to provide ***customer satisfaction in the 21st century.*** Smart grid opens up new and exciting opportunities for us to work together with our customers, who value trust, service excellence, transparency, performance, and reasonable rates. Thus, the utility should:

1. Provide timely information that empowers actions and improves experience with the utility, such as their environmental footprint, energy consumption, outage and restoration notifications, costs and cost projections, budget constraints, utility programs.
2. Offer new forms of communications for customers to have readily available access to utility information, such as web services, email notifications, text messages, online chat-rooms, blogs, and through in-home devices. Multilingual services are also required.
3. Enable energy management controls such as in-home displays, smart thermostats, and smart home appliances, with intuitive, user friendly interfaces.
4. Provide new forms of customer service models that suit their preferences, such as on-line self-services, voice recognition systems, changing billing payment periods, and prepayment options.
5. Offer advices on conservation and saving costs, reducing carbon footprint. Rewards for conserving. Allows integration of renewable energies and plug-in hybrid vehicles with simplified processes.
6. Potentially provide incentives and financial support to sustain reduced energy consumption and environmental footprint, especially for low income households.

Strategic Principles

Strategic principles are simple, understandable, actionable statements that reflect an organization's strategy to achieve a vision. It should empower all stakeholders to move towards the smart grid vision.

The first strategic principle is to ***harness innovation – throughout the grid***. This calls for innovation through applying intelligence in the system – intelligent people, intelligent business processes, and intelligent technologies. This intelligence is to be applied throughout the grid, creating an "end-to-end" smart system, including beyond the meter to assist customers in conserving, managing energy usage, and incorporating renewable energies, as well as partnering with upstream transmission system and other distribution networks in global optimization.

The second strategic principle is to ***explore synergies by integrating systems***. The greatest value from a smart grid is not from the development of independent initiatives, but from the integration of its various technologies and services, and to maximize the use of available data and information. This is a holistic approach to smart grid. The action to realize such synergies comes from integrating systems, such as between people to work collaboratively, between strategies and plans for alignment and leverage, between technologies for enhanced functionalities, and between services for added value.

The third strategic principle is to ***develop an innovation support structure***. The true strength of smart grid arises when innovation is accompanied by a support structure. This structure directs, guides, and focuses efforts on constructive innovation and filters out disruptive ones. It also implies the application of business processes management, mechanisms to quickly turn trends into actions, measures to sustain innovation, training and education, stakeholder engagement, and technology support.

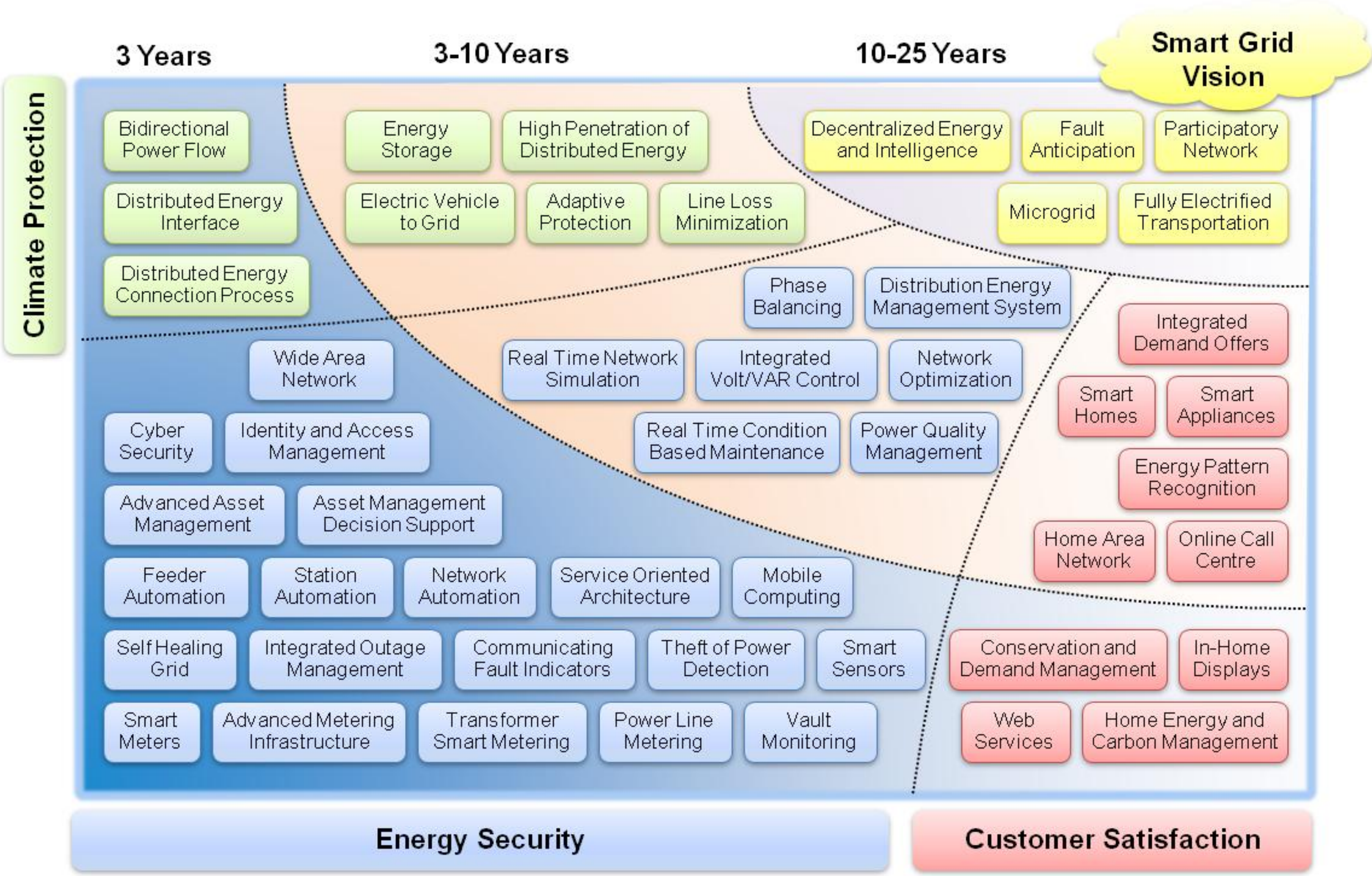
Strategic Roadmap

The role of the strategic roadmap is to translate the smart grid vision into a set of actionable programs and projects. It was developed based on identifying the infrastructure, services, technologies, research and development efforts, as well as core/baseline business and technical requirements needed to achieve the objectives of the smart grid. Highlights from the roadmap are shown in Figure E1.

The **3 year plan** of the smart grid roadmap is to establish *Toronto's Smart Community*. This is a demonstration area where prioritized initiatives can be tested, processes developed, customer acceptance understood, and operating procedures created. Emphasis will be on maturing and accelerating existing smart grid building blocks, as well as integrating building blocks to realize cross-functional services, shared costs, and added values.

Expected benefits will be demonstrated and measured, and used to support potential full scale deployment. The goal is to generate short term wins, and validate the value of smart grid. Additional opportunities and potentials will also be identified for further demonstration. Results and lessons learned will be shared regularly in various forms of communication, such as white papers, presentations, and online content.

Initiatives that were selected as a part of this demonstration area are characterized by relative certainty and value, typically utilizing established, proven technologies to demonstrate immediate value for the customer, society, and the environment. These projects are typically in progress and maturing at Toronto Hydro, or planned to commence in the next three years. For more uncertain initiatives, it is expected that given the pace of industry adoption and effort into advancing smart grid technologies, in 3 years time there will be increased certainly and convergence into technology trends, communication standards, customer responses, and government priorities and regulations.



The **3-10 year plan** involves the expansion of demonstrated initiatives from the smart grid community into larger scale deployments. Simultaneously, additional initiatives will be demonstrated, as characterised by requiring technological advances and solutions, requiring new or convergence of standards, and building on the foundations of the 3 year plan.

Finally, the **10-25 year plan** represents the end state of the smart grid as defined by present drivers. Initiatives are characterised by complete integration of technologies and services, collaboration between the utility and customers, and energy sourced primarily from renewable and clean generation. Proven smart grid technologies will span across the entire territory of Toronto Hydro. There will be further focus on providing services rather than resolving technology barriers.

Key Recommendations

The key recommendations resulting from the research and analysis in this report are presented below. They represent necessary and fundamental steps for the successful launch of smart grid at Toronto Hydro. Implementation of these recommendations is not consecutive, but overlap in a number of instances.

KEY RECOMMENDATIONS FOR LAUNCHING SMART GRID

1 Engage and align with external stakeholders for Toronto's Smart Grid Plan	• Align with the Government of Ontario's Green Energy and Economy Act (Bill 150) upon legislation and regulation • Collaborate with the City of Toronto for the application of smart grid to address the City's Climate Change Plan • Coordinate with the Ontario Energy Board to expedite effective smart grid regulation • Educate Customers
2 Launch campaign on Toronto's smart grid	• Develop communications strategy and plan • Launch internal campaign to educate and engage internal staff on smart grid • Launch external campaign for customers and the industry • Attract new workforces and strategic partnerships
3 Convene steering committee, innovation and sustainability office, and working group	• Steering Committee for executive monitoring and key decision making • Innovation and Sustainability Office to centralize strategic planning and management of overall smart grid portfolio. Align with external industry and government priorities. • Working Group with representation of key stakeholders in the organization for program execution
4 Training and education	• Develop and strengthen key competencies required for smart grid • Allocate sufficient resources to build momentum and reach tipping point • Capable of designing, developing, and operating the smart grid • Extend training and education to customers
5 Develop business plan for Smart Grid Community	• Develop detailed implementation plan with program scope, technology selection, costs and options, and business case • Integrate plan with 10 year capital plan and Electricity Distribution Rates filing process

A Call to Action

The City of Toronto has been known as the hub of Canada – the financial hub, the cultural hub, and the entertainment hub. With firm dedication and collaboration from the Ontario government, Toronto government, Toronto Hydro, and other key stakeholders, Toronto can also become the intelligent and sustainable energy hub of Canada. The smart grid is the avenue to make this happen.

Through innovation and the strategic application of information, communication, and electronic/electrical technologies, the smart grid can optimize the electric infrastructure in a time of a convergence of risks, enhance customer experience in a digital era, and meet the province and city's agenda for environmental sustainability and a green economy.

Guided by our vision, objectives, strategy, and roadmap, we can realize a path through the challenges of deployment into a future of innovation and sustainability. The recommendations in this report envision actions taken by stakeholders throughout the organization to work collaboratively towards a smart grid. The time is right, and the time is now.

1 INTRODUCTION

Smart Grid: From Vision to Action

> **"We need a 21st century electricity grid that can better meet the changing nature of power consumption in Ontario. A smarter grid is essential to maximizing the energy from Ontario's abundant natural solar and wind energy"**
>
> *Premier Dalton McGuinty*

Electricity has been a primary driver for change in the 20th century. Toronto's electricity network (the "grid") has been built to service the City of Toronto for over 95 years, providing a fundamental necessity of life, for comfort, security, entertainment, and upholding the economy in this financial capital of Canada. Without electricity, the world will not be as we see it today – subway systems, telecommunications, information technologies, commercial centres, manufacturing industries, entertainment systems, electronic commerce, etc., will no longer perform its function. Our society has become increasingly dependent on reliable, high quality electricity, and this has made the electricity grid a critical and necessary infrastructure.

However, the electric grid, which has served the population of Toronto well for many decades, cannot be assumed to continue delivering its services indefinitely without a significant change. Our lights may be on, but the grid is faced with an abundance of risks that are increasing in size, scale, and complexity. The infrastructure is aging and demands are increasing, and it becomes increasing difficult to maintain reliability and integrity after years of underinvestment. There is not much time left before the grid reaches its very limits. This is made difficult by an aging workforce, as well as increasing security concerns. There needs to be renewed focus on the need for sustaining the electrical infrastructure. The status quo is just not enough.

Simultaneously, we see significant growths in other industries, which undertook great development driven by innovation and improving customer service. The Information Technology and Telecom explosions of the 1990's, in particular the rise of the Internet, have changed the way we live and open up vast opportunities for better standards of living. Customers are accustomed to highly reliable, real time services, with abundant information exchange, options, control, and instant feedback. Hence, we're in a *smart era* – smart phones, smart computers, smart business, smart cars and smart people. It is time for utilities to come onboard and to offer customers the service they expect in the 21st century.

Finally, environmental protection has become a key priority in the political agenda and in the minds of the public. The message is clear, that the effects of climate change have become increasingly evident, and we must act now. The Ontario Government (Ministry of

Energy and Infrastructure) has put forward the Green Energy Act to drive a green energy system, while the City of Toronto has defined its Climate Change Plan.

These growing pressures are now presenting a convergence of risks that overlays all of a utility's strategic decisions regarding the future. It is calling for an immense task for innovative alternatives and creative problem solving. It requires a shift in the industry that requires everyone's collaborative efforts.

As described in IBM's report on *Plugging in the Customer*, "Collectively, these drivers are overturning traditional assumptions about energy consumers and the fundamental value proposition of the industry itself. Though each of these trends has progressed independently for a time, they have all now reached a point of convergence where each is fuelling the others and the entire combination is catalytic"[1]. Also, according to CEATI's *Electric Distribution Utility Roadmap, Phase II: Common Infrastructure*, "It becomes clear that the industry as a whole could not survive if it chose to remain on the traditional, "Business as Usual" path"[2].

It is now a time for change. We need a change towards a grid that encourages energy conservation and efficiency, accommodates large amounts of renewable and clean energy sources, and reduces carbon emissions and environment footprint for all. We need a grid that provides information and options to customers to make informed decisions about their energy usage and supports an advanced and electrified transportation system that substitutes electricity for oil. We need a grid that continuously innovates, optimizes the grid's operation, and enhances system reliability and security. We need a grid that enables a greener economy with greener jobs. To accomplish this, we need a smarter energy grid. Coined as "smart grid", this is a paradigm shift, a fundamental change in the electric utility business.

The smart grid represents the single greatest transformation in the history of the electric utility, an evolution of how it functions in its social, economical and environmental contexts. The vision is here. The perfect storm has arrived. The challenge now lies not in the vision, but in translating vision into action, by navigating a path through this perfect storm. There is no silver bullet, and grid must be strategically renewed and prudently invested, applying innovative concepts and technologies, to deliver the service that is needed in the 21st century.

[1] IBM Global Business Services, "Plugging in the Customer," Available at: http://www-05.ibm.com/de/energy/pdf/plugging-in-the-consumer.pdf
[2] CEATI, "Electric Distribution Roadmap: Common Infrastructure," Available at: http://www.ceati.com/pdetails.php?id=5962

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- Marketing and Communications
- Metering Technologies

- Policy and Standards
- Regulatory
- Stations and Distribution Automation
- System Reliability Planning

2 DEFINING THE SMART GRID VISION

2.1 DEFINING TORONTO HYDRO'S SMART GRID

In February of 2009, the Ontario Ministry of Energy and Infrastructure introduced Bill 150, the Green Energy Act, to the Legislative Assembly of Ontario. The act defines the smart grid as follows:

> ***"Smart grid" means the advanced information exchange systems and equipment that when utilized together improve the flexibility, security, reliability, efficiency and safety of the integrated power system and distribution systems, particularly for the purposes of,***
>
> ***a) Enabling the increased use of renewable energy sources and technology, including generation facilities connected to the distribution system;***
> ***b) Expanding opportunities to provide demand response, price information and load control to electricity customers;***
> ***c) Accommodating the use of emerging, innovative and energy-saving technologies and system control applications; or***
> **d)** ***Supporting other objectives that may be prescribed by regulation.***

Hence, the following observations can be made about the province's view of the smart grid:

- Smart grid is the use of advanced information exchange systems and equipment in the electrical grid
- It's objective is to improve the flexibility, security, reliability, efficiency, and safety of the grid
- This applies both to the integrated (bulk) power system, the distribution system, and end use
- It is applied for the purpose of increasing the use of renewable generation, for conservation, and providing customers with information and empowering them with energy controls and information to manage their energy consumption
- It serves as a platform to support further and emerging applications that may be prescribed by regulation

It is commonly described that the "smart grid" means different things to different people. Hence it is vital to understand its definition as it relates to the unique context of the City of Toronto. Applying the government's definition of the smart grid, Toronto Hydro has developed the following definition:

A smart grid can be defined as the strategic application of advanced information, communications, and electrical/electronics technology, to optimize the operation and control of the electric infrastructure, to meet customer

requirements and enhance their experience, and to promote environmental sustainability.

In this definition, the following should be noted:

- It refers to smart systems, smart processes, and smart people, working together to realize the new paradigm of a truly "smart" grid
- The term *smart utility* can be used synonymously to the smart grid, expanding from its focus on technology alone
- It is also not a one-time installation program, but a continuously evolving grid, keeping abreast of advances in the industry and seeking opportunities for the betterment of the grid

Smart Grid as a Network of Intelligence

A smart grid can be visualized as a *network of intelligence* through connecting building blocks in the grid. This is illustrated in Figure 1, which divides the path of intelligence into the three areas of Customer/Field, Communications, and the Office. Each contains a set of "building blocks" which participate in this flow of intelligence. Customer and Field devices generate data, which is transferred through communication channels into the Office. Office contains intelligent process and applications that translate data into useful information, and is relayed to people who receives the information and is translated into knowledge. This knowledge can then be used to make intelligent business decisions, which in turn is returned to the grid as grid intelligence and control. Note, in some cases, people may only be informed and based on established algorithms/logic, actions may be directly communicated back to grid intelligence.

This architecture exemplifies how a smart grid can utilize smart systems, processes, and people to optimize the grid. There are, of course, more complex dynamics of the flow of intelligence within the system, such as:

- Distributed intelligence within the field without human intervention
- Strategic decisions made to enable a policy directive (e.g. use of green energy)
- Customers managing their own energy usage through information made available to them from in-home devices

Nevertheless, a smart grid highlights the value-add of intelligence throughout the energy delivery chain, whether the intelligence is centrally managed by the utility or distributed throughout the grid.

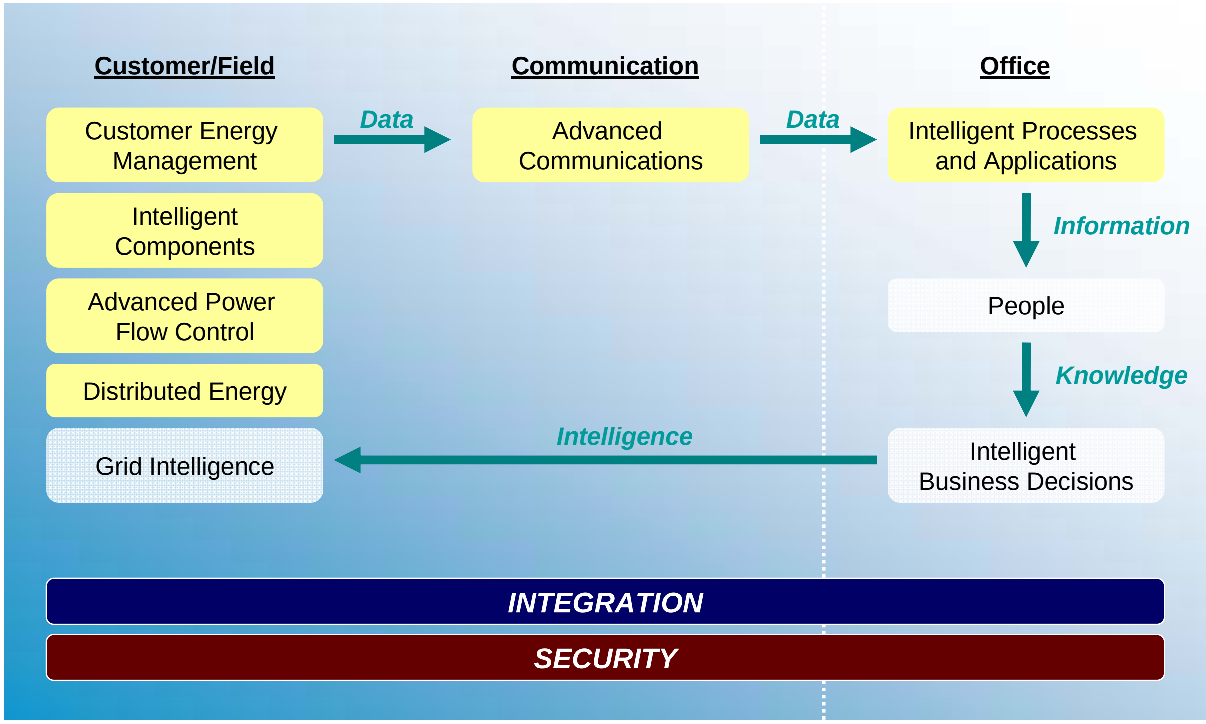

Figure 1: Illustrating the architecture of a Smart Grid, including enabling components and the flow of intelligence throughout the grid.

Furthermore, the fundamental building blocks of smart grid are not entirely new. Traditionally, the latest technologies have been applied in the electrical grid in the form of SCADA (supervisory control and data acquisition/distribution automation), enterprise systems, conservation and demand management, and more. However, the smart grid brings an emphasis of innovation to achieve certain objectives (e.g. environmental sustainability), and true innovation arises when traditionally separate functions are integrated to offer new services. Another key distinction of the smart grid is the attention to the need for security, which is further required as the grid becomes increasingly integrated.

This model closely resembles the connection of the Internet, where numerous data nodes share information through a robust communication system, enabling a decentralized intelligence network.

Smart Grid Characteristics

Tables 1 and 2 describe some of the common characteristics of a smart grid.

TABLE 1: 10 KEY CHARACTERISTICS OF A SMART GRID

Dynamic	Knowledge of the quality of power being delivered by every delivery point in the system, whether from the transmission system, or from attached storage, or distributed generation.
Adaptable	Ability to adapt the system to the incoming power quality and quantity, thereby reducing demand or improving power quality in an active and adaptive manner.
Anticipatory	Knowledge of the conditions of the grid, including conductor stress and temperatures in critical areas, device-induced noise or other problems that could lead to future failures, as well as knowledge of what those possible failure modes are.
Self Healing	Knowledge of how to adapt to failures, and minimize the duration and severity of the failure, without having to create multiple redundant systems.
Sensitive	Understanding of how each customer is consuming energy from the grid, usage patterns in the past and projections of future usage.
Low Cost	Ability to be built and maintained at a reasonable cost, with the maintenance being done on an as-recognized basis, rather than by rote.
Flexible	Ability to deploy new equipment and capabilities without having to completely redeploy or replace existing technologies or to do a wholesale system hardware upgrade. Wherever possible, devices should be capable of taking software upgrades to improve capabilities and the central system should be able to use raw data to create the new knowledge required.
Fast	Systems and components should be able to communicate and exchange data without having to spend much time converting data or routing data through central systems. Standards should exist at the communications protocol level and at the data level. Communication solutions must satisfy data latency requirements.
Intelligent	Intelligence is distributed into the grid. No single point of failure in the system should be able to knock out the ability of the overall grid to function. Movement of information and knowledge to the central level should be done for business reasons only and, as much as possible, by exception.
Living	The grid needs to be able to adapt to changing conditions and needs over time, so that as the needs of customers evolve, so does the grid.

Source: CEATI, *Electric Distribution Utility Roadmap, Phase II: The Case for Change*

TABLE 2: 12 ADDITIONAL CHARACTERISTICS OF A SMART GRID

Interoperable	Open architecture, promoting interoperability between vendor products.
Plug and Play (PnP)	PnP architecture for intelligent devices, controllers, and small generation facilities (e.g. home solar, micro to small wind turbines), to expedite the connections process.
Multidirectional	Power and information can travel in multiple directions and multiple paths, under full control.
Efficient	Losses and switching time are minimized.
Low Tolerance	Low tolerance for interruptions, power quality, safety, etc.
Digital Grade	Provide "digital grade" power quality suitable for modern electronics.
Distributed Intelligence	Processing and decision making is not centralized at the utility, but distributed throughout the entire power flow chain.
Real Time	Real time sensing, measuring, analyzing, and decision making, when required.
Customer End-Point Oriented	More emphasis on the "last mile" of service to the customers, focusing on affordability, reliability, power quality, and demand side management. Increased customer participation in their energy use, and established trust in the utility for information and services.
New Performance Measures	Performance indices addressing reactive power, power quality, and asset conditions.
Intelligent Asset Management	Operate assets much closer to design margin, while expanding lifetime by automating at the optimal operating conditions. Substitute "iron" with "bits" by utilizing intelligence to delay expensive capital investments. Base decision models on progressing goals and probabilistic and stochastic analyses rather than historical performance.
Competitive Energy Markets	Support variable rates and energy accounting.

Note that while all of these characteristics may be desirable for the smart grid, certain solutions will emphasize specific characteristics and prohibitive costs may keep all from being fully achieved.

2.2 SMART GRID BUILDING BLOCKS

Smart grid is composed of an integration of building blocks, each of which carries its key characteristics. These building blocks include:

- Customer Energy Management
- Intelligent Components
- Advanced Power Flow Control
- Distributed Energy
- Advanced Communications
- Intelligent Processes and Applications

This section discusses the smart grid vision along each building block.

Customer Energy Management

Traditionally the only feedback to a customer regarding its energy usage is a bill at the end of the billing cycle, typically 30 to 60 days after the period in which they consumed the electricity. They are uninformed regarding their energy usage, how they can save electricity and thus their costs, as well as the impact of their energy use to the environment. Moreover they did not necessarily have the tools to allow them to obtain this information, save costs, or reduce their environmental footprint.

With the advent of a smart grid, customers will have the tools and information available to become more aware in their energy usage and enabled to make informed decisions. They will have access to multiple communication channels to access utility information. They will be offered a variety of options to manage and control their energy usage. They will become more aware of their environment impact and are encouraged to think in carbon footprints.

The vision is in moving towards a "participatory network", as described in IBM's report on *Plugging in the Customer*[3]. This is a dynamic energy ecosystem where customers and utilities work together, sharing responsibilities and benefits, to achieve core objectives such as maintaining quality of life, reducing costs, and minimizing environmental impact.

Intelligent Components

Intelligent components form the fundamental intelligent building block of the smart grid. They can be distributed sensors, providing visibility throughout the grid. They further generate data and have communication capabilities amongst each other and back to the office for centralized processing and control.

[3] IBM Global Business Services, "Plugging in the Customer," Available at: http://www-05.ibm.com/de/energy/pdf/plugging-in-the-consumer.pdf

They enable utility operators to gain visibility into the grid, perform conditions-based monitoring, provide alarms of vault floods, fires and intrusion, anticipate faults through identifying fault signatures, etc., and make localized intelligent decisions on the course of actions and perform diagnostics.

This also includes components that incorporate the latest advances in materials engineering and equipment design, such as superconductivity and advanced power electronics.

A recent example of intelligent components are smart meters, which are distributed units throughout the grid, and capable of mutual communication with a backhaul for central processing. They enable local monitoring of power usage, with ever growing capabilities such as remote disconnect, power quality measurement, load control, detection of meter tampering, and even as gateways into a home area network (HAN). They are fully scalable to multi-million meter deployments, allow open, two-way communications. When integrated with other systems such as back-office meter data management, they can enable a wide array of other functions, such as outage and restoration notification, energy loss calculations and demand management.

Advanced Power Flow Control

When intelligent components are integrated and used in conjunction with high voltage equipment, they can be utilized for advanced power flow control. Examples include:

- Self-healing grid – automatic fault detection, location, isolation, sectionalisation, and restoration to minimize the impact of an outage.
- Integrated Volt/VAR Control (IVVC) – integrated operation of reactive compensators (e.g. capacitor banks), voltage regulators, and tap changers to control the system's voltage and reactive power, optimizing voltage profile and minimizing energy loss.
- Load balancing – monitoring and control of the loading between phases and feeders, and redirecting loads for phase balancing and away from congested areas, to lower losses and increase system capacity.
- Power conditioning – use of controllable reactive power compensating devices to restore the system's power quality. Examples include DSTATCOMs (Dynamic Static Compensators) and SVCs (Static VAR Compensators), which are being used on the transmission systems today. Potentially distributed energy sources, in particular inverter-based generation, can be set to inject controllable reactive power to condition the system. This also implies the need for a broader use of solid-state power electronics into the electrical system.

Distributed Energy

A primary driver for the smart grid is the decentralization of energy generation. Moving from a traditional vertical utility, where generation is centralized, to a largely decentralized generation network is a primary driver for the smart grid.

Distributed generation (DG) consists largely on alternative energy sources, including photovoltaic (PV), wind, biogas, biomass, fuel cells, combined heat and power (CHP), and geothermal. Other sources such as concentrated solar, tidal and wave are also in research and pilot phases. The benefits of utilizing DG includes locating generating sources close to demand, thus minimizing line losses, supporting clean and renewable energy sources, relieving distribution and transmission system congestion, and enabling customers to own generation and profit from selling excess power back into the grid.

However, distributed generation only paints half the picture. The majority of alternative energies are intermittent in nature, due to their dependency on intermittent sources of "fuel", such as solar and wind, and thus cannot ensure consistent levels of supply. This poses an enormous challenge with matching energy supply and demand, as well in sizing the supporting distribution network. The greatest opportunity to mitigate these challenges lies in the use of distributed storage (DS). Storage options include large scale battery storage (e.g. sodium sulphur), capacitors, pumped water, flywheels, compressed air, thermal, hydrogen, superconducting magnetic energy storage (SMES), and batteries in electric/plug-in hybrid electric vehicles. The use of storage can buffer variations in intermittent supply and demand, significantly improving supply dependency and predictability, as well as reducing the need to curtail and redirect load, or require the development of additional fossil generation as back-up. Combining distributed generation and distributed storage, we get distributed energy.

Further mechanisms can be in place to mitigate the intermittency of alternative sources. This includes accurate generation and load forecasting, controllable demand response, and intelligent switching to direct the flow of energy.

A further challenge to the successful operation of a distributed network is its design and operation. The electric distribution system was designed for unidirectional power flow from the transmission transfer stations. Hence, its line capacities as well as protection system – which are critical towards the safe and secure operation of the grid – will fail under a high penetration of distributed generation. Moreover, distributed generation also have the potential of being "islanded" from the main grid, where they are disconnected from the grid yet continues to generate into a local area. This can pose significant safety and operational risks. To mitigate this will require advances in distribution system analytics (e.g. simulation software), infrastructure upgrades, adaptive protection devices and control schemes. Utilities will likely have to take a phased approach towards a high penetration of DG as solutions are made available and they gain experience into understanding the operation of a fully decentralized network. Research through partnerships with universities and national labs will also drive advances in the knowledge base.

Combining distributed generation, storage, and design and operational advancements, we have an intelligent distributed grid – a decentralized, efficient, clean, network that accommodates a large variety of energy generation and storage options.

Advanced Communications

In order for smart grid to become a network of intelligence, communication systems must be present to serve as the "glue" to connect all sources of intelligence together. In society, communications are critical to exchange ideas, build relationships, and empower actions. This has proven to be true from the phenomenal success of the Internet, where billions of people are interconnected in a fast, secure, and reliable network. Communications will serve a similar purpose for an integrated operation of the smart grid.

The characteristics of a communications network has been outlined in the previous section – open standards, interoperable, two-way, high bandwidth, and low latency networks. To make it all work together, devices have to be plug-and-play to simplify process. This is enabled by standardization. It is recognized that viable plug-and-play of devices, applications, etc., will require a significant effort, and openness and interoperability are key to achieving it.

Many network solutions are available, such as radio, microwave, satellite, fibre optics, cable, power line carrier/broadband over power line, telephone lines, cellular, and much more to come. However, experience tells us that there is not one, single medium that will cover all forms of communications. There are pros and cons to each, and suitable for various operations in the network. Even the Internet is connected through a vast array of communications technologies and topologies. The future will likely be a hybrid of various solutions, each implemented in its most suitable area. The key is interoperability amongst the various technologies and systems.

Intelligent Processes and Applications

The smart grid will consist of both decentralized and centralized processing. While intelligent components and advanced power flow control are supported by distributed intelligence throughout the grid, network and customer data will likely be backhauled to the distribution utility, where centralized processes and applications will translate them into information, knowledge, and actions.

Process and applications are what converts from a “smart distribution grid” into a “smart utility”. They include:

- Robust business processes in planning, design, operation, and construction. Processes will govern the success of data detection, collection, transmission, analysis, and interpretation for decision making and deriving actions.
- Back office applications, such as customer information systems (CIS), outage management systems (OMS), distribution management systems (DMS), geographical information systems (GIS), enterprise resource planning (ERP), meter data management (MDM), and many more.
- Integration layers to connect back office applications, such as business intelligence (BI), enterprise data warehouse (EDW), service oriented architecture (SOA), and enterprise service busses (ESB).
- “Defence in depth” (DOD) security built into every process and application, coordinating with security mechanisms throughout the field and at the customer’s premise, architected and implemented from the enterprise level.

2.3 TORONTO HYDRO’S INVOLVEMENT IN THE SMART GRID

Toronto Hydro has excelled and demonstrated leadership in developing a firm foundation for the smart grid. It has an extensive portfolio of smart grid building blocks, as illustrated in Figure 2. Toronto’s smart grid will expand from this extensive portfolio of building blocks. While individual building blocks will continue to develop and mature, integration and security efforts have already begun. The smart grid will continue to discover new potentials of integrating systems and services for added benefits.

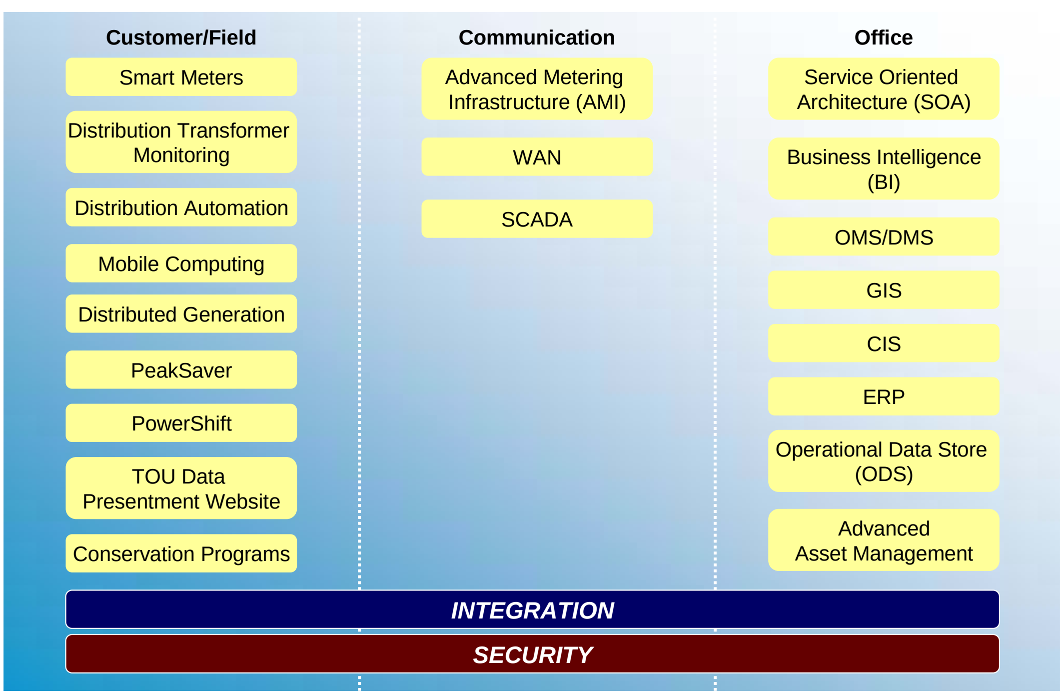

Figure 2: Toronto Hydro’s current Smart Grid portfolio

Table 3 highlights several key initiatives that Toronto Hydro has undertaken that establish a firm foundation for the development of a smart grid.

TABLE 3: HIGHLIGHTS FROM TORONTO HYDRO'S SMART GRID PORTFOLIO

Building Block	Function	Highlights
Advanced Metering Infrastructure (AMI)	Network of sensors at every customer point. Utilities can gain unprecedented understanding of what the customer is experiencing.	• Over 567,000 installed, 80% done • Reading over 402,000 meters daily • By 2010 all customers will have a smart meter
Customer Web Portal	Web interface with the customer for providing information and services.	• Information to customers enables conservation and cost savings. • Allows customers to compare their bill under fixed prices and TOU rates. • A computerized "BOT" interacts with the customer in different ways. • Web self-servicing strategy
Conservation and Demand Management (CDM)	Reduce energy use and free up congestion in the infrastructure. "Negawatts" instead of megawatts.	• 1,150,000 compact florescent lamps distributed since initiation. 77,620 more to be distributed in 2009. • 26,446 inefficient room air conditions retired. 4,000 more to be retired in 2009. • Over 48,000 peaksavers, equating to 50MW of dispatchable load. • 326 PowerShift customers combine peaksaver with TOU • Summer Savings provides 10% credit reward for 140,000 residential and commercial customers who reduce their electricity usage more than 10%. 88,000MWh and 83MW reduced in 2007. • Business Incentive Program (BIP) provides incentive for businesses to install energy efficient equipment.
Distributed Generation	Enable cleaner forms of electricity generation, and generating close to the load for reducing losses.	• Over 89MW of distributed generation • Studies of the integration of DG into Toronto Hydro's electric system
Distribution Automation	Providing visibility and control throughout the system.	• Over 400 intelligent switches, "self-healing" ready for automatic fault detection, isolation, and restoration. • Transformer smart meter pilot monitors the loads on transformers. Enables loss detection and better management of transformer assets.

Enterprise Applications	Software and database systems to collect, clean, filter, interpret, and display data and information to people and other systems.	• Extensive portfolio of enterprise applications – outage management system (OMS), distribution management system (DMS), geographical information system (GIS: "GEAR"), customer information system (CIS: "CC&B"), etc. • Service Oriented Architecture (SOA) and Business Intelligence (BI) in progress

2.4 ILLUSTRATING THE VISION: DAY IN THE LIFE OF A FUTURE CUSTOMER

A smart grid must be developed around a vision of what the electric utility's service to its customer will need to be. Moreover, through enabling people, processes, and technologies, a smart grid must deliver the end benefits back to the customer, whether that is in improved services, reduced costs, or reduced impact to the environment.

In September 2008, Toronto Hydro co-sponsored a video illustrating the life of a future customer in the smart grid, created by a joint group of utilities represented in the Customer Care Research Consortium (CCRC). It illustrates how customers can interact with the utility in the year 2015. The video is divided in to six vignettes, and Table 4 lists the initiatives that are required to realize each of the vignettes.

TABLE 4: HIGHLIGHTS OF TORONTO HYDRO'S SMART GRID PORTFOLIO

Vignette Description	Services Required
Reducing Energy Usage	• Smart thermostat showing the level of energy consumption with a glowing dot, as well as the price of electricity • Utility web portal, allow viewing and control of smart appliances • Home energy management system • LED (light emitting diode) lighting • Smart appliances that responds to the time of usage, with an online utility calculator that computes the rate of return • Home area network (HAN) to enable communication between smart thermostats, home energy management system, and smart appliances
Managing Energy Usage	• Utility web portal that allows viewing of historical and projected energy usage, and match with monthly budget • Utility sends alert when monthly budget is to be exceeded, and suggests methods of meeting monthly budget • Web portal allows customers to change payment plan from bimonthly, monthly, biweekly, and weekly • Demand response on air conditioners, yet allows customer overrides for extra comfort

	• Online customer service representative
Technology and Self Generation	• Plug-in hybrid vehicle charging dock in the garage • Solar panels on roof, export power into the grid. The customer can choose to donate a certain portion of its energy output to a nearby senior's home • Energy management system on computer • An orb that changes color according to the energy consumed/supplied. Red indicates net consumption, green indicates net generation • Customized billing reports
New Customer Connection	• Smart appliances • Home area network that communicates with the utility network • Master controller for control of smart appliances, and serves as communications portal with the utility • Configuration of the smart home through asking simple questions to the customer • Option to purchase power from green generation sources • Option for utility to optimize usage of certain appliances to minimize energy bill or to environmental impact
Providing Financial Assistance	• Energy forecasts and matching with monthly budget, to avoid unexpected costs on the customer's bill at the end of the month • A gaming console that also serves as a home energy management system, with a rebate available from the utility • Online tutorial on how to use her new gaming console/home energy management system • Financial service agents
Responding to a Power Outage	• Utility representative notifies the customer on the customer's mobile device on the outage, what's happening behind the scene, and how long the outage will last • Self-healing smart grid pinpoints the outage, and reroutes electricity back to customers • Utility program enables customer to gain information on the outage status of other family members as well

What is the Customer's Vision of the Future Utility?

In December 2008, the Customer Care Research Consortium conducted two focused group research projects in the Washington DC area, to understand their expectations of the future utility and study their responses to this smart grid video.

When participants were asked about their expectations of the electric utility in the year 2015, their general responses include:

- More renewable energies. Solar and wind should be prevalent and cheaper
- Smarter infrastructure, in terms of smart meters, in-home smart appliances, and more efficient grids
- Rates must be reasonable
- Intelligent communications via text message, email, etc.
- Online tools to manage energy usage
- Rewards for conserving

Following this, the smart grid video was shown to the focused groups to assess their responses. Though they value the specific services shown such as in-home displays and outage notification, they were expecting the utility to have offered these services by now, as the technologies are already readily available and commonly used in other industries. They also demonstrated an overall scepticism and cynicism towards the costs of implementation and the utility's ability to deliver this vision.

Introducing behavioural science into the focus group research, psychologist and social research scientist John Marshall Roberts then applied an established value-based framework, based on the works of psychologist Claire W. Graves, to understand the customers' responses. It was found that though the customers share the same vision of the future as the utility, the services and communication messages from their electricity providers must relate to the core values of its customers, such as reliability, cost, transparency, financial aid to the poor, and environmental impact. By understanding its customer demographics, thus their values, the utility will be able to provide solutions, direct messages, and empower action to realize this common vision of the future.

3 THE CASE FOR CHANGE

The vision of smart grid is based on the realities that the electricity industry is facing today. Utilities must respond to these realities to continue providing its services for its customers, the society, and the environment. At a high level, the smart grid focuses on an integration of current strategies to fulfill environmental plans, address energy security concerns, and meet customer expectations. The message is very clear: it is a time of change.

3.1 DRIVERS FOR CHANGE

The Ontario Green Energy Act (GEA)

Around the world, policymakers are responding to environmental changes with new energy policies and legislation. The Green Energy and Green Economy Act (short titled "Green Energy Act") was introduced into legislation as Bill 150 in February of 2009. This is part of Ontario's plan to become a leader in renewable energy and green economy in North America.

Once passed, it would:

- "Spark growths in clean and renewable sources of energy such as wind, solar, hydro, biomass, and biogas in Ontario
- Create the potential for savings and better managed household energy expenditures through a series of conservation measures
- Create 50,000 jobs for Ontarians in its first three years"[4]

> **"There exists today a global race to establish the policies, attract the investment and build the foundation for the green economy that is sure to sustain future prosperity and progress. It is a race Ontario is determined to win. This proposed legislation would help Ontario become the preferred destination for green jobs, green investment and green energy."**
>
> **"Our ambition is to increase the standards of living and quality of life for all Ontario's families. That is best achieved by creating the conditions for green economic growth."**
>
> *George Smitherman, Deputy Premier and Minister of Energy and Infrastructure*

Highlights of the act as it relates to the role of the distribution company include:

- Definitions for "smart grid" and "renewable energy source"
- Obligation for transmitters and distributors to provide priority connection access to their systems, for renewable energy generation facilities that meet technical, economic and other regulatory requirements

[4] http://www.mei.gov.on.ca/english/energy/gea/

- Feed-in tariff program that guarantees specific rates for energy generated from renewable energy sources
- One-stop streamlined approvals process, providing service guarantees for renewable projects
- Provide municipalities with the ability to generate up to 10 megawatts of electricity
- Creation of a renewable energy co-operative, restricted to generating and selling electricity from renewable energy sources
- Streamlining of municipal approvals for renewable energy generation facilities, including the elimination of any requirement to comply with a municipal official plan or zoning by-law
- Permit a distributor to own a renewable energy generation facility that does not exceed 10 megawatts (or such other capacity prescribed by regulations), a generation facility that uses technology that produced power and thermal energy from a single source, or an energy storage facility
- Local Distribution Companies (LDCs) will be required to prepare plans and seek the Board's approval for the expansion or reinforcement of its distribution system for the connection of renewable energy generation facilities and for the development and implementation of the smart grid
- Amendments to the Ontario Energy Board Act, 1998, requiring the Board to take steps as specified in relation to the "establishment, implementation promotion" of a smart grid

The Green Energy Act has the potential of creating the single largest transformation of the electric industry since it was first constructed. To respond to this call for action, a smart grid must be created, overlaying the power delivery infrastructure with a high speed, two way, robust, and secure information, communications, and intelligence network. The customers will further have to be empowered with information and tools to participate in conservation and renewable energy initiatives.

"In 1999, the German government made available low-interest loans for renewable electricity generation equipment. The following year, they put in place the Renewable Energy Sources Act (EEG), which allowed homeowners and farmers to connect their power systems to the grid and provided them a fair price for their surplus electricity. While this created some additional interest, an amendment to the EEG in 2004 boosted power sell-back prices by 25 percent, causing investment to skyrocket. Between 1999 and 2003, the number of residential installations of photovoltaic power systems grew steadily at a CAGR of 88 percent, but in 2004, installations shot up by 233 percent.

In 2006, Germans invested more than US$10 billion in new sources of renewable energy, setting a world record. Germany now operates more wind-powered generation, more solar systems and more biogas plants than any other nation worldwide."

IBM Global Business Services, Plugging in the Consumer

City of Toronto's Climate Change Plan

> **"During our public engagement for the Climate Change, Clean Air and Sustainable Energy Action Plan we heard a very clear message: the residents of the City of Toronto want action and they want the knowledge and support needed to make real changes in their homes, businesses and neighbourhoods"**
>
> *Climate Change, Clean Air and Sustainable Energy Action Plan: Moving from Framework to Action, Phase 1, City of Toronto*

The City of Toronto has also committed to environmental leadership and creating a sustainable future for Torontonians through its Climate Change, Clean Air, and Sustainable Energy Action Plan. It is the City's belief that "in a sustainable city, a clean and healthy environment goes hand-in-hand with strong community engagement, a thriving economy and access to opportunity for all residents"[5].

A number of key initiatives are identified as a part of the plan, including:

- Becoming the renewable energy capital of Canada
- Building a sustainable transportation system
- Green economic sector development
- Water efficiency plan
- 70% waste solid diversion plan
- Doubling the tree canopy

The reduction target for greenhouse gas (GHG) emissions, from 1990 levels of approximately 22 million tonnes per year are:

- 6% by 2012 (Kyoto target)
- 30% by 2020
- 80% by 2050

The reduction target for locally generated smog causing pollutants is 20%, from 2004 levels by 2012.

Similar to the Ontario Green Energy Act, it must be emphasized that a smart grid is essential to realize a greener future. The present system with its technologies does not have the intelligence required to achieve such benefits. A smart grid will enable a sustainable future by:

- Enabling the safe and efficient connection of a large number of renewable and clean generation sources
- Identifying the location of and mitigating system losses, including line losses and power diversions
- Energy storage to offset peak power and balance intermittent supply and demand
- Supporting an electrified transportation system

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[5] City of Toronto, "Climate Change, Clean Air and Sustainable Energy Action Plan: Moving from Framework to Action," Available at: http://www.toronto.ca/changeisintheair/pdf/clean_air_action_plan.pdf

- Providing customers with the information and tools to manage and conserve electricity

Electrification of Transportation

The electrification of transportation represents one of the greatest shifts in the transportation industry following the invention of the internal combustion engine. Governments and customers are looking upon a new generation of plug in electric/hybrid electric vehicles as the solution to reduce dependency on foreign oil, reduce impact to the environment and provide economic stimulus.

According to the US Department of Energy, it is estimated that US power plants may meet the power requirements of 73% of the nation's light vehicles if they were replaced by plug-ins charging at off-peak times. This means a reduction of oil consumption by 6.2 million barrels per day and the elimination of 52% current imports[6].

Nevertheless, transitioning to a "plugged in" electric transportation infrastructure presents a vast challenge for both the electricity and automobile industries. Challenges include:

- Need for a standardize plug for charging
- Metering and standardized communications required for cross-geographical billing
- Impacts to system power quality as vehicles charge or export back to the grid
- Stress to the grid as vehicles charge during non-peak hours
- Challenges in predicting demand

Intelligence is essential for the grid to accommodate a high penetration of electrified vehicles:

- Smart chargers and enhanced battery storage, with two-way communications between to vehicle and the grid for sensing pricing and other signals
- Utility systems to coordinate variable supply and demand
- Power quality conditioners to enable a large penetration of plugged in vehicles
- Potential for utilizing vehicle's storage devices to export power back into the grid ("vehicle-to-grid", or V2G), especially during critical peak periods

In addition to the automobile industry, other areas of the transportation section are also becoming increasingly electrified. With the TransitCity plan, the Toronto Transit Commission (TTC) is determined to expand its light rail:

> ***The Toronto Transit City Light Rail Plan is an exciting initiative that will revolutionize transit and transportation across Toronto. Its far-reaching lines will revitalize neighbourhoods, spur economic growth and clean the air we breathe.***

[6] US Department of Energy, "The Smart Grid: An Introduction," Available at: http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages.pdf

> ***Seven new Light Rail Transit (LRT) lines will bring reliable, fast, quiet and comfortable transit service to many Toronto neighbourhoods. Transit City has been strongly endorsed by the TTC, the City of Toronto, and Metrolinx, the regional transportation agency. The Province of Ontario has announced funding for the construction of the lines and they are incorporated into the Regional Transportation Plan recently proposed by Metrolinx.***[7]

Furthermore, the Government of Ontario has announced the Move2020 plan in June 2007, committing to launch a $17.5 billion rapid transit action plan for the Greater Toronto Area and Hamilton, tackling gridlock, creating 175,000 jobs, and strengthening the economy. In this plan, the government recommended building 902 kilometres of new and improved rapid transit, as well as electrifying the GO Lakeshore line.[8]

Such vast electrification of public transit will imply further congestion of the electric infrastructure, demanding generation, transmission and distribution upgrades. Intelligence in the system is needed to provide effective execution of infrastructure upgrades and management of assets, and to maintain a reliable electric network. To reduce the need for long distance electricity transmission and distribution, providing generation close to demand through a distributed generation architecture will ensure that losses and environmental impact are kept to a minimum when transportation switches from fossil-fuel to electricity as a fuel.

Energy Security

Constructed predominantly in the early to mid 1900's, the electric power system has been recognized as one of the most significant engineering developments of the 20th century.

But this complex infrastructure is old and continues to age at a fast pace. Significant portions of the distribution system have reached advanced deterioration and end of life stages, and it is becoming increasing difficult to keep up with the needs for capital investment. An aging infrastructure represents higher operational and maintenance costs and more importantly, lower reliability and power quality. Moreover, the increased number of major blackouts the industry has begun to raise attention on electric infrastructure investments.

Toronto is a growing city with a growing demand for electricity. As the demands on electricity grow it stresses on the capacity of grid elements and increases risks with decreased operating margins and reduced contingencies. Siting new equipment is also extremely difficult as overhead and underground land uses are nearly at full occupancy. There is an urgent need to enable customer participation in conservation and time of use

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7 http://www3.ttc.ca/About_the_TTC/Projects_and_initiatives/Transit_city/index.jsp

8 http://www.premier.gov.on.ca/news/Product.asp?ProductID=1383

efforts, to offset or delay the need to build and site new infrastructure, while the utility optimizes the distribution of electricity and use of the assets.

The price of electricity is influenced by supply and demand. However, once electricity is generated it must be consumed, as the system is limited in its ability to store excess capacity . Hence generation, transmission and distribution capacities have to be scaled to accommodate the highest demand, and a significant portion of system capacities are merely utilized in a few days of the year. While the customer pays fixed electricity rates, the true costs of electricity in the market has become very volatile as consumptions are not well controlled.

The traditional vertically integrated electric system is further not designed for efficient operation, especially during peak periods. Significant line losses and lack of detection of power diversions imply that a large majority of energy generated is wasted and never delivered to the end customer. If the grid were just 5% more efficient, the energy savings would equate to permanently eliminating the fuel and greenhouse gas emissions from 53 million cars[9]. In addition to high losses, the use of spinning reserves to meet peak demands implies further impact to the environment.

Moreover, with the advent of the digital and connected era, the grid is becoming more susceptible to cyber security risks. The installation of large numbers of communicating devices also increases the number of access points and thus making the grid more vulnerable. The threat of terrorism, copper theft, and vandalism present a further risk for the grid. Reduction of system vulnerability and prompt identification of threats is essential.

In addition to infrastructure challenges, the electricity sector is facing high retirement rates, exposing the organization to significant risks in this time of change in renewing and upgrading the infrastructure. It is expected that the industry will need to incur additional expenditures to replace and train skilled workforces, requiring both specialists in traditional and new fields, as well as generalists with diverse skills sets. Currently it requires approximately five years to train trades employees on the job.

These risks, including aging infrastructure, congestion, price volatility, system losses, security risks, and need for workforce renewal compound to create a future of uncertainty. This results in high unknowns for the future including future investment requirements. Nevertheless, as Peter Drucker writes, “the best way to predict the future is to create it”. With strategic investments, embedding intelligence into the system, pursing new technologies such as energy storage, empowering customers for energy management and more, the future can become more certain, and utilities will be able to mitigate the risks associated with this changing industry.

[9] US Department of Energy, “The Smart Grid: An Introduction,” Available at: http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages.pdf

Customer Expectations in a Digital Era

The expectations of customers have changed dramatically in the digital era. Customers now recognize community values and environmental actions on par with traditional values like customer service and reliability. It is well understood that environmental problems are highly associated with energy problems. Customers want to be more aware of their environment footprint in both their electricity and transportation uses. They are interested in renewable energy options and more familiar with the environmental practices of energy providers. The customer of today wants to have a more active role on how to control their electricity use to mitigate environmental damage.

Corporations outside the utility industry are also very aware of their environmental impact and implementing measures to reduce their footprint. This is reflected in the recent applications of corporate responsibility reports and will be accelerated once a carbon cap and trade system is in place.

In times of rising energy costs, there is further a high motivation for conservation and consumption management through greater awareness and better technologies. For examples, consumers will choose to use power at off-peak times and be rewarded for it with a lower rate. They will be able to find out hour by hour the units of power they've used, what they cost, and how to use less without compromising their quality of life.

The coming of the digital age has further influenced consumers' views, behaviours and expectations. In light of these changes utilities will need a radical shift. Today, the electricity system is primarily a vehicle for moving electricity from the generation source to the costumer. In order to respond to new customer demands utilities should engage a new era of technology and telecommunications.

As described in Section 2.2, the vision is to move towards a participatory network, with the utilities and customers sharing responsibilities and benefits, to achieve core objectives such as maintaining quality of life, reducing costs, and minimizing environmental impact.

Utilities must be prepared to adapt to these new trends and provide new services. The challenge is to connect its operations with customer experience. The smart grid will allow end-users of electricity to ensure their involvement in deciding how and when they use energy. With the application of new technologies the grid will enable two-way flows of electricity and information, empowering them with control to make informed energy choices to benefit them, the infrastructure, and the environment.

3.2 THE VALUE PROPOSITION

Toronto Hydro's smart grid is the plug that connects environmentally mindful consumers to the grid in a digital era

The smart grid is an essential component to carry the traditional electric infrastructure in the direction that society would like to go in the 21st century. This section explores the benefits and challenges that the smart grid will bring.

Customer Benefits

The smart grid connects consumers to the grid not only to improve the customer experience but also to excel their participation in the grid:

- Access to timely information to make informed decisions on their energy use, such as interval usage data, price, fuel mix, carbon footprint, and utility offers. Enables awareness of energy use and its relation to carbon footprint.
- Greater control through tools and devices to conserve electricity and reduce costs, such as energy efficient appliances, high efficiency lighting, promotional pricing models, home automation, demand response units, energy audits, and insulation upgrades. Automation and configuration allow customers to set preferences according to their lifestyles.
- Manage their electricity usage with an energy budget dashboard, including historical usage, projections, as well as alerts and alarms to notify excessive usage.
- New modes of communication such as in-home energy displays, web portals, smart thermostats, email, media players, mobile phones, and online call centre.
- Provide better experience with the utility, such as through self servicing models which enable customers to manage their accounts online.
- Set preferences over their billing, such as information displayed, billing cycles, or prepaid plans.
- Improvements in grid reliability and power quality through monitoring and controls.
- Receive outage notifications from the utility, cause of outage, immediate actions, time to restoration, tips on what to do, and restoration notification.
- Opportunities to generate and sell electricity back into the grid.
- Mechanisms to contribute towards the environment, such as signals and programs to limit the use of coal generation, decide on a preferred fuel mix, and renewable self generation.
- Support the connection and billing management of full electric or plug-in hybrid electric vehicles.

Social and Economic Benefits

The smart grid supports social and economic growth by:

- Job creation through the design, construction, operation, and support of a renewed infrastructure. For example, the Green Energy Act forecasts the creation of 50,000 high paying jobs in Ontario in the first three years, while Ontario's Move2020 plan estimates a further 175,000 jobs in the expansion of the transportation infrastructure, largely supported by the electric system.
- Stir economical growth through global investments, ensuring security of supply, job creation, and increasing competitiveness by enabling the national economy to lead in the development of renewal energy solutions.
- Opportunities for the enhanced coordination of utilities and efficiencies in the development of shared services, such as in public telecommunications bandwidth.
- Increase in public safety and quality of life by investing in an aging infrastructure, supporting safe operation of distributed generation, and creating an environmentally sustainable future.
- Promoting cleaner air, better water, and fewer wastes for generations to come, such as through the use of renewable energies, conservation, and electric vehicles.
- Reduce dependence on oil and encourage the use of alternative fuels.
- Commercialization of energy efficiency, renewable energies, and electric vehicles will bring opportunities for increased economic activities.
- Relieving gridlock through expansion of electrified public transit systems.

Environmental Benefits

The smart grid can deliver and realize enormous environmental benefits:

- Promote use of energy generation and conservation for residential and commercial buildings will contribute to the reduction of the carbon footprint as well as the reduction in costs and energy consumption.
- Reduction in the generation of CO_2 and pollutants into the environment with the displacement of centralized plants with distributed generation, offering cleaner and renewable fuel sources and minimizing line loss. Peak demand reduction and energy storage also reduce the need for peaking power plants and spinning reserves.
- Design and construction of buildings will meet environmental regulations as well as include technological breakthroughs for energy renewal and conservation.
- Having alternative renewable sources of electricity like solar, wind and geothermal will lessen the necessity for power generation plants of the 21st century and therefore, reducing environmental impact and the risks associated with global warming.

Utility Benefits

The smart grid enables utilities to meet the needs and demand of the electric infrastructure:

- Ensure reliability in the generation and distribution of electricity through the use of innovative technologies, such as outage management systems, power quality monitors, and automated switching.
- Provide "digital grade" power quality through monitors, analyzers, and conditioners.
- Ensure security of energy supply through conservation, infrastructure expansions, rerouting of power, loss reduction, and distributed generation.
- Improved equipment monitoring increases asset utilization and reduces operating margins.
- Operational improvements in monitoring, control, and mobile workforce support
- Provide intelligence and control capabilities to accommodate a high penetration of distributed generation and electrified vehicles.
- Allow deferral of infrastructure investments through distributed generation, storage, conservation, and peak demand reduction.
- Consideration to physical and cyber security will ensure that the grid is protected and resilient to attacks.

Challenges and Costs of Deployment

While the smart grid has significant potential to deliver value, it represents a significant endeavour. Research and development is needed to break through knowledge and technology barriers. Technology solutions will take time to develop, mature, and be ready for commercialization. Communication and engineering standards will need to converge.

Building Toronto Hydro's smart grid will require a framework of intelligence, energy, communications, strategy, legislation, regulation, and stakeholders' commitment. Business models should have a solid foundation for decision making to ensure ongoing commitment to innovation. A coordinated innovation effort will consist of a solid integration and synchronization of decentralized systems, processes and organizational structure. The workforce will require new competencies, while not drawing resources away in a time of renewal of aging infrastructure. Security measures must be put in place. Business processes, operating procedures, and work protection will have to incorporate the new paradigm of a smart grid.

Progressive and timely legislation and regulation will be instrumental towards its success. Disincentives from rates must be removed to recognize the benefits of conservation and energy efficiency, as well as accounting for socioeconomic and environmental factors.

Customer education and adoption of new technologies will further need to be assisted by retailers and service providers. Utilities will have to approach customers with transparency and address their specific yet evolving needs.

The costs and time required, as well as the benefits attained, will depend on the scope and pace of implementation, technology trends, and customer acceptance, and is thus not straightforward to quantify. Costs and benefits are typically shared amongst a wide mix of projects rather than in isolation. Investments are made to account for future requirements, and benefits often extend into socioeconomic and environmental contexts and to improve customer experience.

Careful investments and guiding strategies can be utilized to mitigate the risks of initial deployments and ensure that early benefits are attained. Given that investments in the Advanced Metering Infrastructure (AMI) have been mandated by the government, and that some of the building blocks for the smart grid are already in progress and maturing within Toronto Hydro, it is expected that additional costs for smart grid deployment will be incremental spending to accelerate maturing of in-progress building blocks, implementation of new smart grid solutions, and in integrating various programs/solutions.

The Ontario Smart Grid Forum report states that “overcoming these challenges will require innovation, investment, creativity and hard work, but if Ontario is to realize a sustainable future and continue to grow and prosper, the transformation of its electricity infrastructure is essential.”

Toronto Hydro is responding to the call for action to create a better future for the environment, customers, and the electricity infrastructure. Considering the solid foundation that has already been developed and the commitment towards this endeavour, Toronto Hydro is determined to thrive in its smart grid deployment.

4 VISION, MISSION, OBJECTIVES AND STRATEGIC PRINCIPLES

A clear vision of the smart grid has been defined and illustrated. This vision has been grounded upon the central belief that it will provide prosperity and benefits to the people of Toronto, the electric infrastructure, and the environment. Yet a vision must lead to actions.

How well the utility navigates through this perfect storm will depend on how it strategically applies its resources, competencies, and capabilities to accomplish its vision, leading to real and tangible results. This chapter will lay the foundation for this voyage, including:

- Vision and mission statements to identify where we must go and what we must do
- Specific objectives to define what we want to achieve
- Strategic principles to guide our scope, priorities, and how to achieve our objectives

4.1 VISION AND MISSION

The vision statement reflects the essence of Toronto Hydro's goal towards a smart grid and a Smart Utility:

Vision: An intelligent, continually innovative electricity network

This vision illustrates the smart grid as an electricity network with two traits. The first is *intelligence*, referring to the "smartness" of the grid, including self-healing, robustness, fast, reliable, and having optimized solutions. The second trait is a *continual innovation*, defining the smart grid as a paradigm rather than a technology, a direction rather than project. The core of this direction is innovation, where new solutions and methods are strategically applied to the electric system and its services. It's a continuously advancing utility, keeping up with the needs of its customers and applying new technologies and methods in its solutions.

In other words, this vision statement describes the paradigm of *smart grid as innovation through applied intelligence.*

The smart grid mission statement describes the task to accomplish our vision:

Mission: Modernize to deliver value in meeting customer needs and expectations of the 21st century

Thus the mission is to modernize. This includes modernizing the infrastructure, communications, and even processes, culture, and the services it provides to customers. This modernization is necessary in order to deliver value in the 21st century, including value to our customers, shareholders, staff, and the environment. Modernization is the first step towards innovation.

4.2 OBJECTIVES

The Case for Change in developing the smart grid system has outlined three key drivers for smart grid. It is also through these drivers that our objectives are set.

Objective #1: Climate Protection and Sustainable Energy

As an energy company, Toronto Hydro has the social responsibility to become an organization that values climate protection and environmental sustainability. This will require a close partnership with our customers, the governments, as well as other agencies and organizations to make this a priority.

In particular, Toronto Hydro can have a substantial contribution meeting the following government targets in the area of climate protection:

City of Toronto's Climate Change, Clean Air, and Sustainable Energy Action Plan (the Climate Plan) of July 2007

- 6% greenhouse gas (GHG) and 20% smog reduction by 2012
- 30% GHG reduction by 2020
- 80% GHG reduction by 2050

Federal Government's targets

- Kyoto Protocol targets: reduce CO_2 emissions by 6% below 1990 levels between 2008-2012
- Upcoming carbon cap and trade system

Further targets are expected to be set by the Ontario government as a result of the Green Energy Act.

For Toronto Hydro to effectively meet these targets and become environmentally sustainable, we need to achieve the following:

1. Targeted reduction of environmental footprint, working towards a zero carbon, zero waste organization by closely monitoring, tracking, and controlling our environmental footprint and helping our customers manage their environmental footprint

2. An infrastructure that accommodates a variety and high penetration of distributed generation and storage options.
3. Provide customers with programs and streamlined processes for the connection of renewables, clean generation, and conservation efforts.
4. An infrastructure that supports the reliable connection of microgrids, community energy, and virtual power plants in the Toronto Hydro system.
5. Support an electrified transportation infrastructure, including full and plug-in electric hybrid vehicles, subway systems, and electric trains.

Objective #2: Energy Security

It is the mandate of Toronto Hydro to deliver electricity to our customers that is safe, reliable, and efficient. As the infrastructure ages and approaches the end of its useful life, utilities must sustain the operation of this infrastructure. At the same time, utilities are faced with new expectations from their customers and regulatory environments.

To achieve energy security, we need to:

1. Invest prudently in an aging infrastructure to manage risks and to provide high levels of reliability.
2. Provide the visibility and control throughout the network, working towards a self healing and fault anticipatory network, and connect high levels of distributed energy sources.
3. Monitor and manage power quality levels and its impact to customers.
4. Improve the efficiency and effectiveness of utility operations.
5. Incorporate Physical and cyber security measures.

Objective #3: Customer Satisfaction in the 21st Century

The smart grid opens up new and exciting opportunities for us to work together with our customers, who value trust, service excellence, transparency, performance, and reasonable rates. Customers also expect “digital grade” power quality and new modes of communication in the 21st century, comparable to the services they receive in the industries such as Telecom and Internet Service Providers. The utility must understand customer expectations, and provide information, tools, options, and controls to meet them.

To achieve customer satisfaction in the 21st century, we need to:

1. Provide timely information that empowers actions and improves experience with the utility, such as their environmental footprint, energy consumption management, outage and restoration notifications, costs and cost projections, budget constraints, utility programs.

2. Offer new forms of communications for customers to have timely access to utility information, such as web services, email notifications, text messages, online chat-rooms, blogs, and through in-home devices. Multilingual services are also required.
3. Enable energy management controls such as in-home displays, smart thermostats, and smart home appliances, with intuitive, user friendly interfaces.
4. Provide new forms of customer service models that suit their preferences, such as on-line self-services, voice recognition systems, changing billing payment periods, and prepayment options.
5. Offer advices on conservation and saving costs, reducing carbon footprint. Rewards for conserving. Allows integration of renewable energies and plug-in hybrid vehicles with simplified processes.
6. Potentially provide incentives and financial support to sustain reduced energy consumption and environmental footprint, especially for low income households.

4.3 STRATEGIC PRINCIPLES

Strategic principles are simple, understandable, actionable statements that reflect an organization's strategy to achieve a vision. It should empower stakeholders to move towards the smart grid vision. This section presents three strategic principles, developed based on industry needs, utility trends, and the strategic position that the organization decides to adopt to implement a smart grid.

Strategy #1: Harness innovation – throughout the grid

This strategy defines the action and breadth of Toronto Hydro's smart grid. As described in the vision and mission statements, the action for deploying a smart grid is in modernization, by harnessing innovation through applying intelligence in the system – intelligent people, intelligent business processes, and intelligent technologies.

Hence, in this strategy smart grid is defined not as a technology portfolio, but a paradigm of innovation, a continuous process of improving through innovating. It is about evolving and keeping abreast of advances in other industries, such as the information technology and telecom industries, and offering comparable services to customers. It is about being a "smart utility", and offering "smart energy".

This action is to be applied throughout the grid, creating an "end-to-end" smart grid. This means that the smart grid will have coverage throughout the electricity network:

- Applying smart grid inside the medium voltage distribution network
- Enabling and providing solutions beyond to the meter to assist customers in conserving, managing energy usage, and incorporating renewable energies

- Partnering with upstream transmission system and other distribution networks in global optimization

As one of the largest distribution utilities in Canada, and responsible for operating the electricity network in the mega-urban financial hub of the City of Toronto, Toronto Hydro is committed to develop an end-to-end smart grid.

Strategy #2: Explore synergies by integrating systems

The greatest value from a smart grid is not from the development of independent initiatives, but from the integration of its various technologies and services, and to maximize the use of available data and information. This strategy emphasizes that true innovation arises when synergies between various systems and services are explored. This is a *holistic* approach to smart grid, by focusing on integrating various building blocks to realize new values and services. The action to realize such synergies comes from the second half of the strategy – integrating systems:

- Between people to work collaboratively
- Between strategies and plans for alignment and leverage
- Between technologies for enhanced functionalities
- Between services for added value

Strategy #3: Develop an Innovation Support Structure

The true strength of this smart grid arises when innovation is accompanied by a support structure. It includes:

- Strategic planning to direct, guide, and focus efforts on constructive innovation, while filtering disruptive ones that don't show true value
- Business processes alignment and management
- Mechanisms to quickly turn trends into actions
- Measures to sustain innovation and avoid innovation fatigue
- Education and training of resources
- Customer, government, and regulatory engagement
- Technology support, such as bidirectional communications and power flow

4.4 ALIGNMENT WITH TORONTO HYDRO'S STRATEGIC BUSINESS PRIORITIES

Toronto Hydro has four business pillars. A smart grid will support and strengthen each of these pillars moving forward. These pillars include:

- Provide a safe and healthy work environment
- Modernize our utility
- Deliver superior customer service
- Maintain financial strength

Additionally, it has been the organization's priority to work closely with the City to help implement its Climate Change, Clean Air, and Sustainable Energy Action Plan (Climate Change Plan). A mapping of each of the smart grid objectives that have a direct relationship to these strategic business priorities are listed in Table 5.

TABLE 5: ALIGNMENT OF SMART GRID OBJECTIVE AREAS WITH STRATEGIC BUSINESS PRIORITIES

	Smart Grid Objective Areas	Health and Safety	Modernize Our Utility	Customer Satisfaction	Financial Strength	Climate Change
1	**Climate Protection and Sustainable Energy**					
1.1	Zero carbon, zero waste		✓			✓
1.2	Distributed generation and storage		✓	✓		✓
1.3	Streamlined process			✓		✓
1.4	Microgrids, community energy, and virtual power plants		✓	✓	✓	✓
1.5	Electrified transportation		✓	✓	✓	✓
2	**Energy Security**					
2.1	Invest in aging infrastructure	✓	✓	✓	✓	
2.2	Manage power quality		✓	✓	✓	
2.3	Visibility and control throughout	✓	✓		✓	✓
2.4	Improve utility operations	✓	✓		✓	
2.5	Physical and cyber security	✓	✓			
3	**Customer Satisfaction**					
3.1	Timely information		✓	✓		
3.2	New forms of communication		✓	✓		
3.3	Energy controls		✓	✓	✓	✓
3.4	New customer service models		✓	✓		
3.5	Advices from utility			✓		✓
3.6	Incentives and financial support			✓		✓

5 STRATEGIC ROADMAP

Toronto Hydro is committed to developing a smart grid. All drivers are pointing in the same direction, calling for a need to modernize. It's time to move forward. The role of this strategic roadmap is to serve as the tool that translates our vision, mission, objectives, and strategies into a set of actionable programs/projects. Illustrating the path to the future, the roadmap gives direction and foresight into what needs to be done (strategy #1), what to prepare for these initiatives, establishing long term needs, and aligning timelines. It further clarifies relationships and interdependencies for building synergies between programs (strategy #2), and enable us to lay down necessary foundations to support innovation early in the planning stage (strategy #3).

5.1 ROADMAP DEVELOPMENT PROCESS AND HIGHLIGHTS

The roadmap development process is outlined in Figure 4. From the drivers in the case for change, this translated into the vision and mission of the smart grid. This then is interpreted as a comprehensive list of objectives and the strategic principles for deployment. From that, a list of services were identified to achieve the mentioned smart grid objectives, with enabling technologies identified, and supported by necessary research and development efforts. This is then prioritized into 3 year, 3 to 10 year, and 10 to 25 year plans.

The following factors are considered when prioritizing the roadmap initiatives:

- Necessity to deliver on government policy
- Customer needs and expectations in the digital age
- Technology trends and readiness
- Ability to generate short term results
- Feasibility and capacity to execute, both financially and available skilled personnel

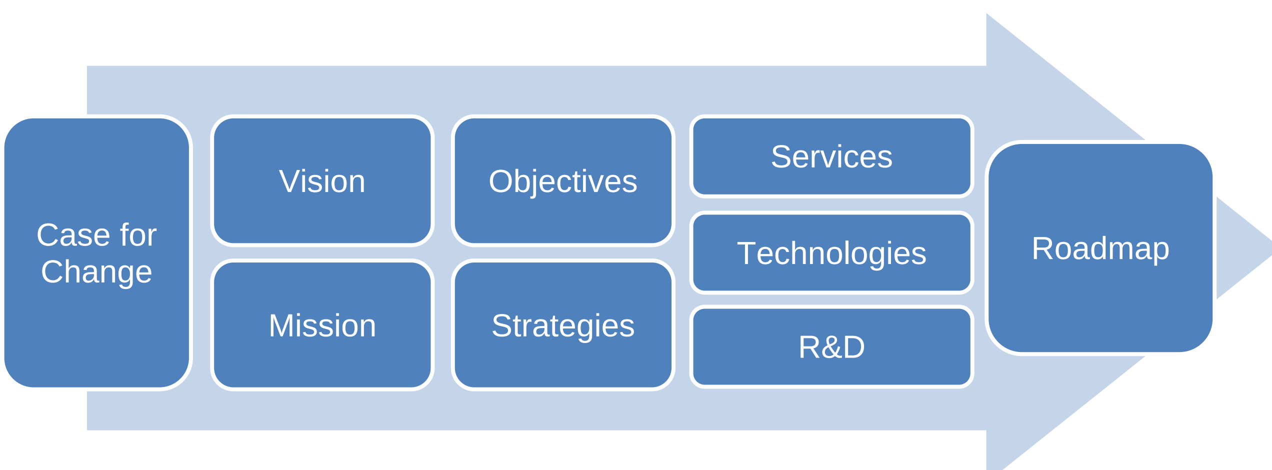

Figure 4: Roadmap development process

The following critical assumptions are also made:

- Government and regulatory support
- Workforce knowledge transfer
- Core business is maintained
- No disruptive game-changers

This roadmap can then be used to drill down on the requirements of individual initiatives, through models such as use cases.

Moreover, this is intended to be a living roadmap. While it has the potential to bring significant value to the infrastructure, society, and the environment, smart grid is not risk free. Many technologies and standards are still in their early stages of development, and not all will move into commercialization or reach a suitable price point for mass deployment. As seen in the later sections, this proposed roadmap attempts to recognize such risks and incorporate measures to ensure that its promises and value are realized. Nevertheless the roadmap will evolve with lessons learned from the initial stages of deployment, and as needs, technologies, and priorities change over time. What are needed are regular reviews, adequate research, innovative strategies, and mechanisms to quickly turn new trends into actions.

5.2 SMART GRID ROADMAP HIGHLIGHTS

Given the above process, a 25 year roadmap was developed for Toronto Hydro's smart grid deployment. Highlights of the roadmap are illustrated in Figure 5.

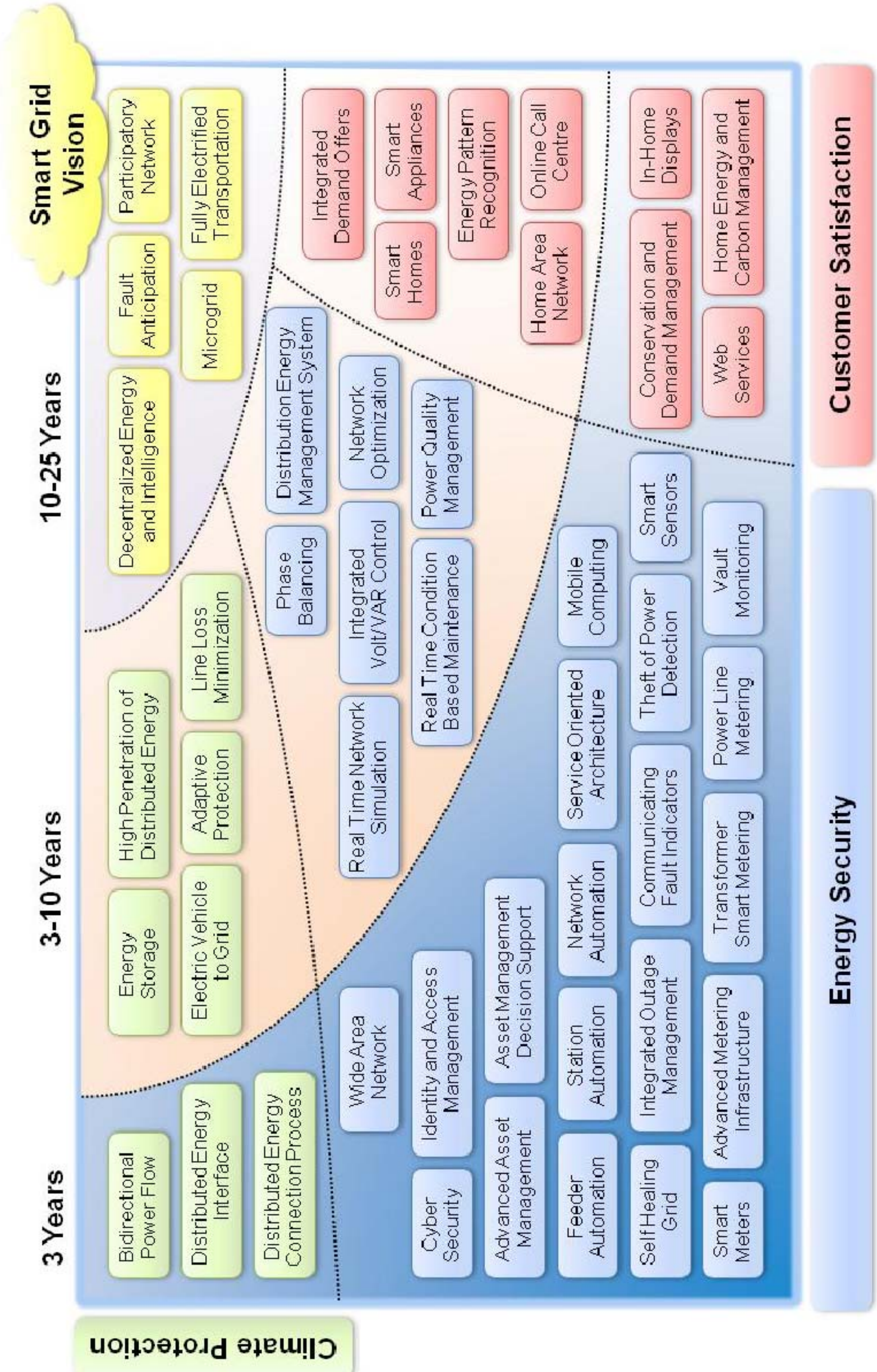

Figure 5: Highlights from Smart Grid Roadmap

5.3 3 YEAR PLAN: DEMONSTRATING TORONTO'S SMART GRID COMMUNITY

The first 3 years of the smart grid roadmap is to materialize the smart grid vision and strategy and translate into actions, through the establishment of *Toronto's Smart Community*.

The Smart Grid Community is a demonstration area where technologies can be tested, processes developed, customer acceptance understood, and operating procedures written. The innovation effort will begin, and all three strategic principles will be used to guide its implementation. Toronto Hydro's leadership and expertise will be leveraged to:

- Maturing existing smart grid building blocks
- Commit to and accelerate planned building blocks
- Integrating our building blocks to realize cross-functional services, shared costs, and added values

Functional strategies such as for communications, distribution equipments, and customer engagements will be developed to guide this effort. Opportunities to attract new workforces and partnerships will also be explored.

The size and scale of this demonstration is currently proposed to include 2 substations, 10 feeders, and approximately 25,000 customers. The location of this demonstration area as well as its detailed scope will be determined in a separate detailed plan. However, the following factors will be considered in determining the demonstration area:

- Reliability performance
- Feeder proximity
- System operational flexibility
- Smart grid devices installed
- Communications coverage
- Customer diversity

Expected benefits will be demonstrated and measured, and used to support potential full scale deployment. The goal is to generate short term wins, and validate the true value of smart grid. Additional opportunities and potentials will also be identified for further piloting. Results and lessons learned will be shared regularly in various forms of communication, such as white papers, presentations, and online content.

Initiatives that were selected as a part of this demonstration are characterized by relative certainty and value, typically utilizing established, proven technologies to demonstrate immediate value for the customer, society, and the environment. These projects are typically in progress and maturing at Toronto Hydro, or planned to commence in the next three years. The smart grid community will accelerate their maturity, and explore areas of integration to provide new services.

For more uncertain initiatives, it is expected that given the pace of industry adoption and effort into advancing smart grid technologies, in 3 years time there will be increased certainty and convergence into technology trends, communication standards, customer responses, and government priorities/regulations. This certainty and understanding of the state and direction of smart grid will enable Toronto Hydro to embark on further demonstrations and larger scale deployments following the 3 years.
The following tables describe the services, technologies, and research and development efforts that encompass the 3 year plan. R&D efforts are used to support the services and technologies in this time frame, or to prepare for the 3-10 year plan.

TABLE 6: 3 YEAR PLAN – SMART GRID SERVICES

Smart Grid Service	Service Description
Bidirectional Power Flow Support	Infrastructure will support the two-way flow of power, such as in terms of generation, load and short circuit capacity, protection and control, stability, and supply/demand balance.
Distributed Energy Interface Support	Support any interface between distributed energy sources and the grid, such as inverter-based, synchronous, or induction, along with communications and controls.
Distributed Energy Connection Process	Streamline the connection process of distributed energy, including generation and storage, enabling customers to install clean and green energy sources with minimal hassle and in short timing.
System Loss Detection	Sensors, communications, and processing to calculate location of system losses (primarily focused on non-theft losses).
Grid-Wide Communications	Secure, high bandwidth, low latency, robust, two-way communications network that can enable all smart grid devices to speak to each other and to back office systems.
Self-Healing Grid	Automatic fault detection, location, sectionalisation, isolation, and restoration to restore as many customers as soon as possible in the event of an outage.
Vault Monitoring	Communicating grid sensors that can monitor the condition inside vaults and report back alarms and statuses to the utility.
Theft of Power Detection	Devices or programs which can identify locations of power theft. Examples include transformer and customer smart metering, and usage pattern recognition.
Advanced Asset Management	Advanced asset management models to optimize and mitigate risks in an aging yet evolving infrastructure.
Mobile Workforce Support	Supply workforce with mobile computing and information capabilities for effective and efficient work execution.

Integrated Outage Management	Mitigating outage occurrences via a network of information and automation. Examples include integrating the outage management system (OMS) with outage reporting smart meters, a self-healing grid, real time field information, restoration time estimates, and outage reporting in-home displays or customer mobile phones.
Identity and Access Management	Ensure security on worksites, the office, or company applications through identifying the user and granting appropriate access.
Cyber Security	Ensure cyber security throughout the grid, including communicating grid, metering, and in-home devices.
Billing, Energy, Outage, Carbon Information	Supply customers with information regarding their billing, energy usage, outage status, and carbon footprint information, such as through a web portal, in-home display, or mobile devices.
Web Services	Offering customers with self service via online web portal, such as billing and payment, monitoring electricity usage, checking outage information, changing personal information, and moving services.
Home Energy and Carbon Management	Program to help customers manage their energy consumption/production and carbon footprint, such as tracking, goal setting, projections, and recommended actions.
Conservation and Demand Management	Programs on conserving energy and managing customer demand, with a focus on peak demand reduction in the summer months.

TABLE 7: 3 YEAR PLAN – SMART GRID TECHNOLOGIES

Smart Grid Technology	Technology Description
System Loss Detection	Utilizing customer, transformer, feeder, and station smart meters, medium voltage measurement devices, communication networks, and processing applications to calculate the location of system losses.
Smart Meters	Meters with embedded intelligence and communication capabilities.
Advanced Metering Infrastructure	A network of smart meters, enabling services such as automatic meter reads, outage detection, and power quality monitoring.
Transformer Smart Metering	A smart meter installed at a transformer, enabling services such as load monitoring, outage detection, and theft of power detection.
Wide Area Network	A two-way communications network that spans a large geographical area, for grid-wide communications. Example usage will be for smart meter backhaul, smart grid communications, and once sufficiently proven, for grid operations and control.
Smart Sensors	Sensors with embedded intelligence and communications capabilities. Also

	known as intelligent electronic devices (IEDs).
Vault Monitoring	A system of smart sensors that monitors the conditions inside vaults and cable chambers, such as temperature, flood, and gas sensors.
Feeder Automation	Automatic feeder switching to enable a self-healing network.
Station Automation	Advanced sensing, relaying, and computing for distributed intelligence and processing of grid conditions, as well as to coordinate with feeder automation devices.
Network Automation	Applying further intelligence into the downtown underground secondary network system, with smart sensors, relays, meters, and autonomous controls.
Asset Management Decision Support	Advanced models, information, and decision support applications to optimize and mitigate risks in an aging yet evolving infrastructure.
Mobile Computing	Mobile computers and handheld devices with communication capabilities that connects to enterprise applications, to support effective and efficient work execution and documentation.
Service Oriented Architecture	IT enterprise architecture that enables interoperability between enterprise applications and databases to provide for integrated services. This allows for data exchange between different applications as defined by business processes.
Communicating Fault Sensors	Smart, communicating sensors that detect the presence of a fault on the system, to assist in identifying the fault location during outage restoration. Measurement of the actual fault current is highly desired.
Home Energy Management System	An application, such as online or installed in a computer, to help customers manage their energy consumption/production and carbon footprint, such as tracking, goal setting, projections, and recommended solutions for meeting goals.
In-Home Displays	Displays inside the customer's property, such as a mobile device or built into a thermostat, which provides customers with information and control on their energy usage and carbon footprint.
Home Communication Gateway	A communication gateway that ties the utility's local or wide area network with the customer's home area network. This may be in the form of a smart meter or an in-home display.
Customer Web Portal	Online customer portal enabling customer self services, such as billing and payment, monitoring electricity usage, checking outage information, changing personal information, and moving services.

TABLE 8: 3 YEAR PLAN – SMART GRID RESEARCH AND DEVELOPMENT

Smart Grid R&D	Research and Development Description
Self-Healing Networks	Innovative means of realizing a self-healing grid, in regards to both power and communications. Examples include network topologies, adaptive protection, intelligent switches, and the use of graph theory to identify the optimal restoration path.
Distributed Energy Integration	Understand and identify solutions to accommodate a high penetration of distributed energy. Include load flow control, adaptive protection, power quality management, and islanding control.
Energy Storage	The exploration of energy storage to buffer intermittent and varying levels of generation and demand. Examples include grid-scale batteries, capacitors, pumped water, flywheels, compressed air, thermal, hydrogen, superconducting magnetic energy storage (SMES), and batteries in electric/plug-in hybrid electric vehicles.
Power Electronic Interfaces	Optimize the operation and mitigate the risks of power electronic interfaces between the grid and distributed generation/storage units. Examples include mitigation of resonance and stability issues, controlling distributed energy units for custom power (perfect power quality through controlled injection of active/reactive power), and intentional islanding/microgrid operation.
EV/PHEV Integration	Understand and identify solutions to accommodate a high penetration of plug in electric/hybrid electric vehicles to the grid. This includes a standardized charging plug, analysis of system capacity, managing intermittent demand (and potentially supply from vehicles), and metering, billing, and rate structures.
Metering Data Analytics	Data mining of metering information collected from customer and transformer smart meters. This can offer ancillary services such as transformer load monitoring, power quality monitoring, theft of power detection, and identifying custom solutions to customers to conserve energy.
Advanced Asset Management Models	Advanced models and algorithms to optimize and mitigate risks in an aging yet evolving infrastructure. Examples include the use of risk, economic, and probabilistic/stochastic models to determine maintenance requirements, loading of assets, asset life, etc.
Interoperability, Open Standards	Participate and keep abreast of developments of open standards between smart grid devices.
Consumer Research	Understanding and meeting the needs of the customer, offering information, options, and control of their energy usage and carbon footprint.

5.4 3 TO 10 YEAR PLAN

The 3-10 year plan involves the expansion of demonstrated initiatives from the smart grid community. Information, results, and lessons learned from the initial 3 year demonstration will contribute towards the scope and timeline of larger scale deployments.

Simultaneously, additional initiatives will be demonstrated, as characterised by:

- Requiring technological advances through research and development
- Requiring new or convergence of communications or connection standards
- Requiring products and solutions provided by vendors
- Building on the foundations of the 3 year plan

Research and development requirements of this plan are then used to support the services and technologies in this time frame, or to prepare for the 10-25 year plan.

The following tables describe the services, technologies, and research and development efforts that encompass the 3-10 year plan.

TABLE 9: 3 TO 10 YEAR PLAN – SMART GRID SERVICES

Smart Grid Service	Service Description
Energy Storage Integration	The integration of energy storage to buffer intermittent and varying levels of generation and demand. Storage can be grid-scale or distributed in customer's premise or vehicles.
High Penetration of Distributed Energy	Network with a high penetration of distributed energy to connect to the system, exchange bidirectional energy throughout the grid in real time.
PHEV-to-Grid Integration	Network that accommodates the charging of a large number of plug-in electric/hybrid electric vehicles. This requires a standardized charging plug, analysis of system capacity, managing intermittent demand (and potentially supply from vehicles), and metering, billing, and rate structures.
Line Loss Minimization	Measures to mitigate line loss for network efficiency and reducing environmental footprint. Examples include voltage conversion, peak demand reduction, power quality mitigation (including power factor correction), theft of power detection, and load re-routing.
Network Optimization	Optimize the day-to-day operation of the network, such as increasing network flexibility, visibility, and operability, phase balancing, peak demand reduction, and Volt/VAR control.
Power Quality Management	Monitor and mitigate power quality problems in the system, such as sags, swells, power factor, harmonics, and transients.

Online Call Centre	Enabling customers to make inquires online, such as through instant messaging applications and blogs.
Home Automation	Configuration and autonomous operation of home appliances, such as dishwashers and dryers, to reduce costs and carbon footprint.
Integrated Demand Offers	“Bundled” services that help customers manage and reduce demand, such as energy efficiency, demand response, and green energy.

TABLE 10: 3 TO 10 YEAR PLAN – SMART GRID TECHNOLOGIES

Smart Grid Technology	Technology Description
Real-Time Conditions Based Maintenance	Utilizing smart sensors to provide real time information to make maintenance and repair decisions.
Integrated Volt/VAR Control	A system that automatically optimizes the voltage and reactive power balance in the system, through monitoring and control of reactive power injection devices, such as capacitor banks and distributed energy units.
Phase Balancing	Monitoring, configuration, and switching of loads on system phases to balance and reduce system losses.
Power Line Metering	Smart metering and sensors on medium voltage lines to monitor system voltages, currents, and potentially power quality.
Adaptive Protection	Protection devices, such as circuit breakers and switches, with coordination characteristics that adapt to system conditions. This enables a network to accommodate varying distributed energy online as well as supporting dynamically reconfiguring systems, such as self-healing grids and microgrids.
Power Quality Monitors	Smart sensors that monitor power quality characteristics (voltage and frequency) in the system, such as sags, swells, power factor, harmonics, and transients.
Power Quality Conditioners	Power quality mitigation devices, including passive and active filters, as well as utilizing distributed energy sources for custom power (perfect power quality through controlled injection of active/reactive power).
Anti-islanding Control	Control algorithms, devices, and standards that prevent the formation of an “island” (isolated, self-powered, self-sustaining subset of the utility grid), even in the case of a high depth of penetration of distributed generation.
Distribution Energy Management System	Utility application that manages the stability and supply/demand balance of the distribution system. Traditionally used in large transmission networks, the Distribution EMS will become increasing critical as distributed generation connect to the medium voltage distribution systems.

Real Time Network Simulators	Network simulation application that, given real time conditions of the grid, computes the real time state of the network, including load flow, energy balance, stability, and power quality.
Energy Pattern Recognition	Pattern recognition applied to energy information collected from customer, transformer, feeder, and station smart meters to enable a variety of services such as demand reduction, loss identification, and theft of power detection.
EV/PHEV Charging Stations	Charging stations for plug in electric/hybrid electric vehicles with metering capabilities, as well as capacity for accommodating the vehicle charging load.
Home Area Network	Communications network in customer's premises to support smart appliances and energy management.
Smart Appliances	Home appliances, such as dishwashers and dryers, with built-in intelligence and communications functionalities to accept utility signals to reduce costs and carbon footprint.
Smart Homes	Customer residences with built-in home area network and smart appliances for management of energy and carbon footprint.

TABLE 11: 3 TO 10 YEAR PLAN – SMART GRID RESEARCH AND DEVELOPMENT

Smart Grid R&D	Research and Development Description
Fault Anticipation	Detection and recognition of fault signatures to anticipate a fault, and perform predictive maintenance or isolation activities to prevent its occurrence.
Adaptive Protection	Protection devices, such as circuit breakers and switches, with coordination characteristics that adapt to system conditions. This enables a network to accommodate varying distributed energy online as well as supporting dynamically reconfiguring systems, such as self-healing grids and microgrids.
Real Time Network Simulations	Network simulation application that, given real time conditions of the grid, computes the real time state of the network, including load flow, energy balance, stability, and power quality.
Islanding Control	Control algorithms, devices, and standards that intentionally creates, or avoids the formation of, an "island" (isolated, self-powered, self-sustaining subset of the utility grid), even in the case of a high depth of penetration of distributed generation.
Microgrid Control	Control algorithms, devices, and standards that control the creation and

	operation of a microgrid 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.
Data Mining	Mining of a utility's information rich enterprise databases to identify new potentials for improving the system or assisting the customer in energy/carbon management. Possible sources include metering, asset conditions, and operational information.
Weather, Supply, Demand Forecasts	Perform weather, supply, and demand forecasts to predict system behaviour and manage the varying levels of generation and load.

5.5 10 TO 25 YEAR PLAN

The 10-25 year plan is characterised by complete integration of technologies and services, maturing of technologies and services that were deployed in the first 10 years, collaboration between the utility and customers, and energy sourced primarily from renewable and clean generation. Proven smart grid technologies will span across the entire territory of Toronto Hydro. There will be further focus on providing services rather than resolving technology barriers.

New initiatives in this plan require the most significant amount of research and development, and have a comparable degree of uncertainty as seen in this stage of deployment. However the services that they enable represent the end state of the smart grid as defined by present drivers.

The following tables describe the services, technologies, and research and development efforts that encompass the 10-25 year plan.

TABLE 12: 10 TO 25 YEAR PLAN – SMART GRID SERVICES

Smart Grid Service	Service Description
Fully Distributed Energy and Intelligence	A network in which energy and intelligence are completely distributed amongst the network and coordinated with centralized sources and controls. A network where energy is generated and consumed locally, while centralized sources are only used as reserve. Network data and decision making are also localized for optimal timing and performance, while centralized processing are only used for high level monitoring and controls.
Fully Electrified Transportation	A network where all modes of transportation, personal vehicles and public transit (including subway and trains), are electrified and "plugged in" to the

	smart grid.
Microgrid Control	Control algorithms, devices, and standards that control the creation and operation of a microgrid 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.
Participatory Network	A system where customers and the utility work collaboratively, with shared responsibility, to achieve common set of objectives. Opportunities for new markets, demands, and mutual benefits.

TABLE 13: 10 TO 25 YEAR PLAN – SMART GRID TECHNOLOGIES

Smart Grid Technology	Technology Description
Fault Anticipation	Detection and recognition of fault signatures to anticipate a fault, and perform predictive maintenance or isolation activities to prevent its occurrence.
Microgrid Controllers	Control algorithms, devices, and standards that control the creation and operation of a microgrid 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.

TABLE 14: 10 TO 25 YEAR PLAN – SMART GRID RESEARCH AND DEVELOPMENT

Smart Grid R&D	Research and Development Description
Advanced Materials	Nanotechnology and self-healing materials, enabling better reliability, higher capacity, smaller dimensions, embedded intelligence, and lower environmental footprint.
HVDC	High voltage, direct current circuits that carry bulk currents with minimal losses and isolate electrical disturbances in the network.
Superconductors	Ultra low to zero resistance (near perfect to perfect conductivity) conductors that enable significant amounts of currents to be carried in a small footprint.

5.6 SYNERGISTIC VIGNETTES

At the core of the smart grid strategy is valuing true innovation through exploring synergies among initiatives. Following the identified services, technologies and research and development efforts above, four "synergistic vignettes" are described in Table 15 to illustrate the value of cross-functional services, and to realize new services. Each vignette is a potential narrative of how various components of the smart grid may look like once fully integrated. This approach at innovation opens up opportunities for new business models and customer service.

A mapping of the four vignettes to the list of enabling services, technologies, and R&D efforts in the roadmap are provided in Appendix B. It becomes evident the importance of integration to realize such vignettes.

TABLE 15: SYNERGISTIC VIGNETTES FOR INTEGRATED SMART GRID OPERATION

Participatory Network	Customers logs onto the utility's online instant messaging service to inquire about how they can save on their electricity bill. The utility's customer service representative loads up the customers' profile, understands their historical usage and projects to the end of the month, and lets the customers know if they are going to exceed their monthly plan. The representative then takes to customers to a list of customized plans on how they can save energy, money, and help the environment at the same time. The plan consists of a package of services that the customer can opt in or out, providing them information, options, and control over their energy use. Services include trading in energy efficient appliances, home energy and carbon management programs, home automation units, email alerts when the customer exceeds their budget, text message notifications before every peak pricing periods, and any financial assistance programs in which they quality for. The utility also offers two special programs – "GreenHome" and "GridAssist". GreenHome is a program to assists the customer to go green. Programs include a streamlined process to sign up for purchasing their own renewable energy generation, such as solar panels, with zero or low interest financing. Alternatively they can allow the utility to "rent their roofs" and install utility-owned solar panels, sharing the benefits with the utility. They can also donate a portion of their outputted green energy to a nearby community centre, sign up for free energy audits for their home, or have an "EV-Plug" installed in their home to charge their plug-in electric cars. GridAssist involves incenting the customer to help the utility's grid. Programs include allowing the utility to control their home appliances, such as air conditioners, hot water heaters, and dishwashers, whenever the demand of the

	power grid reach too high, or when the level of green energy in the system is too low and more polluting sources of generation will have to come online. Intelligence within the appliances ensures that the level of comfort in the home will not be compromised, and the customers will be given the ability to override the pre-programmed settings. Throughout the time the utility's representative stays online and responds to any questions that the customer might have. The customer simply adds any programs they want by "add to cart" and do a "checkout". They can then print a summary of all the services they signed up for and will be contacted by the utility shortly on what to do next.
Green Society	A decentralize generation network powered entirely from renewable and clean energy sources. Each building has become a "positive power plant" by generating both negawatts (conservation) and watts. Through an extensive carbon cap and trade system, society as a whole also becomes carbon neutral, even when considering the full life cycle, including manufacturing and transportation, of its generation sources. The smart grid infrastructure also has the capacity and intelligence to accommodate a wide array of generation options, including various interfaces. Distributed generation, distributed storage facilities, demand response, and intelligent applications ensure that supply and demand are balanced at all times despite the intermittent nature of renewable sources. Smart sensors, adaptive protection devices, sophisticated controls, and an extensive communications network ensure that power quality and system stability are well managed. Community power corporations, microgrids, and virtual power plants are also enabled to better manage the production and use of green energy. Potential, municipalities can become a positive energy source, and optimize their electricity with other districts. Centralized generation continues to exist but as reserves, while transmission systems tie both net positive and negative distribution networks together for energy trading. Mechanisms to promote green energy include zero or low interest financing for renewable generation, carbon cap and trade systems, and streamlined processes. To reduce the risks of financing green energies for customers, utilities and other third parities can enter contractual agreements with the customer to install their own generation while sharing benefits with the customer. Meanwhile, this dynamic, decentralized generation network also supports a fully electrified transportation infrastructure. Electrified vehicles, subway and train systems all plug in into the smart grid both as mobile loads and energy storage units.

Infrastructure Optimization	Day to day operation of the electric system is optimized with a dynamic, robust, and efficient grid. Safety, reliability, and supply security is ensured at all times. Distributed generation and storage facilities, as well as demand response and plug-in electric vehicles all work together to ensure supply demand balance. A network of intelligent sensors gives valuable information into the real time condition of the grid and warns of immediate work required. Automated controls perfects grid power quality and minimize the amount of losses, knowing exactly where they are. Valuable asset and grid operating information also flows back to back end intelligent systems to optimize the economic life and performance of assets. Workers are empowered with access to back end enterprise systems, such as maps and asset data, and work paperless to reduce impact on the environment.
Integrated Outage Restoration	A power outage occurs. Smart meters and communications immediately inform the utility that the customers' power is out. A self-healing grid automatically isolates the fault and restores power to as many customers as soon as possible. Distributed generation devices such as customer's solar panels and electric cars start feeding power to the customers as backup. The utility sends a text message to mobile and in-home devices acknowledging that the power is out and the utility is doing its best to restore power as quickly as possible. It also provides a best estimate given information captured from the grid and the circuit that was out of how long it will take to restore power. It further offers tips of what to do in the event of an outage. A crew is dispatched from the nearest location to confirm the location and reason for the outage, and provides a further update to the time till restoration. Using advanced tools and equipments, they proceed to remedy the cause of the outage and bring power back as soon as possible. Once power is restored, the utility confirms the restoration to all customers who were out, and sends a text message to their devices informing them of the restoration.

5.7 INNOVATION SUPPORT STRUCTURE

Smart grid is described as a "whitespace" in the organization – an amorphous territory where structured, well established, and formal strategies, processes, and history are absent, but where speed and flexibility reigns.[10] In the initial phases of deployment, the smart grid must be supported by a system that initiates, realizes, and sustains constructive innovation. Systems, processes, and people must be coordinated, aligned, and paced to bring true value with innovation. Table 16 identifies the key items to initiate and sustain innovation for the smart grid.

TABLE 16: ELEMENTS OF THE INNOVATION SUPPORT STRUCTURE

Strategic Planning	• Clear objectives and vision, focused strategies, and realistic roadmap to turn innovation into true value • Keep abreast of market trends, customer needs, government priorities, and regulatory support • Innovation efforts must support vision, disruptive innovation and technologies removed, feasibility assessed, risks managed, timelines aligned, and will contribute towards the overall well-being of society, the environment, and the organization • Balance of priorities with core business functions such as infrastructure renewal • Continual Stakeholders involvement
Business Process Management	• Portfolio, program, and project management • Direct progression from an open, unstructured concept to a controlled yet dynamic and flexible implementation • Coordinate cross-divisional efforts • Ensure benefits attainment
Organizational Support	• Centralized coordination and planning, with decentralized innovation and action • Steering Committee for executive monitoring and key decision making • Set up Innovation and Sustainability Office to initiate, manage, and sustain constructive innovation efforts • Cross-functional working group for program execution
Energy Delivery Infrastructure	• Renew aging infrastructure to sustain power delivery (i.e. Project Rebuild) • Bidirectional power flow support, including advanced sensing, control, and protection • Work procedures and protection for safe operations

[10] N. Nohria, M.C. Maletz, "Managing in the Whitespace," Harvard Business Review, Feb 2001, http://hbswk.hbs.edu/archive/2064.html

Strategic Alliance and Equipment Standards	• Strategic alliance with vendors and manufacturers to co-develop products to meet the needs of the smart grid • Collaboration between engineering and procurement to select the most suitable products • Standards to support smart grid, especially in the areas of integrating equipments with communications and for bidirectional power flow
Grid-Wide Communications	• A superhighway of bidirectional communications network for exchange of information and intelligence • Security measures • Communication standards for interoperability • Forecast communications requirements and convergence of protocols
Enterprise Applications and Integration	• Service enabling applications for customers and utility personnel • Integration between enterprise systems through a service oriented architecture and enterprise service bus (ESB)
Customer Relations	• Ensure that customers' needs are satisfied • Anticipate customer needs • Guide progression into a participatory network
Marketing and Communications	• Internal communications enables workers to understand and embody smart grid, empowering actions and further visions • Well thought out plan to communicate with customers • Open forums and marketing campaigns to engage the customer and encourage participation • Technical publications to work together with the research community
Resources and Training	• Need for both specialists and generalists • New skill sets required, especially in the areas of engineering, trades, and customer research • Knowledge capture and retention

6 KEY RECOMMENDATIONS

The key recommendations resulting from the research and analysis in this report are presented below in Table 17. They represent necessary and fundamental steps for the successful launch of smart grid at Toronto Hydro. Implementation of these recommendations is not consecutive, but overlap in a number of instances.

TABLE 17: KEY RECOMMENDATIONS FOR LAUNCHING SMART GRID

1 Engage and align with external stakeholders for Toronto's Smart Grid Plan	• Align with the Government of Ontario's Green Energy and Economy Act (Bill 150) upon legislation and regulation • Collaborate with the City of Toronto for the application of smart grid to address the City's Climate Change Plan • Coordinate with the Ontario Energy Board to expedite effective smart grid regulation • Educate Customers
2 Launch campaign on Toronto's smart grid	• Develop communications strategy and plan • Launch internal campaign to educate and engage internal staff on smart grid • Launch external campaign for customers and the industry • Attract new workforces and form strategic partnerships
3 Convene steering committee, innovation and sustainability office, and working group	• Steering Committee for executive monitoring and key decision making • Innovation and Sustainability Office to centralize strategic planning and management of overall smart grid portfolio. Align with external industry and government priorities • Cross-functional working Group with representation of key stakeholders in the organization for program execution
4 Training and education	• Develop and strengthen key competencies required for smart grid • Allocate sufficient resources to build momentum and reach tipping point • Capable of designing, developing, and operating the smart grid • Extend training and education to customers
5 Launch Smart Community demonstration	• Launch sizable demonstration project to create a "Smart Grid Community", as indicated in the 3 year plan of the Smart Grid Roadmap (Figure 4) • Develop detailed implementation plan with program scope, technology selection, costs and options, and business case • Integrate plan with 10 year capital plan and Electricity Distribution Rates filing process

Ontario Smart Grid Forum

In 2008, the Ontario Smart Grid Forum was convened to establish a common vision of Ontario's smart grid and its benefits, as well as develop recommendations for advancing it in Ontario. The forum consists of executives from industry leaders, including: BOMA, Burlington Hydro, Hydro Ottawa, Hydro One, Independent Electricity System Operator, Ministry of Energy and Infrastructure, Ontario Centres of Excellence, Ontario Energy Board, Ontario Power Authority, Toronto Hydro, University of Waterloo, and Veridian. Key recommendations from the Forum's report are referenced as below.

Key Recommendations from the Ontario Smart Grid Forum Report

Presented below are some of the key recommendations that follow in the Forum's Report. They reflect the central belief that Ontario should develop a smart grid to improve the prosperity of its citizens, the performance of its electricity system and the environment. The rapid development of a smart grid to benefit electricity consumers and advance environmental initiatives should be the policy of the Province of Ontario.

- The Ministry of Energy and Infrastructure should facilitate the development of Ontario's smart grid through legislation, regulation or other available means that clarify authorities, establish requirements or create incentives for those entities investing in Ontario's electricity system to accelerate the deployment or enhance the functioning of smart grid technologies.
- Consumers should pay prices that reflect the cost of energy at different times.
- In order to plan and operate the grid reliably and efficiently, distributors, transmitters, the OEB, OPA and the IESO should work together to:
    - develop requirements for and propose sufficient monitoring of distribution connected generation, energy storage, and responsive load;
    - determine the authority necessary to direct the operation of these facilities, the conditions under which their operation could be directed and any compensation that would be provided to the facility;
    - propose contractual and pricing arrangements with distribution connected generation, energy storage, and responsive load that support efficient grid operations and are consistent with the operation of the wholesale electricity market;
    - coordinate the development and implementation of grid control and information systems to facilitate the actions listed above.
- A Task Force led by the Ministry of Economic Development and involving other relevant Ministries should be created consisting of representatives from the auto sector (vehicle manufacturers and suppliers) electricity sector (OEB, IESO, OPA, distributors and generators) and universities to develop a comprehensive plan for enabling plug-in electric vehicles in Ontario. The plan would address policy, financial, and electricity system impacts of substantial electric vehicle penetration and identify what is required to ensure that vehicles can be charged as they develop. The Task Force should link to the ongoing collaborative work by the Electric Power Research Institute (EPRI), the Society of Automotive Engineers (SAE) and standards development organizations to develop electric vehicles standards.
- Utilities, the IESO, the OPA, universities and OCE should conduct research and development related to smart grids to advance Ontario's leadership position in this area, promote innovation and develop green jobs in the province. The OCE should facilitate the development of a task force to produce a framework for smart grid research in Ontario that would include targeted amounts of funding and proposed funding mechanisms.

7 A CALL TO ACTION

The City of Toronto has been known as the hub of Canada – the financial hub, the cultural hub, and the entertainment hub. With firm dedication and collaboration from the Ontario government, Toronto government, Toronto Hydro, and other key stakeholders, Toronto can also become the intelligent and sustainable energy hub of Canada. The smart grid is the avenue to make this happen.

Through innovation and the strategic application of information, communication, and electronic/electrical technologies, the smart grid can optimize the electric infrastructure in a time of a convergence of risks, enhance customer experience in a digital era, and meet the province and city's agenda for environmental sustainability and a green economy. It is a phenomenal task, but it is necessary. And we're prepared to lead this effort.

It is thus a time for change, for turning vision into action. Guided by our vision, objectives, strategy, and roadmap, we can realize a path through the challenges of deployment into a future of innovation and sustainability. The recommendations in this report envision actions taken by stakeholders throughout the organization to work collaboratively towards a smart grid. This involves initiating the transformation and innovation effort, engaging key stakeholders and customers, convening core groups in commencing smart grid activities, preparing workforce for modernization, and launching Toronto's Smart Grid Community.

The smart grid represents the greatest effort the industry has seen to "plug in" – plug in our customers, plug in the environment, plug in new technologies, and plug in our grid. The time is right, and the time is now.

APPENDIX A:

MAPPING SMART GRID INITIATIVES WITH STRATEGIC OBJECTIVES

			Smart Grid Objectives															
			Climate Protection					Energy Security					Customer Satisfaction					
		Total Count	Zero Footprint	Distributed Energy	Streamlined Processes	Microgrid/Community Energy/VPP	Electrified Transportation	Modernize Aging Infrastructure	Manage Power Quality	Visibility and Control Throughout	Improve Utility Operations	Physical and Cyber Security	Timely Information	New Forms of Communication	Energy Controls	New Customer Service Models	Advices from the Utility	Incentives and Financial Support
Timeline	**Smart Grid Initiatives**		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	3.6
Now-3 years																		
Services	Bidirectional Power Flow Support	11	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	
	Distributed Energy Interface Support	11	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	
	Distributed Energy Connection Process	7	✓	✓	✓	✓	✓									✓	✓	
	System Loss Detection	3	✓					✓		✓								
	Grid-Wide Communications	11		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
	Self-Healing Grid	5				✓		✓	✓	✓	✓							
	Vault Monitoring	4	✓					✓		✓	✓							
	Theft of Power Detection	6	✓					✓		✓	✓	✓					✓	
	Advanced Asset Management	11	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓	
	Mobile Workforce Support	5	✓		✓						✓					✓	✓	
	Integrated Outage Management	9		✓		✓	✓	✓	✓	✓	✓		✓				✓	
	Identity and Access Management	1										✓						
	Cyber Security	2										✓					✓	
	Billing, Energy, Outage, Carbon Information	11	✓	✓		✓	✓			✓			✓	✓	✓	✓	✓	✓
	Web Services	8	✓		✓	✓							✓	✓		✓	✓	✓
	Home Energy and Carbon Management	10	✓	✓		✓	✓	✓					✓		✓	✓	✓	✓
	Conservation and Demand Management	9	✓	✓		✓		✓					✓		✓	✓	✓	✓
Technologies	Smart Meters	14	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
	Advanced Metering Infrastructure	14	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
	Transformer Smart Metering	5	✓					✓	✓	✓	✓							
	System Loss Detection	3	✓					✓		✓								
	Wide Area Network	11		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
	Smart Sensors	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Vault Monitors	4	✓					✓		✓	✓							
	Feeder Automation	5				✓		✓	✓	✓	✓							
	Station Automation	5				✓		✓	✓	✓	✓							
	Network Automation	5				✓		✓	✓	✓	✓							
	Asset Management Decision Support	9	✓	✓	✓	✓	✓	✓	✓	✓	✓							
	Mobile Computing	3	✓		✓						✓							
	Service Oriented Architecture	4			✓						✓		✓				✓	
	Communicating Fault Sensors	6		✓		✓	✓	✓		✓	✓							
	Home Energy Management System	10	✓	✓		✓	✓	✓					✓		✓	✓	✓	✓
	In-Home Displays	9		✓		✓	✓						✓	✓	✓	✓	✓	✓
	Home Communication Gateway	6				✓							✓	✓	✓	✓	✓	
	Customer Web Portal	12	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓
R&D	Self-Healing Networks	5				✓		✓	✓	✓	✓							
	Distributed Energy Integration	12	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
	Energy Storage	11	✓	✓		✓	✓	✓	✓	✓	✓				✓	✓	✓	
	Power Electronic Interfaces	6	✓	✓		✓	✓	✓	✓									
	EV/PHEV Integration	9	✓			✓	✓	✓	✓	✓					✓	✓	✓	
	Metering Data Analytics	13	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
	Advanced Asset Management Models	10	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓					
	Interoperability, Open Standards	11	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓			
	Consumer Research	11	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓

			Smart Grid Objectives															
			Climate Protection					Energy Security					Customer Satisfaction					
		Total Count	Zero Footprint	Distributed Energy	Streamlined Processes	Microgrid/Community Energy/VPP	Electrified Transportation	Modernize Aging Infrastructure	Manage Power Quality	Visibility and Control Throughout	Improve Utility Operations	Physical and Cyber Security	Timely Information	New Forms of Communication	Energy Controls	New Customer Service Models	Advices from the Utility	Incentives and Financial Support
Timeline	Smart Grid Initiatives		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	3.6
3-10 years																		
Services	Energy Storage Integration	12	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
	High Penetration of Distributed Energy	12	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
	PHEV-to-Grid Integration	12	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
	Line Loss Minimization	4	✓					✓		✓	✓							
	Network Optimization	6	✓			✓		✓	✓	✓	✓							
	Power Quality Management	11	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	
	Integrated Demand Offers	10	✓			✓		✓		✓	✓		✓		✓	✓	✓	✓
	Online Call Centre	6			✓								✓	✓		✓	✓	✓
	Home Automation	11	✓	✓		✓	✓	✓					✓	✓	✓	✓	✓	✓
Technologies	Real-Time Conditions Based Maintenance	4	✓					✓		✓	✓							
	Integrated Volt/VAR Control	6	✓			✓		✓	✓	✓	✓							
	Phase Balancing	6	✓			✓		✓	✓	✓	✓							
	Power Line Metering	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Adaptive Protection	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Power Quality Monitors	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Power Quality Conditioners	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Anti-islanding Control	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Distribution Energy Management System	12	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	
	Real Time Network Simulators	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Energy Pattern Recognition	12	✓	✓		✓	✓	✓	✓				✓	✓	✓	✓	✓	✓
	EV/PHEV Charging Stations	10	✓			✓	✓	✓	✓	✓				✓	✓	✓	✓	
	Home Area Network	6				✓							✓	✓	✓	✓	✓	
	Smart Appliances	9	✓			✓		✓					✓	✓	✓	✓	✓	✓
	Web-Based Call Centre	5			✓									✓		✓	✓	✓
	Smart Homes	11	✓	✓		✓	✓	✓					✓	✓	✓	✓	✓	✓
R&D	Fault Anticipation	4						✓	✓	✓	✓							
	Adaptive Protection	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Real Time Network Simulations	8	✓	✓		✓	✓	✓	✓	✓	✓							
	Islanding Control	9	✓	✓	✓	✓	✓	✓	✓	✓	✓							
	Microgrid Control	14	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
	Data Mining	11	✓	✓		✓	✓	✓	✓	✓	✓		✓			✓	✓	
	Weather, Supply, Demand Forecasts	14	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
10-25 years																		
Services	Fully Distributed Energy and Intelligence	12	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
	Fully Electrified Transportation	11	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	
	Microgrid Control	13	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	
	Participatory Network	16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Technologies	Fault Anticipation	4						✓	✓	✓	✓							
	Microgrid Controllers	14	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
R&D	Advanced Materials	4	✓					✓	✓		✓							
	Superconductors	4	✓					✓	✓		✓							
	HVDC	4	✓					✓	✓		✓							

APPENDIX B:

SMART GRID INITIATIVES REQUIRED IN SYNERGISTIC VIGNETTES

		Vignette			
Timeline	Smart Grid Initiatives	Participatory Network	Green Society	Integrated Outage Restoration	Optimized Infrastructure
Smart Grid Services					
Now-3 years	Bidirectional Power Flow Support		✓	✓	✓
	Distributed Energy Interface Support		✓	✓	✓
	Distributed Energy Connection Process	✓	✓		✓
	Grid-Wide Communications	✓	✓	✓	✓
	Self-Healing Grid			✓	✓
	Vault Monitoring				✓
	Theft of Power Detection				✓
	Advanced Asset Management	✓	✓	✓	✓
	Mobile Workforce Support			✓	✓
	Integrated Outage Management		✓	✓	
	Identity and Access Management				
	Cyber Security				
	Billing, Energy, Outage, Carbon Information	✓	✓		
	Web Services	✓	✓	✓	
	Home Energy and Carbon Management	✓	✓	✓	
	Conservation and Demand Management	✓	✓	✓	
3-10 years	Energy Storage Integration	✓	✓	✓	✓
	High Penetration of Distributed Energy	✓	✓	✓	✓
	PHEV-to-Grid Integration	✓	✓		✓
	Line Loss Minimization		✓		✓
	Network Optimization				✓
	Power Quality Management				✓
	Integrated Demand Response		✓	✓	✓
	Online Call Centre	✓		✓	
	Home Automation	✓	✓	✓	
10-25 years	Fully Distributed Energy and Intelligence		✓	✓	✓
	Fully Electrified Transportation		✓		✓
	Microgrid Control		✓	✓	✓
	Islanding Control		✓	✓	✓
	Participatory Network	✓	✓	✓	✓

Timeline	Smart Grid Initiatives	Vignette			
		Participatory Network	Green Society	Integrated Outage Restoration	Optimized Infrastructure
Smart Grid Technologies					
Now-3 years	Smart Meters	✓	✓	✓	✓
	Advanced Metering Infrastructure	✓		✓	✓
	Transformer Smart Metering	✓		✓	✓
	Wide Area Network	✓	✓	✓	✓
	Smart Sensors		✓	✓	✓
	Vault Monitors				✓
	Feeder Automation			✓	✓
	Station Automation			✓	✓
	Network Automation			✓	✓
	Asset Management Decision Support	✓	✓	✓	✓
	Mobile Computing			✓	✓
	Communicating Fault Sensors			✓	
	Home Energy Management System	✓	✓	✓	✓
	In-Home Displays	✓	✓	✓	
	Home Communication Gateway	✓		✓	
	Demand Reponse Dispatch	✓	✓	✓	
	Customer Web Portal	✓	✓	✓	
3-10 years	Real-Time Conditions Based Maintenance				✓
	Integrated Volt/VAR Control		✓		✓
	Phase Balancing		✓	✓	✓
	Power Line Metering		✓	✓	✓
	Adaptive Protection		✓	✓	✓
	Power Quality Monitors		✓	✓	✓
	Power Quality Conditioners		✓	✓	✓
	Anti-islanding Control		✓	✓	✓
	Distribution Energy Management System		✓	✓	✓
	Real Time Network Simulators		✓	✓	✓
	Energy Pattern Recognition	✓	✓		✓
	EV/PHEV Charging Stations	✓	✓		✓
	Home Area Network	✓		✓	
	Smart Appliances	✓	✓	✓	
	Web-Based Call Centre	✓		✓	
	Smart Homes	✓	✓	✓	
10-25 years	Fault Anticipation			✓	✓
	Microgrid Controllers		✓	✓	✓
Smart Grid Research and Development					
Now-3 years	Self-Healing Networks			✓	✓
	Distributed Energy Integration	✓	✓	✓	✓
	Energy Storage	✓	✓	✓	✓
	Power Electronic Interfaces	✓	✓	✓	✓
	EV/PHEV Integration	✓	✓		✓
	Metering Data Analytics	✓	✓		✓
	Advanced Asset Management Models	✓	✓	✓	✓
	Interoperability, Open Standards	✓	✓	✓	✓
	Consumer Research	✓	✓	✓	✓
3-10 years	Fault Anticipation			✓	✓
	Adaptive Protection		✓	✓	✓
	Real Time Network Simulations		✓	✓	✓
	Islanding Control		✓	✓	✓
	Microgrid Control		✓	✓	✓
	Data Mining	✓			✓
	Weather, Supply, Demand Forecasts	✓	✓	✓	✓
10-25 years	Advanced Materials				✓
	Superconductors				✓
	HVDC				✓

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INTERROGATORY 37:

Reference(s): Exhibit I1 Tab1 Schedule1, p. 3 - 5

a) Provide 5 years of information showing the breakdown of historic income from services, sale of scrap, and interest income.

b) Provide more support for the forecast that other income will be zero in 2010 based on economic and interest rate forecasts.

RESPONSE:

a)

Historical Revenue from Services, Sale of Scrap and Interest Income ($,000)

	2004	2005	2006	2007	2008
Merchandising Revenue (excluding Scrap Sales)	6,809	9,890	8,640	16,435	10,510
Merchandising Expenses (excluding Scrap Sales)	- 8,041	- 8,615	- 7,922	- 8,651	- 9,391
Merchandizing Revenue – Expenses (excl. Scrap Sales)	- 1,232	1,275	718	7,785	1,119
Scrap Sales Revenue	2,108	2,174	3,322	4,159	3,827
Cost of Sales of Scrap	-609	-885	-1,347	-930	-1,107
Gains on Sales of Scrap	1,499	1,288	1,975	3,229	2,720
Investment Interest Income	10,324	10,485	8,709	8,159	6,020

It should be noted Other Income and Reduction can vary significantly from year to year due to one-time or extraordinary events. For example, the 2007 value of $20.2 million is partly due to $6 million in CDM revenue received from the OPA which was recorded to this account. It was to reimburse THESL for offering a 10% discount

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to commercial customers achieving 10% load reduction as a conservation measure. THESL also receives investment tax credits, in varying amounts from time to time, due to research and development, which are difficult to forecast. This amount, while booked to Other Revenue, is not a Revenue Offset.

b) Investment income depends on interest rate and amount of cash in hand. Currently the interest rate on short term cash investments is only about 0.25%. Also, due to the significant increase in capital spending in the Test Year, available cash for short- term investment will be diminished.

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INTERROGATORY 38:

Reference(s): Exhibit J1 Tab1 Schedule 2 page 5 Table 2

a) Why is 36 months disposition appropriate given the size of the 2010 DRR and Rate Increase?

b) Provide a calculation of the residential rate rider for disposition over 12 months and 24 months and compare this to THESL's 36 month disposition.

RESPONSE:

a) As explained in the referenced exhibit, THESL proposes a 36-month clearance to eliminate the potentially significant increase in customer bills which would occur when a one-year rate rider eliminated in 2011. Spreading the recovery over the 36 months makes the transition to post-rider bills more smoothly.

b) Please see the following table.

	Residential Rate Rider ($/kWh)	Monthly Bill Impact Assuming 800 kWh
As filed (36 Month clearance)	-0.00127	-$1.02
24 Month Clearance	-0.00190	-$1.52
12 Month Clearance	-0.00380	-$3.04

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INTERROGATORY 39:

Reference(s): Exhibit J1 Tab1 Schedule 2 page 6

"The 2007 LRAM and SSM balance is the subject of a current Application in process with the Board (EB-2008-0401)".

a) Given the Board's EB-2008-0401 Decision and Order, will THESL now clear Account 1508.

b) Confirm the residential rate rider for this clearance.

RESPONSE:

a) THESL will be clearing the amounts approved by the Board for the 2007 LRAM and SSM balances. They will be cleared by way of rate rider to begin May 2010. The full balance of account 1508 will not be cleared, as it contains balances related to other regulatory assets, as described in the referenced evidence.

b) The rate riders will only be able to be calculated once the carrying costs to May 2010 are known, which requires Board approved carrying charge rates through 2010 Q2. However, based on the LRAM and SSM amounts approved by the Board, the OEB approved carrying charge rates through 2009Q4, and a forecast of carrying charge rates for 2010 Q1 and Q2, the Residential Rate Rider of LRAM/SSM is expected to be $.00049/kWh.

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INTERROGATORY 40:

Reference(s): **Exhibit J1 Tab1 Schedule 2 page 7**

a) Please provide a breakdown/details of the IFRS costs in Account 1508 as of September 30,2009 and an estimate at year end 2009

b) When will THESL is seeking recovery?

RESPONSE:

a) The following table provided details of amounts included in account 1508 for IFRS costs. An estimate to 2009 year end is not currently available.

	Amounts as of Sept 30/09 ($000s)
Internal Labour	$454
External Services	$1,438
Other	$66
Total	$1,958

b) THESL will be seeking recovery of IFRS related costs in a future rate hearing.

Non-RPP Allocators

	Annual	RPP	Non-RPP	Total	2008 Non RPP in each Rate Class as a % of Total Non RPP	2008 of Non RPP KWH as a % of the total Rate Class kWh
		A	B	C	$D = B_{row\ x} / B_{row\ 8}$	E = B/C
Row. 1	Residential	4,821,342,380	623,544,646	5,444,887,027	4.05%	11.45%
Row. 2	GS <50	1,907,583,998	490,579,162	2,398,163,160	3.19%	20.46%
Row. 3	GS 50-1000	1,893,134,198	4,178,891,584	6,072,025,782	27.18%	68.21%
Row. 4	GS 1000-5000	503,276,004	4,673,372,548	5,176,648,552	30.39%	90.28%
Row. 5	LU >5000	107,865,042	2,344,813,316	2,452,678,357	15.25%	95.60%
Row. 6	St Ltg.	38,075	115,001,231	115,039,306	0.75%	99.97%
Row. 7	GS 50-1000	1,429,294,781	2,951,083,834	4,380,378,616	19.19%	67.37%
Row. 8	Total	10,662,534,478	15,377,286,321	26,039,820,799	100.00%	
	%	40.1%	59.9%			

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INTERROGATORY 41:

Reference(s): Exhibit J1 Tab1 Schedule 2 page 8 and Tables 3 and 4

In the case of the RSVA Power, the portion which is related to Global Adjustment, and has been collected only from customers who are non-RPP customers, is allocated based on estimates of the load to non-RPP customers in each rate class.

a) Provide a schedule that shows the basis of this allocation – the number of non-RPP customers and associated load over the period *for the Residential Class.*

b) Reconcile the allocation with the percentages shown in Table 3 and the rate riders in Table 4.

RESPONSE:

a) Please see Appendix A of this Schedule for the Non RPP allocations. The allocations are based solely on Non-RPP loads in each class, not customers.

b) Exhibit J1, Tab 2, Schedule 10, page 2 details the derivation of the rate riders shown in Table 4, including the allocations shown in Table 3.

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INTERROGATORY 42:

Reference(s): Exhibit K1/Tab 1/Schedule 1, page 1

a) Please reconcile the $540.5 M Total Distribution Revenue for 2010 reported here with the values ($547.5 M & $528.7 M) reported in Exhibit J1, Tab 1, Schedule 1, Table 1 for 2010.

b) Please explain what is meant by Note 3 to Table 1 regarding the Distribution Revenue not including the adjustment for the Transformer allowance.

c) Please provide a schedule that sets out the 2010 distribution revenues at the proposed rates by customer class. Please show both the rates and volumes for each class, where the rates:

   i. exclude the Smart Meter Adder,
   ii. exclude Hydro One Networks' LV costs and
   iii. reflect the discount for transformer ownership where appropriate.

d) Please provide a schedule that sets out the revenues by customer class based on 2009 approve rates and 2010 forecast billing determinants. Please show both the rates and volumes for each class, where the rates:

   i. exclude the Smart Meter Adder,
   ii. exclude Hydro One Networks' LV costs and
   iii. reflect the discount for transformer ownership where appropriate.

   Please reconcile the results with the $476.8 value implicit in Exhibit J1, Tab 1, Schedule 1 (i.e., $495.5-18.7).

RESPONSE:

a) As indicated in the notes to Table 1 in Exhibit K1, Tab 1, Schedule 1, page 1, the revenue figures do not include the adjustment for Transformer allowance costs. The

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Base Revenue requirement of $528.7M must be grossed up to account for $11.7M in transformer allowance paid to customers who own their own transformation assets. The remaining difference of 0.1M is due to rounding.

b) Please see (a) above.

c) The requested information is provided in Appendix A to this Schedule, labelled VECC 42c. Note that the first two items listed are not included in distribution charges. The transformer allowance has been removed from the total revenues for the GS 50-999kW, GS 1000-4999kW, and the Large User classes.

d) The requested information is provided in Appendix B to this Schedule, labelled VECC 42d. Note that the first two items listed are not included in distribution charges. The transformer allowance has been removed from the total revenues for the GS 50-999kW, GS 1000-4999kW, and the Large User classes.

VECC 42c

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
1					
2			2010 Billing Units	2010 Proposed Rates	2010 Test Year
3	Residential	Customer Charge	614,841	18.14	$ 135,697,476
4		Distribution Charge	5,081,028,663	0.01684	$ 85,564,523
5	GS <50 kW	Customer Charge	65,747	22.84	$ 18,270,124
6		Distribution Charge	2,229,476,310	0.02399	$ 53,485,137
7	GS 50-999 kW	Customer Charge	12,276	50.5	$ 7,542,417
8		Distribution Charge	26,511,577	5.5866	$ 146,847,066
9	GS 1000-4999 kW	Customer Charge	517	691.11	$ 4,346,329
10		Distribution Charge	11,142,188	4.0844	$ 40,705,848
11	Large Use	Customer Charge	47	2277.32	$ 1,302,247
12		Distribution Charge	4,974,405	4.3984	$ 19,219,493
13	Street Lighting	Connection Charge	162,353	1.12	$ 2,212,336
14		Distribution Charge	321,183	31.1169	$ 10,133,022
15	Unmetered Scattered Load	Customer Charge	1,124	3.74	$ 51,149
16		Connection Charge	21,782	0.37	$ 98,056
		Distribution Charge	52,413,320	0.06283	$ 3,293,129
17	Total	Customer Charge			$ 169,520,135
18		Distribution Charge			$ 359,248,217
19					
20	Total Distribution Revenue				$ 528,768,352

VECC 42d

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
1					
2			2010 Billing Units	2009 Approved Rates	2010 Test Year Revenue at 2009 Rates
3	Residential	Customer Charge	614,841	16.85	$ 126,047,545
4		Distribution Charge	5,081,028,663	0.01432	$ 72,760,330
5	GS <50 kW	Customer Charge	65,747	21.44	$ 17,150,239
6		Distribution Charge	2,229,476,310	0.01975	$ 44,032,157
7	GS 50-999 kW	Customer Charge	12,276	32.69	$ 4,882,408
8		Distribution Charge	26,511,577	5.1509	$ 135,135,540
9	GS 1000-4999 kW	Customer Charge	517	705.35	$ 4,435,883
10		Distribution Charge	11,142,188	4.323	$ 43,401,298
11	Large Use	Customer Charge	47	2639.04	$ 1,509,091
12		Distribution Charge	4,974,405	3.9348	$ 16,881,329
13	Street Lighting	Connection Charge	162,353	0.89	$ 1,758,017
14		Distribution Charge	321,183	19.7581	$ 6,434,101
15	Unmetered Scattered Load	Customer Charge	1,124	3.42	$ 46,773
16		Connection Charge	21,782	0.35	$ 92,755
		Distribution Charge	52,413,320	0.04174	$ 2,187,732
17	Total	Customer Charge			$ 155,922,712
18		Distribution Charge			$ 320,832,487
19					
20	Total Distribution Revenue				$ 476,755,199

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INTERROGATORY 43:

Reference(s): Exhibit K1/Tab 1/Schedule 1, pages 4-8

a) In its EB-2007-0680 Report (page 33) the Board directed Toronto Hydro to work with other parties to understand differences in load forecast methodologies employed.
   - Please outline what activities Toronto Hydro undertook in response to the Board's direction.
   - Is the changed load forecast methodology the result of this initiative?

b) In their 2010 Rate Applications many of the other electricity distributors in the province (e.g., Festival, Oakville, Orangeville and Burlington) have expressed concerns about the quality of their monthly customer usage data and the inappropriateness of using it to model monthly customer sales by class.
   - Is Toronto Hydro aware of these concerns?
   - What is different about Toronto Hydro's data that makes it acceptable for modelling purposes?

c) Page 6 indicates that the main drivers of load growth over time are economic conditions, while the primary driver of year over year changes is weather. The Application states that economic conditions are captured by customer, population and time trend variables. Did Toronto test any model specifications that included more direct indicators of economic conditions such as GDP? If not, why not? If yes, what were the results and why were these models rejected?

d) The customer class usage inputs used (per Exhibit K1, Tab 2, Schedule 1) are reported as purchased kWh. Please clarify if this is meant to reflect "customer purchases" or "wholesale purchases by Toronto Hydro" to supply the customers. If the latter, what loss factors were used to determine the wholesale purchases in each year and how were these loss factor calculated?

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RESPONSE:

a) EB-2007-0680 Report (page 33) the Board states: "Going forward, the Board ***encourages*** the Applicant to work with OPA, IESO, and perhaps others to understand differences in methodology employed by each… The Applicant can make a very important contribution to the sector by working with stakeholders to bring needed clarity to this aspect of forecasting and utility operations." (emphasis added). The Board did not direct, but only advised THESL (and indirectly, other stakeholders) to exchange information on certain load forecasting issues and to contribute to the developing of common approaches in treating some of those issues.

Since summer 2008THESL has been making efforts to increase familiarization with other utilities' load forecasting models, including the utilities outside of the province (within North America). In particular, THESL took part in two Load Forecasting conferences organized by "Itron" in the US (September 2008 and April 2009) and participated in the inaugural LDC load forecasting forum hosted by the IESO in November 2009.

THESL finds that although the set of load forecasting issues being faced by all distributors is similar, service territory and customer base characteristics likely significantly influence the set of explanatory variables best suitable for their load modeling. Going forward THESL plans to continue working in this direction.

THESL made a decision to change its forecasting model because the previously used regression specifications were not satisfactorily capturing the most recent loads experienced by THESL. This conclusion was made based on ongoing testing of the

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previous regression model taking place on the monthly basis since summer 2008. To define the main directions for model improvement, THESL explored and attempted to incorporate some of the successful methodologies other utilities were using. Those ideas where thoroughly tested in terms of their applicability to THESL's load modeling. The load forecasting models filed in support of this filing are the result of detailed historic load analysis and statistical testing of various explanatory variables and their combinations for each customer class.

b) THESL is aware of the fact that distributors around the province (and outside of it) are concerned about the quality of their monthly billing data.

THESL has never stated in its evidence that class billing data were directly used as dependent variables in its models. As was done in the previous rate application approved by the Board, THESL's load data begins with total purchased energy data. This time, however, total purchased energy monthly amounts are allocated by customer class using proportions based on the calendarized class billing data. This way THESL ensures the use of the most reliable available data (purchased energy on the wholesale level) as well as capturing the differences in class load behaviour and extrapolating them into the forecast period. The detailed explanation of how total purchased energy is allocated between rate classes is provided in Board Staff Interrogatory #8.

Generally, since the main purpose of the load forecast is for the development of rates for each customer class, it is impossible not to incorporate (directly or indirectly) class billing consumption data at some stage of the load forecasting process.

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c) THESL did test different direct indicators of economic conditions. Among them: Toronto GDP, Housing market information on Sales, Completions and Starts (raw and lagged data), Industrial, Commercial and Residential building permits (raw and lagged data) and others. These variables were not included in the final set of explanatory variables because they were found to be statistically insignificant and added no additional explanatory value to the regression models (in particular, the Adjusted-R^2 was lower than for the regressions filed in the evidence). Please refer to the Board Staff Interrogatory #7d) to for details on the model estimation with Toronto GDP included in the set of explanatory variables.

d) The term “purchased energy, kWh” is used in the filed evidence to reflect “wholesale purchases by Toronto Hydro to supply its customers”. Loss factors used are current Board approved loss factors.

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INTERROGATORY 44:

Reference(s): Exhibit K1/Tab 1/Schedule 1, pages 9-10

a) Page 8 notes that customer counts were forecast based on trend analysis. Using such an approach, how do the population and customer count forecasts capture economic conditions (as suggested on page 6)?

b) Please provide a schedule that sets out for each class the year over year growth rate in customer/connection count from 2002-2010.

c) Please provide Toronto's actual customer count by class for the most recent month available.

d) Please show the derivation of the 2009 and 2010 Residential class customer counts and how the increase in individually metered suites was specifically factored in.

RESPONSE:

a) Extrapolation and trend forecasting techniques have demonstrated their value in forecasting population and customer numbers in the past. Generally, because customer numbers and population do not experience significant short-term swings – unlike loads - extrapolation techniques are quite acceptable as forecasting methods for such variables. Furthermore, as the most recent actual data is included in the development of these models, recent experience is being captured within them, making them very suitable for short-term forecasts such as one or two years.

b) For the requested schedule please refer to Exhibit R1, Tab11, Schedule 44, Appendix A.

c) Please see the table below.

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Customer Class	Cust / Conn	October 2009
Residential	Customers	610,419
GS < 50 kW	Customers	65,873
GS 50-1000 kW	Customers	12,316
GS 1-5 kW	Customers	506
Large Users	Customers	47
Street Lighting	Connections	162,371
USL	Customers	1,093
	Connections	21,394
Total	**Customers**	**690,254**
	Connections	**183,765**
Note: the latest available data for USL are from June 2009.		

d) The 2009 and 2010 residential customer numbers were derived using a two step methodology:

- First, a linear trend extrapolation was used to forecast “conventional” residential customer numbers. Forecasting was performed on the monthly data and the historic data range included residential customer numbers from May 2002 to May 2009.
- Second, monthly cumulative projections of individually metered suites (both retrofits and new construction) were then added to the forecast of the “conventional” residential customers.

Col. 1	Col. 2	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Actual Customers Growth Rate									
		2003 Actual vs 2002 actual	2004 Actual vs 2003 Actual	2005 Actual vs 2004 Actual	2006 Actual vs 2005 Actual	2007 Actual vs 2006 Actual	2008 Actual vs 2007 Actual	2009 Bridge vs 2008 Actual	2010 Test Year vs 2009 Actual
Residential	Customers	0.8%	0.4%	0.5%	0.5%	0.4%	0.7%	0.7%	1.1%
GS <50 kW	Customers	-0.2%	-0.3%	-0.2%	0.5%	-0.6%	-0.5%	-0.6%	-0.2%
GS 50-999 kW	Customers	2.3%	1.8%	1.6%	1.6%	0.4%	5.5%	1.2%	0.5%
GS 1000-4999 kW	Customers	0.4%	1.0%	2.6%	2.8%	-0.8%	0.6%	-0.8%	0.2%
Large Use	Customers	0.0%	2.2%	0.0%	2.1%	2.1%	0.0%	-4.1%	0.0%
Street Lighting	Connections	0.0%	0.0%	0.0%	0.0%	1.3%	0.2%	0.1%	0.1%
Unmetered Scattered Load	Customers	-2.9%	4.8%	-15.9%	-4.3%	-27.3%	23.6%	0.8%	0.0%
	Connections	-2.9%	3.7%	-33.9%	116.1%	-2.4%	10.5%	1.9%	0.0%
Total	Customers	0.7%	0.3%	0.4%	0.5%	0.2%	0.7%	0.6%	0.9%
	Connections	-0.2%	0.3%	-2.7%	6.3%	0.9%	1.3%	0.3%	0.1%

Notes

1. Customer/Connection growth rate calculation is based on mid-year values (consistent with the Table 1, Exhibit K1, Tab 4, Schedule 1).

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INTERROGATORY 45:

Reference(s): **Exhibit K1/Tab 1/Schedule 2**

a) Are any of Toronto Hydro's customers registered as Market Participants with the IESO? If yes, what is their total usage over the most recent 12 months and what is their forecast usage for 2010?

b) What is the basis for Toronto Hydro's forecast 5% increase in electricity commodity costs for 2010?

c) Please provide an alternative 2010 commodity cost forecast based on forecast purchased energy for 2010 and the forecast commodity cost for 2010 as set out in the Board's most recent RPP Report (October 2009). For purposes of the forecast price please use the following calculation to determine the average commodity cost for 2010:

- Weight the forecast HOEP price by the proportion of Toronto Hydro's sale that are for non-RPP customers
- Weight the forecast RPP price by the proportion of Toronto Hydro's sales that are for RPP customers.

RESPONSE:

a) THESL has one customer registered with IESO as a Market Participant. That customer's total energy usage based on the most recent 12 months bills amounts to 224.1 GWh (October 2008 to September 2009). THESL does not produce a separate forecast for the Market Participant.

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b) This is THESL's forecast of the commodity costs based on professional judgement. Commodity prices are extremely difficult to forecast, as is the Global Adjustment component.

c) Please see response to BOMA interrogatory #42 at Exhibit R1, Tab 3, Schedule 42.

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INTERROGATORY 46:

Reference(s): Exhibit K1/Tab 2/Schedule 2, page 3

a) The Adjusted R-squared for the Large User Model is only 62.1%, significantly lower than that for the models adopted for the other customer classes. Please outline what other specifications Toronto Hydro tested for the Large User Model and why they were rejected.

RESPONSE:

a) THESL tested a number of specifications for the Large User class in an attempt to find a model with a better "Goodness of Fit". The following variables were tested in various combinations:

- Toronto GDP
- Toronto GDP indicators by industry
- Large Users customer numbers
- Industrial building permits (raw data and their lags)
- Toronto Unemployment
- Toronto Population
- Other variations of linear trend variable

The variables listed above either had insignificant coefficients or "wrong" signs when introduced in the model, thereby providing a strong indication of an incorrect regression specification. Additionally, the Adjusted R^2 for all tested specifications was lower than 62.1%. Due to the poor statistical properties, these models were rejected. THESL considers the filed specification to be the model for this class.

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From a general perspective, the fact that Large User model exhibits a lower "Goodness-of-Fit" value as opposed to models used to estimate load for all other classes is somewhat expected, as this class has a small number of customers (47) spanning different sectors (industrial, commercial, institutional), thereby creating a non-homogeneous class.

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INTERROGATORY 47:

Reference(s): Exhibit K1/Tab 3/Schedule 1

a) Are the loads by class set out in Table 1 the forecast sales made to each customer class or the wholesale purchases made by Toronto Hydro to supply the class? If the latter, what loss factor was assumed for each class and how was it established?

b) For which years/columns are the values in Table 1 weather normalized as opposed to being actual values?

RESPONSE:

a) The loads by class presented in the Table 1 are sales made to each customer class. They were derived from the wholesale purchases made by THESL for each customer class by applying the Board-approved loss factors. Table 47-1 below shows Loss Factors by customer class used for the calculation:

Table 47.1: Customer class loss factors applied to convert purchased energy to sales by class

Residential	GS<50 kW	GS 50-1000 kW	GS 1-5 MW	Large Users	Street Lighting	USL
1.0376	1.0376	1.0376	1.0376	1.0187	1.0376	1.0376

b) Years 2004-2008 (Col. 3 – Col. 11) represent actual historic or Board-approved values. Year 2009 (Col. 12) is bridge year. Values presented in the Column 12 consist of four months of Actual values (January 2009-April 2009) and eight months of normalized (forecasted) values. 2010 year is a test year: numbers in Col. 13 are forecasted annual values and, therefore, normalized.

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To see weather-normalized annual loads for all years please refer to Table 1, Exhibit K1, Tab 3, Schedule 2.

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INTERROGATORY 48:

Reference(s): **Exhibit K1/Tab 5/Schedule 1**

a) How much of the reduction in use per Residential customer from 2007 to 2009 can Toronto Hydro attribute to its CDM programs? Please provide the supporting calculations of the CDM impact over this period per customer.

RESPONSE:

The table below summarizes the CDM impact on residential customers in 2008, and is expressed as kWh savings associated with programs implemented in that calendar year. The impact from programs implemented in previous years has not been reflected.

Toronto Hydro is not in a position to provide the CDM impact for 2009 at this point of time. Final results for 2009 programs will be available in the second or third quarter of 2010.

As shown in Table 48.1 below, programs implemented in 2008 delivered energy savings of 41,930,364 kWh in the same year.

Table 48.1: kWh Savings in 2008 for Residential Customers

Program	Measures Installed/Removed	kWh Savings
The Great Refrigerator Roundup	Old refrigerator removal	2,227,738
Every Kilowatt Counts	Various	18,910,159
Take A Load Off	Clotheslines, CFLs	18,089,463
Keep Cool	Old room air conditioner retirement	2,024,950
Low Income	CFLs	656,481
TABIA	SLEDs	21,573
Total		**41,930,364**

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On average, a reduction of **69** kWh per residential customer can be attributed to CDM programs delivered by Toronto Hydro in 2008. (Please refer to Table 1 in Exhibit K1, Tab 5, Schedule 1 for 2008 number of customers).

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INTERROGATORY 49:

Reference(s): Exhibit D1 Tab14 Schedule 1 Page 1 Table 1

Exhibit J1, Tab 2, Schedule 7

a) Please provide more detail of the assumptions and details (lines 2-6) of the WCA calculations in J1 Tab2 Schedule 7.

b) Have any of the main assumptions e.g., lag days changed since 2008 Board-Approved? If so provide more information on the change(s).

c) Will THESL adjust the WCA if the Board approves different amounts for the components used for the WCA? If so when will this occur?

RESPONSE:

a) The calculation of the Working Capital Allowance is based on the Lead/Lag study produced for THESL's EB-2007-0680 rate filing. THESL has relied on this study to derive the WCA for the 2010 rate year. The calculations use 2010 forecast cost components, and apply weights and lag days as determined in the Lead/Lag study to determine the 2010 WCA.

b) No, the lag days that were filed in EB-2007-0680 have not changed.

c) THESL will reflect any changes ordered by the Board for components used to calculate the WCA in its final DRO.

Working Capital Calculation Details	Reference					
Cost of power	L1/T2/S1/p.4	1,994,736,710		* 10.63%	$	212,040,512
Expenses						
- OM&A Expense @ 14.12%	L1/T2/S1/p.4	218,828,003		* 14.12%	$	30,898,514
- Interest on Long term debt @ 7.73%	E1/T4/S2	71,596,043		* 7.73%	$	5,534,374
- Income, and Capital Tax @ 9.18%	H1/T1/S1/p.6	21,697,157		* 9.18%	$	1,991,799
- Debt Retirement Charge (@ 10.47%	kWh Sales (K1/T3/S1) * DRC charge * 10.47%	24,865,322,485	*.007	* 10.47%	$	18,223,795
- GST (See 2-1-1 GST - Lead Lag Study)	Table A				$	8,214,820
					$	**276,903,814**

TABLE A - THESL - GST WORKING CAPITAL REQUIREMENT - Calculation Model
Based upon Navigant Lead Lag Study Methodology below.

Table A	Forecast Year Amounts (Mil $s)	5% GST	Net Lead (lag) Days	GST Benefit (Cost)
	(A)	(B)	(C)	(D) = (B) * (C)
GST CATEGORY				
Electricity Sale - (Net Sales Revenue + Other Distribution Revenue) - L1/T2/S1/p.3	2,013,477,335	100,673,867	-18.49	(5,101,162)
Cost of power - L1/T2/S1/p.4	1,994,736,710	(99,736,835)	43.58	11,909,216
OM&A Expenses - L1/T2/S1/p.4	218,828,003	(10,941,400)	46.93	1,406,766
TOTAL		**(10,004,369)**		**8,214,820**

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INTERROGATORY 50:

Reference(s): Exhibit L1 Tab 1 Schedule 1

a) Please provide an electronic copy of Toronto's 2010 Cost Allocation model.

b) With respect to pages 4-5, please provide a schedule that sets out the transformer allowance provided to each rate class in 2010. Please also explain where and how this "cost" was included in the Cost Allocation model and/or the Rate Design process.

c) With respect to pages 4-5, the Board's Filing Guidelines (revised May 2009 – page 20) directed Applicants to:

Revise cost allocation by (1) removing the "cost" associated with transformer ownership allowance from the revenue requirement (Worksheet I3) and (2) subtracting the "revenue" associated with the transformer ownership allowance from the approved revenue of the affected rates class(es) (worksheet I6, row 29)

Please confirm that this is not the approach used by Toronto Hydro and re-file a version of the Cost Allocation Model that conforms with the Board's direction.

RESPONSE:

a) An electronic copy has been provided.

b) As in EB-2007-0680 THESL treated the 2010 Transformer Ownership Allowance by directly assigning the Transformer Ownership Allowance to the rate classes that benefited from customer owned transformers. This removes any of the costs associated with the Transformer Ownership Allowance from the revenue requirement of those rate classes that did not have any customers with their own transformers. In THESL's case, Residential, GS < 50 kW, USL and Street Lights revenue requirements were not allocated any Transformer Ownership Allowance.

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c) Although THESL did not revise the cost allocation model as per OEB's direction, THESL did identify this model shortfall in its EB-2007-0680 filing and made changes which it believes achieve the same effect. In any event, removing the amounts from the model does not solve the issue of how these costs will be allocated and recovered.

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INTERROGATORY 51:

a) Reference(s): Exhibit L1 Tab 2 Schedule 1

a) With respect to pages 24-25, please reconcile the following:
   - The total Rate Base reported here ($2,163.8 M) with that reported at Exhibit J1, Tab 2, Schedule 2, page 1 ($2,162.3 M)
   - The total Service Revenue Requirement reported here ($559.2 M) with that reported at Exhibit J1, Tab 2, Schedule 4, page 1 ($547.5 M)

b) Please provide a schedule that set outs how the Distribution Revenue by class (totalling $540.5 M) as reported in Sheet O1 was determined.

c) With respect to pages 24 and 19-22, please provide a schedule that explains what each of the expense item reported on these pages is meant to represent and how/why they were directly allocated to specific customer classes (for a total of $15.2 M).

d) Please provide the breakdown by customer class (in dollar values) of the allocation base used in the CA Model to allocation A&G costs (excluding Property Insurance and Community Safety Programs) to customer classes.

e) Please confirm that, in the OEB CA model, directly allocated OM&A costs are not included in the allocation base used to allocate A&G costs to customer classes (i.e., those costs with an “ad” Group Designation in Worksheet O4 – with the exception of Property Insurance and Community Safety Programs).

f) Please provide a revised allocation base broken down by customer class for A&G costs (excluding Property Insurance and Community Safety Programs) that includes directly allocated O&M costs.

g) With respect to pages 18-19 and 25, please provide a schedule that explains what dollars for each of the reported asset-related accounts is meant to represent and

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how/why they were directly allocated to specific customer classes (for a total of $24.8 M).

h) Please confirm whether, in the OEB CA model, directly allocated Fixed Assets are included in the allocation base (NFA ECC) used to allocate General Plant costs to customer classes (i.e., those costs with an “gp” Group Designation in Worksheet O4).

i) If not, please provide a revised allocation base for broken down by customer class for General Plant costs that includes directly allocated assets.

j) Please provide a revised 2010 Cost Allocation run where directly allocated O&M expenses and Assets are included in the allocation base for A&G costs and General Plant items respectively.

RESPONSE:

a) The difference in the Rate Base reported in the Cost Allocation Model vs J1/T2/S1 stems from the manner in which the Cost Allocation model treats the Transformer Ownership Allowance. In the Cost Allocation model inputs, the Transformer Ownership Allowance forms part of the costs which are used to determine a working capital allowance, whereas these costs are not included in the calculation of the working capital allowance for the revenue requirement calculations. THESL has confirmed that this treatment in the Cost Allocation model has no impact on either allocated cost, revenues recovered through rates, or the revenue cost ratios. It simply impacts the presentation of rate base (and the calculation of Return on Equity by class) on the referenced sheet.

The total Service Revenue Requirement of $559.2 M includes the addition of Transformer Ownership Allowance of $11.7M.

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b) Please see Appendix A of this Schedule.

c) Please see response to Board Staff's interrogatory # 95 a).

d) The A&G costs have been rolled into O&M grouping as provided for in the Board's Cost Allocation Model guidelines. The allocation of A&G costs is on the same basis as other O&M costs.

e) There are no direct allocations of O&M costs.

f) Please see (e) above.

g) $15.2M is the directly assigned net fixed share of the PILs, Return on Debt and Return on Equity. The allocator is the amount of directly assigned Net Fix Assets divided by the Total Net Assets excluding general plant. F or details please see the bottom section in Exhibit L1, Tab 2, Schedule 1, age 23.

h) In the OEB Cost Allocation Model, directly allocated Fixed Assets are not included in the allocation base used to allocate General Plant costs to customer classes.

i) Please see response h).

j) There was no direct allocation of O&M costs and the direct allocation of fixed assets was done in accordance with OEB's instructions (Cost Allocation Review – EB2005-0317 Chapter 5.1).

	2009 Rates (For Revenue Requirement Aloocation by Rate Class)			**Number of Customers (Connections)**	**Energy Data**	**Demand Data**	**Calculated Revenue for Allocation to Customer Classes: 2010 Consumption determinants x Rates for 2009 test year**				**Allocation to Customer Classes %**	**2010 Base Revenue Requirement (including Transformer Credit)**	**2010 Base Revenue Requirement Allocated**
	Mthly Service Chrg (Per Cust. or Connection) ($)	Distribution Rate kWh ($)	Distribution Rate (kVA)	2010 Forecast (#)	2010 Forecast (kWh)	2010 Forecast (kVA)	Monthly Fixed Charges ($)	Volumetric kWh ($)	Volumetric kVA ($)	Total ($)	Total for customer class as % of Total for all classes	Base Revenue Requirement ($)	Overall Allocation to Classes ($)
	(A)	(B)	(C)	(F)	(D)	(G)	(H)	(I)	(J)	(K)	(M)	(N)	
Formulas							(A)*(F)*12	(B)*(D)	(C)*(G)	(H)+(I)+(J)	(K) / (L)		(M)*(N)
RESIDENTIAL	$ 16.85	$ 0.01432	$ -	614,841	5,081,028,663	-	$ 124,320,866	$ 72,760,330	$ -	**$ 197,081,197**	40.77%	$ 540,468,543	$ 220,342,267
GS < 50 kW	$ 21.44	$ 0.01975	$ -	65,747	2,229,476,310	-	$ 16,915,304	$ 44,032,157	$ -	**$ 60,947,461**	12.61%	$ 540,468,543	$ 68,140,959
GS > 50 to 999 kW	$ 32.69	$ -	$ 5.15	12,276	10,134,340,212	26,511,577	$ 4,815,526	$ -	$ 136,558,482	**$ 141,374,008**	29.25%	$ 540,468,543	$ 158,060,078
GS > 1,000 < 4,999	$ 705.35	$ -	$ 4.32	517	4,880,642,723	11,142,188	$ 4,375,118	$ -	$ 48,167,680	**$ 52,542,798**	10.87%	$ 540,468,543	$ 58,744,311
Large Use (> 5000 kW)	$ 2,639.04	$ -	$ 3.93	47	2,378,122,313	4,974,405	$ 1,488,419	$ -	$ 19,573,287	**$ 21,061,706**	4.36%	$ 540,468,543	$ 23,547,573
Unmetered Scattered Load - Admin per Customer	$ 3.42	$ 0.04174	$ -	1,124	52,413,320	-	$ 46,132	$ 2,187,732	$ -	**$ 2,233,864**	0.46%	$ 540,468,543	$ 2,497,522
Unmetered Scattered Load - Charge per Connection	$ 0.35	$ -	$ -	21,782	-	-	$ 91,485	$ -	$ -	**$ 91,485**	0.02%	$ 540,468,543	$ 102,283
Street Lighting	$ 0.89	$ -	$ 19.76	162,353	109,298,944	321,183	$ 1,733,934	$ -	$ 6,345,962	**$ 8,079,897**	1.67%	$ 540,468,543	$ 9,033,550
TOTALS										**$ 483,412,415**	**100.00%**		**$ 540,468,543**
										(L)			

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INTERROGATORY 52:

Reference(s): Exhibit M1/Tab 1/Schedule 1, pages 4-5

a) Why is Toronto proposing to increase the revenue to cost ratio for the Residential class when it is already above the lower end of the Board's recommended range given that the Board concluded in its EB-2007-0667 Report that there are "factors that currently limit or otherwise affect the ability or desirability of moving immediately to a cost allocation framework that might, from a theoretical perspective, be considered ideal (page 2) and that "a range approach is preferred" (page 4)?

b) Has Toronto made any improvements or changes to the Cost Allocation model used for 2010 (as opposed to that used for the 2007 filing) to address the data and methodology concerns noted by the Board in its EB-2007-0667 Report (pages 5-6)?

RESPONSE:

a) Please see response to BOMA 50a found at Exhibit R1, Tab 3, Schedule 50.

b) THESL has continued to use the Board's Cost Allocation Model, and has not made any changes to the model (other than updating input data) from the model used in THESL's EB-2007-0680 filing.

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INTERROGATORY 53:

Reference(s): Exhibit M1/Tab 1/Schedule 1, pages 5-6

a) Please confirm that the Board's EB-2007-0667 Guideline (page 12) sets the upper limit for the MSC at 120% of avoided costs plus the allocated customer costs (i.e., Minimum System plus PLCC Adjustment).

b) Given that the OEB has not completed its Rate Design review, why is it appropriate, for those classes whose values are currently within the Board's recommended range, to increase the Monthly Fixed Charges towards the value derived including the Minimum System as opposed to maintaining the current fixed-variable split for the class.

c) Please reconcile Toronto Hydro's approach regarding the Fixed Monthly charge with that proposed for the Transformer Allowance (page 7), where it is proposed to maintain the status quo until the completion of the OEB's Rate Design review.

d) Please provide a schedule that sets out the derivation of the current fixed-variable split for each customer class based on 2009 approved rates and 2010 billing determinants.

e) Please provide a schedule that sets out the month service charge for each class for 2010 consistent with the current fixed-variable split (per part (d)).

RESPONSE:

a) Confirmed.

b) THESL believes the current Cost Allocation model provides a reasonable estimate of the fixed and variable cost components for each rate class. THESL also believes in the matching of recovery of fixed costs through fixed rate components, and variable

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costs through variable rate components. THESL believes that its proposed fixed and variable rates continue to move the recovery of costs in this direction, with minimal impact on customer bills.

c) The transformer allowance is a very specific rate to a very specific group of customers. THESL recognizes that there may be a desire on the part of the OEB to standardize this rate across LDCs, within reason (i.e., rates that reasonably compensate for costs), unlike distribution rates, where there is likely more variability, and higher revenue/cost consequences than with the transformer allowance.

d) Please see Appendix A to this Schedule labelled VECC 53d.

e) Please see Appendix B to this Schedule labelled VECC 53e.

VECC 53 d

Calculated Revenue for Allocation to Customer Classes:
2010 Consumption determinants
x Rates for 2009 test year

Monthly Fixed Charges ($)	Percentage of Fixed (Fix/Variable Split)	Volumetric kWh ($)	Volumetric kVA ($)	Percentage of Variable (Fix/Variable Split)	Total ($)
(H-a)	(H-b)	(I-a)	(J-a)		(K)
(A)*(F)*12		(B)*(D)	(C)*(G)		(H)+(I)+(J)
$ 124,320,866	**63.1%**	$ 72,760,330	$ -	**36.9%**	**$ 197,081,197**
$ 16,915,304	**27.8%**	$ 44,032,157	$ -	**72.2%**	**$ 60,947,461**
$ 4,815,526	**3.4%**	$ -	$ 136,558,482	**96.6%**	**$ 141,374,008**
$ 4,375,118	**8.3%**	$ -	$ 48,167,680	**91.7%**	**$ 52,542,798**
$ 1,488,419	**7.1%**	$ -	$ 19,573,287	**92.9%**	**$ 21,061,706**
$ 46,132	**2.1%**	$ 2,187,732	$ -	**97.9%**	**$ 2,233,864**
$ 91,485	**100.0%**	$ -	$ -		**$ 91,485**
$ 1,733,934	**21.5%**	$ -	$ 6,345,962	**78.5%**	**$ 8,079,897**
					$ 483,412,415
					(L)

VECC 53e

	Number of Customers (Connections)	**Energy Data**	**Demand Data**	**Calculated Revenue for Allocation to Customer Classes: 2010 Consumption determinants**		**Base Revenue Requirement Allocated (adjusted for Transformer Credit)**	**Calculated Revenue for Allocation to Customer Classes: 2010 Consumption determinants x Rates for 2009 Fix/Varaible Split**				
	2010 Forecast (#)	2010 Forecast (kWh)	2010 Forecast (kVA)	Percentage of Fixed (Fix/Variable Split)	Percentage of Variable (Fix/Variable Split)	Overall Allocation to Classes ($)	Monthly Fixed Charge ($) of 2010 Revenue Requirement	Variable Charge ($) of 2010 Revenue Requirement	Total ($)	Monthly Fixed Charge	Variable Charge
	(F)	(D)	(G)	(H-b)	(P)	(Q)	(R)	(S)	(T)		
Formulas						(M)*[(N) + (O)]	(H-b)*(Q)	(H-b)*(P)	(R) + (S)	(R) / [(F) * 12]	(S)/(G)
RESIDENTIAL	614,841	5,081,028,663	-	**63.1%**	**36.9%**	**$ 220,342,267**	$ 138,994,191	$ 81,348,076	**$ 220,342,267**	$ 18.84	$ 0.01601
GS < 50 kW	65,747	2,229,476,310	-	**27.8%**	**72.2%**	**$ 68,140,959**	$ 18,911,781	$ 49,229,178	**$ 68,140,959**	$ 23.97	$ 0.02208
GS > 50 to 999 kW	12,276	10,134,340,212	26,511,577	**3.4%**	**96.6%**	**$ 158,060,078**	$ 5,383,892	$ 152,676,186	**$ 158,060,078**	$ 36.55	$ 5.7588
GS > 1,000 < 4,999	517	4,880,642,723	11,142,188	**8.3%**	**91.7%**	**$ 58,744,311**	$ 4,891,504	$ 53,852,808	**$ 58,744,311**	$ 788.60	$ 4.8332
Large Use (> 5000 kW)	47	2,378,122,313	4,974,405	**7.1%**	**92.9%**	**$ 23,547,573**	$ 1,664,093	$ 21,883,480	**$ 23,547,573**	$ 2,950.52	$ 4.3992
Unmetered Scattered Load - Admin per Customer	1,124	52,413,320	-	**2.1%**	**97.9%**	**$ 2,497,522**	$ 51,577	$ 2,445,945	**$ 2,497,522**	$ 3.82	$ 0.04667
Unmetered Scattered Load - Charge per Connection	21,782	-	-	**100.0%**		**$ 102,283**	$ 102,283	$ -	**$ 102,283**	$ 0.39	$ -
Street Lighting	162,353	109,298,944	321,183	**21.5%**	**78.5%**	**$ 9,033,550**	$ 1,938,587	$ 7,094,963	**$ 9,033,550**	$ 1.00	$ 22.090
TOTALS						**$ 540,468,543**			**$ 540,468,543**		

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INTERROGATORY 54:

Reference(s): **Exhibit M1/Tab 1/Schedule 1, page 9**

a) Please provide a revised version of Table 4 based on the loss factors calculations set out in Exhibit M1, Tab 5, Schedule 1.

RESPONSE:

a) THESL has requested to maintain its current loss factors, which are provided in the above reference. Using the 2004-2008 average calculated in Exhibit M1, Tab 5, Schedule 1, the table loss factors would be as follows.

	Secondary Metered Customers
(A) Primary Metering Adjustment	0.9900
(B) Supply Facilities Loss Factor	1.0045
Distribution Loss Factors	
(C) Customers less than 5000kW	1.0309
(D) Customers Greater than 5000kW	1.0141
Total Loss Factors	
Secondary Metered Customers	
(E) Customer less than 5000kW (B*C)	1.0355
(F) Customer greater than 5000kW (B*D)	1.0187
Primary Metered Customers	
(G) Customer less than 5000kW (A*E)	1.0251
(H) Customer greater than 5000kW (A*F)	1.0085

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INTERROGATORY 55:

Reference(s): **Exhibit M1/Tab 3/Schedule 1**

a) With respect to the referenced schedule, please explain what is meant by "Adjusted for DOS" and why the revenues aren't simply equal to the rates times the billing quantities.

b) Please reconcile the 2009 total revenues ($471.6 M) with the Base Distribution revenues for 2010 (at approved 2009 rates) implicit in Exhibit J1, Tab 1, Schedule 1, Tables 1 & 2 ($476.8 M = $495.5 – $18.7).

RESPONSE:

a) All THESL's monthly based rates and charges are adjusted for a "30-Days of Service" period ("DOS"). To reconcile monthly DOS revenue to the annual revenue requirement, the rate needs to be recalculated to a daily rate (divided by 30) and times 365 days. The same result can also be derived by using 1.0139 factor as an approximation.

b) A cell reference error was in the pre-filed table in Exhibit M1, Tab 3, Schedule 1. A corrected table has been filed.

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INTERROGATORY 56:

Reference(s): **Exhibit N1/Tab 2/Schedule 2**

a) Please provide a schedule that sets out the RTSR revenues by class for each of Networks and Connection based on 2009 approved rates and 2010 volumes.

b) Please comment on the merits of using the results from part (a) to allocate the forecast 2010 Wholesale Transmission costs to customer classes.

c) How many delivery points does Toronto Hydro have that are subject to Line and/or Transformation Connection charges by the either the IESO or Hydro One Networks?

RESPONSE:

a) Please see Appendix A of this Schedule.

b) The methodology used by THESL in evidence (and in previous filings) allocates forecast transmission costs to rate classes based on 12CP (for Network charges) and 12NCP (for Line and Transformation charges). This allocation methodology reflects the anticipated cost drivers for each class for each component. THESL sees no merit in allocating forecast transmission costs based on historical proportions based on previously approved rates.

c) THESL has 35 Delivery Points.

All 35 TSs are subject to Network Connection Charges because all 35 TSs are connected to the IESO-controlled transmission network. Network charges apply to all transmission connected TSs regardless of the ownership of the TS.

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Thirty-four TSs (all except Richview) are subject to Line Connection Charges because the TSs were constructed for the purpose of supplying loads in the THESL service area. Richview is not subject to Line Connection Charges because Richview Station was constructed for the purpose of supporting the operation of the IESO-controlled transmission network.

Thirty-four TSs (all except Cavanagh) are subject to Transformation Connection Charges because HONI owns the high-voltage station transformers at all the TSs except Cavanagh. THESL owns the high-voltage station transformers at Cavanagh TS so Transformation Connection Charges do not apply at Cavanagh TS.

	2010 RETAIL Transmission					
	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6
1	**RETAIL Transmission (kWh with Losses)**	**2010 kWh/kW**	**2009 Retail Network Rates**	**2010 kWh/kW**	**2009 Retail Line and Transformation Rates**	**Revenue**
2	**Residential**	5,272,075,340	$ 0.00560	5,272,075,340	$ 0.00490	$ 55,356,791
3	**GS <50**	2,313,304,620	$ 0.00530	2,313,304,620	$ 0.00470	$ 23,133,046
4	**GS 50-999KW**	24,085,591	$ 2.0100	24,348,503	$ 1.5400	$ 85,908,732
5	**GS 1000-4999KW**	10,088,059	$ 2.1900	10,207,576	$ 1.7300	$ 39,751,957
6	**Large Use**	4,465,361	$ 2.2200	4,593,881	$ 1.7800	$ 18,090,210
7	**Street Light**	214,116	$ 2.6000	321,183	$ 2.0000	$ 1,199,068
8	**Unmetered Scattered Load**	54,384,061	$ 0.00380	54,384,061	$ 0.00310	$ 375,250
9	**Total**					**$ 223,815,054**

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INTERROGATORY 57:

Reference(s): **Exhibit Q1 Tab2 Schedule 1 Tables 2 and 3**
Exhibit Q1 Tab 3 Schedule 1

Kinetrics 2009 ACA and HI assessment includes the following assessments (Relative to 2006)

- Wood Poles had an 8.6% increase of assets in poor and very poor condition.
- Station Transformers had a 10.4% increase of assets in poor and very poor condition. This indicates that THESL should review its maintenance practices, particularly as they relate to Stations Transformers, and be prepared to have more assets in need of replacement or major refurbishment.
- Underground cables (not in duct)had a significant increase in percentage of assets in poor and very poor condition based on the number of faults experienced over the last five and a half years: almost 75%

a) Provide a schedule that provides a summary of capital investment and maintenance expenditures for these 3 asset groups from 2006-2009 and forecast 2010. Show the also the percentage invested in these categories as a percentage of

   i. sustaining capital
   ii. overall total capital
   iii. sustaining maintenance costs
   iv. overall maintenance costs

b) If THESL agrees that the Kinetrics assessment shows deteriorating asset condition in these groups, then discuss why did not the Capital Plan channel more dollars to these critical asset categories in the period 2007-2009.

c) THESL appears anecdotally in part to “blame” the Board-directed reduction in Capital and maintenance in EB-2007-.0680 (Exhibit Q1 Tab 2 Schedule 1 Page 6 and

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Table 3). Provide proper support for this "claim" based on the response to part a) or otherwise explain why the average condition of these assets groups continues to deteriorate.

d) Identify in Table 5 of Q1 Tab 2 Schedule 1 deferred projects in the three groups and the cost reduction and period of deferment related to the EB-2007-0680 Decision.

e) Does remediation of the secondary system (new priority) have a higher/lower priority than the underground primary system? Please discuss.

RESPONSE:

a) Summary of Capital Investment Expenditures

Portfolios ($ millions)	2006 Historical	2007 Historical	2008 Historical	2009 Bridge	2010 Test
Overhead	19.0	24.3	19.3	15.7	22.0
Underground Direct Buried/Cable	7.3	33.0	23.8	48.3	70.3
Municipal Substation Transformers	5.9	6.2	8.3	6.3	6.8
Total Sustaining Capital	71.8	125.0	102.8	116.0	157.0
Total Capital	157.4	213.4	205.7	235.5	423.6

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Portfolios (%)	2006 Historical	2007 Historical	2008 Historical	2009 Bridge	2010 Test
Overhead as a percentage of Sustaining Capital	26.5%	19.4%	18.8%	13.5%	14.0%
Underground Direct Buried as a percentage of Sustaining Capital	10.2%	26.4%	23.2%	41.6%	44.8%
Municipal Substation as a percentage of Sustaining Capital	8.2%	5.0%	8.1%	5.4%	4.3%
Overhead as a percentage of Total Capital	12.1%	11.4%	9.4%	6.7%	5.25
Underground Direct Buried as a percentage of Total Capital	4.6%	15.5%	11.6%	20.5%	16.6%
Municipal Substation as a percentage of Total Capital	3.7%	2.9%	4.0%	2.7%	1.6%

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1 **Summary of Maintenance Investment Expenditures**

Portfolios ($ millions)	2006 Historical	2007 Historical	2008 Historical	2009 Bridge	2010 Test
Overhead (Preventive, Predictive, Corrective, Emergency) -Total	19.4 * (Include UG)	10.45	10.12	11.66	12.91
Overhead & Sustaining (Preventive, Predictive)	3.0	4.21	4.0	5.0	5.86
Underground direct buried total	NA	NA	NA	NA	NA
Underground direct buried Sustaining	NA	NA	NA	NA	NA
Municipal Substation total	0.38	0.47	0.59	.86	.84
Municipal Substation Sustaining	0.24	0.32	0.39	.40	.30
Total Sustaining Maintenance Cost (predictive, preventative)	8.37	20.13	20.0	20.7	25.57
Total Maintenance Cost (predictive, preventative, corrective, emergency)	24.72	36.67	37.45	38.81	47.0

2 1) NA – not available

3

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Portfolios (%)	2006 Historical	2007 Historical	2008 Historcial	2009 Bridge	2010 Test
Overhead vs. Total	NA	28.5%	27.0%	30.0%	27.5%
Overhead vs. Sustaining	NA	51.9%	50.6%	56.3%	50.5%
Underground Direct Buried vs. Total	NA	NA	NA	NA	NA
Underground Direct Buried vs. Sustaining	NA	NA	NA	NA	NA
Municipal Substation vs. Total	1.5%	1.3%	1.6%	2.2%	1.8%
Municipal Substation vs. Sustaining	2.9%	1.6%	2.0%	1.9%	1.2%

b) THESL agrees that the two asset condition assessments from Kinectrics show a significant deterioration trend for the following assets:

- Station Transformers
- Underground direct buried cable

For wood poles, a trend of significant deterioration cannot be established because the sample size used in the asset condition assessment from 2006 was deemed to be insufficient and thus did not present a good overall perspective on the condition of these poles. Hence a trend cannot be determined to extrapolate for wood poles replacement. Please refer to 2009 Rate Filing, Exhibit Q1, Tab 3, Schedule 1, Page 57: "Thus, in 2006, there was insufficient data to extrapolate the Health Index classification over the remaining population."

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For the underground direct buried cable portfolio there was an average capital spending increase of 380% on a yearly basis from 2007 to 2009 compared to 2006 to address these deteriorating conditions. Furthermore, an additional 100% is proposed for 2010 to address assets.

Station Transformers (Municipal Substation Transformer portfolio) – There was an average increase of 18% during 2007 to 2009 compared to 2006 capital spending. For 2010, spending is proposed to remain relatively constant. Also in 2009 THESL started an oil reclamation program whereby oil contaminants, moisture and sludge materials would be removed and inhibitors added to 13 units. The objective of this program is to stabilize the condition of transformers in fair condition to prevent them from deteriorating.

c) It is clear that many of the deferrals as a result of the OEB's Decision in EB-2007-0680 were projects directly associated with poor condition and unreliable assets. THESL is concerned that the backlog of these poor assets (both from deferred projects as well as other causes) is growing. This view is supported by the recent ACA assessment and the continued increase of the ratio of defective equipment causing outages.

With respect to the question regarding these three asset groups continuing to deteriorate, THESL periodically analyzes asset condition data so that near term capital expenditures are reflective of condition assessments. A cause of continued deterioration of asset groups is the failure to replace them in prior years.

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d) The following are the deferred projects for the Poles, Direct Buried Cable, and Station Transformer asset groups:

Deferred Projects - Poles Asset Group		
Project #	Cost Reduction ($)	Period of Deferment
W08191	650,000	2010
W07111	550,000	Post 2010
W09095	500,000	Post 2010
W09096	3,500,000	Post 2010
W09103	800,000	Post 2010
W09124	500,000	Post 2010

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Deferred Projects - Direct Buried Asset Group		
Project #	Cost Reduction ($)	Period of Deferment
E08124	1,760,000	2010
E08113	1,733,822	2010
E08115	4,680,000	2010
E08116	5,310,000	2010
E09085	2,420,000	2010
E09088	4,510,000	Post 2010
E09089	880,000	Post 2010
W09081	600,000	2010
W09097	780,000	Post 2010
W09098	2,280,000	Post 2010

Deferred Projects - Station Transformers Asset Group		
Project #	Cost Reduction ($)	Period of Deferment
No Projects		

e) Remediation of the secondary system is essential in order to maintain the integrity of the THESL assets used to serve the street lighting system. This is considered non-discretionary work since it encompasses efforts to bring these assets up to acceptable operating condition.

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INTERROGATORY 58:

Reference(s): Exhibit Q1 Tab 5 Schedule 1

a) Provide a version of Table 1 that matches THESL regulatory filings (Board approves where available for CAPEX and FTEs. Then make the following additions
b) Insert a line that shows external contractor costs related to capital projects
c) Insert a line that shows controllable OM&A costs (excluding Amortization)
d) Insert a line that shows # customers
e) Insert a line that shows kWh distributed
f) Provide the following ratios
   i. Capex/FTE (including external contractors)
   ii. O&M/ FTE
   iii. Customers per FTE
   iv. Kwh/distributed per FTE
g) Graph these ratios in the same format as the chart on page 5
h) Discuss the trends in capital and labour productivity based on the above 4 ratios.

RESPONSE:

Please see attached Appendix A for parts a) to g).

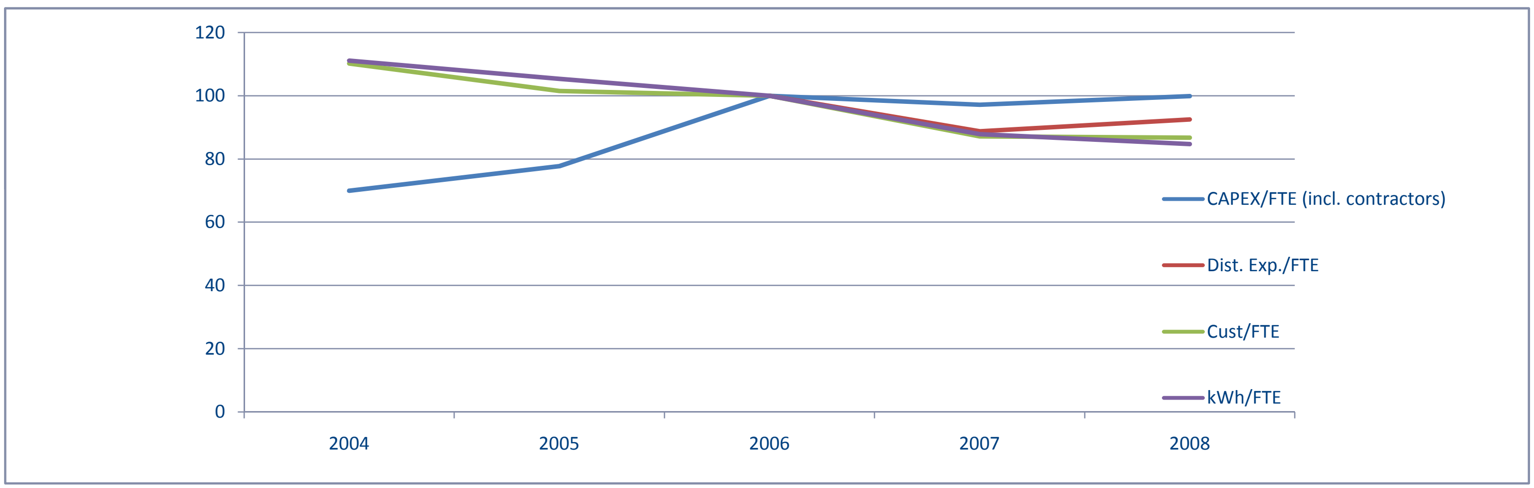
For part h), the effects of rising costs associated with infrastructure renewal and workforce renewal are clear as are the effects of declining load.

Assumptions used in Appendix A include:

1) 50% of contractor costs are labour.
2) Average contractor cost per FTE is $80,000.

Appendix A

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
1	**Year**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	
2	**CAPEX ($M)**	116	101	100	132	168	213	205	already in evidence
3	**FTE**	1462	1201	1207	1316	1343	1543	1562	already in evidence
4	**Inflation (CPI)**	100	103	105	107	109	111	114	already in evidence
5	**Contractor Costs ($M-labour)**			17.8	39.8	32.9	76.5	52.7	Civil contracts
6	**Dist. Exp. excl. ammortization($M)**			n/a	n/a	169.4	172.7	182.3	as per D1T3SCH1 (2007 filing for 2006 and reconstructed for 2007 based on mapping)
7	**Number of Customers**			671432	674231	677645	679327	684143	already in evidence
8	**kWh distributed**			25481022305	26336651977	25519951665	25755440781	25142336053	already in evidence
9	**CAPEX/FTE (incl. contractors-$k)**			75858	84359	108483	105387	108387	assume # contractors=.5*row 5/$80k (ie 50% of cost is labour)
10	**Dist. Exp./FTE ($k)**					126136	111925	116709	calculated
11	**Cust/FTE**			556	512	505	440	438	calculated
12	**kWh/FTE**			21111038	20012653	19002198	16691796	16096246	calculated



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INTERROGATORY 59:

Reference(s): **Exhibit Q1 Tab 5 Schedule 1 Page 8**

a) Provide a list of all scorecards and their KPIs employed by THESL.

b) Other than Supply Chain Management, which Scorecards/KPIs were examined in depth by Key Willow Consulting.

c) Provide copies of any other assessments analyses similar to that on page 5 for Supply Chain Management.

d) Does THESL agree that the Key Willow Study falls short of meeting the Board's direction.

> "The Board expects that the Company will develop the ability to track productivity gains throughout its operations in a programmatic manner that will appropriately inform its next rebasing application."

If THESL disagrees explain why not.

e) Explain why THESL did not undertake a standard productivity study. For example a capital and labour productivity study similar to that that the Pacific Economics Group (PEG) undertook for the Board to assess productivity factor differentials for 3GIRM.

f) What was the cost of the Key Willow study?

RESPONSE:

a) THESL's 2010 KPIs and scorecard is expected to be approved by the Board of Directors by the end of December 2009. As soon as the KPIs and scorecard are approved, THESL will submit this to the Board and intervenors.

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b) KeyWillow did not examine any scorecards “in depth.” Their mandate was to prepare a document which would allow readers to understand how THESL was achieving productivity improvements. The analysis focused on describing the use of tools, processes and leadership which created a culture of improvement, that together, guarantee systematic improvements will continue. In addition to review of Supply Chain Management, other documents reviewed included; Safety KPI Gap, Attendance Summary Statistics, LDC Operations Report, 2010 Plan, and an MCRS Overview.

c) THESL has adopted a number of initiatives in the area of health and safety, with the intention of ensuring a higher quality of life for, and greater productivity from its employees. To ensure the effectiveness of these initiatives, THESL has established health and safety KPIs that are monitored via the MCRS process. This has resulted in significant improvements in health and safety performance:

- Lost Time Injury Frequency (a measure of lost time injuries) has dropped from 2.4 in 2001 to 0.7 in 2008, and 0.15 YTD October 2009
- Accident Severity (a measure of time lost due to injuries) has dropped from 34.9 in 2001 to 11.0 in 2008, and 0.83 YTD October 2009
- All Injury Frequency (a measure of Workplace Safety & Insurance Board [WSIB] claims) has dropped from 7.18 in 2001 to 5.28 in 2008, and 4.08 YTD October 2009

THESL has also instituted within its MCRS process a KPI around crew safety inspections. In 2001, Supervisors were expected to conduct three crew inspections per month. By 2008, the expected level had increased to 20 per month. These inspections serve to reinforce good safety practices and the need for personal

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responsibility for safety from each crew member. They also provide an extra opportunity to coach staff and execute short interval control on projects, which enhances productivity.

d) THESL does not agree with the general thrust of the question. The environment that THESL is operating in is changing rapidly. In addition, there are variable conditions within the work program. Consequently, traditional quantitative metrics for measuring productivity prove to be misleading when comparing year-over-year changes to assess trends. It is for this reason that THESL has not produced these types of analyses.

Rather, THESL's programmatic approach is to incorporate strong business discipline into its operation to achieve continuous improvement. This discipline is applied through the Management Control and Reporting System (MCRS), which establishes scorecards involving Key Performance Indicators (KPIs), sets targets and stretch goals for each, manages the program through regular KPI reviews to achieve short interval control, and rewards staff for performance against the targets/stretch goals. Through these techniques, THESL is able to improve its operations in all areas of the business over time.

e) A standard productivity study approach using outputs divided by inputs is considered by THESL to be useful only in an environment where incremental output can be effectively associated with incremental inputs. In THESL's case, load is declining due to economic and conservation effects while costs are growing at an unprecedented rate to deal with aging infrastructure, workforce renewal and other emerging capital requirements. THESL considers its approach using a corporate-

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wide MCRS system to be more effective in optimizing its operations, while minimizing cost increases in a sustainable way.

f) The cost of the KeyWillow study was $39,240 plus GST.