Toronto Hydro-Electric System Limited
EB-2010-0142
Exhibit L1
Tab 4
Schedule 1
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(22 pages)

COST OF SERVICE STUDY FOR INDIVIDUALLY METERED SUITES IN MULTI-UNIT RESIDENTIAL BUILDINGS
Alternative Scenario Ordered by the Ontario Energy Board

Submitted to
Toronto Hydro-Electric System Limited
February 18, 2011

BDR

BDR
34 King Street East
Suite 1000
Toronto, ON M5C 2X8
416-214-4848 phone
416-214-1643 fax

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1 REPORT SUMMARY

This study was undertaken by BDR NorthAmerica Inc., at the request of the Toronto Hydro-Electric System Limited ("THESL") and in response to the OEB's Decision and Order on Motion dated January 21, 2011. This study expands on BDR's report dated November 29, 2010, by dividing THESL's residential suite-metered customers into two classes for cost allocation purposes: one class consisting of approximately 9,000 customers metered with Quadlogic meters, and the other class consisting of approximately 110,000 other suite metered customers.

BDR performed the study, based on 2009 cost and operating data, and 2009 consumption data, consistent with its November study. For each Quadlogic customer, hourly interval data was provided and was used as the basis for both the load shape and the total consumption of the class in the base case. Modeling assumed the costs of a Quadlogic meter and THESL's current third party arrangement for meter reading for all customers in the Quadlogic class in creating the base case.

Since the November study had shown secondary infrastructure to be a key respect in which the costs of serving suites in multi-unit residential buildings may differ from the costs of serving other residential customers (for example detached single family homes), THESL staff reviewed drawings to determine the extent of secondary infrastructure for the specific buildings served by the Quadlogic meters. This resulted in a reduced allocation of secondary infrastructure to the Quadlogic class as compared with customers who are not suites in multi-unit buildings, and even in comparison with the class of 110,000 other suite metered customers.

In reviewing the available interval load data for the Quadlogic metered customers in detail, BDR was concerned about the confidence that can be placed in this data as the basis for the total load and load shape in view of the number of gaps and unusually low readings in some of the data. As a result, two scenarios were developed to test the impact of an erroneous assumption as to either load or load shape. It was found that a reasonable alternative assumption resulted in only a small change to the Quadlogic customers' revenue-to-cost ratio, and therefore would not affect the general conclusions that can be drawn as to whether cross-subsidization is occurring.

A scenario was also tested to reflect the expected reduction in THESL's costs to read the Quadlogic meters. At present, the meters are read by an arms' length party. THESL is working toward bringing this function in-house, and expects to be able to implement the change shortly. This scenario resulted in a change of ten percent (from 95:100 to 104:100 revenue-to-cost ratio). In BDR's view, the ability of THESL to realize cost savings in its service to the Quadlogic customers in the future should be taken into account in considering whether an issue of cross-subsidy related to this customer group

should be of concern to the OEB, even though the cost reduction was not realized in 2009.

The base case scenario, which reflects costs as incurred in 2009, and estimates of load and load shape based on interval metered data, indicates a revenue-to-cost ratio of 95:100 for the Quadlogic class. This is well within the boundaries set for acceptable ratios by the OEB, and is higher than the revenue-to-cost ratio of the residential class in aggregate (90:100 per the BDR November 29, 2010 report, and 86:100 as filed by THESL with the OEB for its 2009 test year). This result leads to the conclusion that at residential rates, the Quadlogic customers are not receiving a cross-subsidy from other customers in the residential class.

2 PURPOSE OF THIS ANALYSIS AND REPORT

On December 1, 2011, Toronto Hydro-Electric System Limited ("THESL") filed a report titled "Cost of Service Study for Individually Metered Suites in Multi-Unit Residential Buildings", prepared on THESL's behalf by BDR NorthAmerica Inc., and dated November 29, 2010 ("the November cost of service study"). That study had been prepared in response to direction from the Ontario Energy Board ("OEB" or "Board") to prepare a cost allocation study that would assist the OEB in making a judgment as to whether the rate that THESL is charging for condominium smart metering is recovering the costs of these services. THESL currently charges these customers at its approved residential rate.

For purposes of the November cost of service study, the class of individually metered suites in multi-unit residential buildings was defined as consisting of all separately metered residential units in buildings with more than six residential units. In 2009, there were 119,947 customers meeting this definition. The November cost of service study separated these customers from the balance of the residential class as to revenue and allocated cost, and computed revenue-to-cost ratios separately for the individually metered suites (the "suite-metered sub-class" or "SMSC") and for the balance of the residential class (the "non-suite-metered sub-class" or "NSMSC").

The cost allocation model was loaded with the data and run as a base case (with a single residential class) and as a case with a separate suite-metered class. The overall residential class showed a revenue-to-cost ratio of 90:100. When the class was separated, the result was a revenue-to-cost ratio of 120:100 for the suite-metered customers and a ratio of 85:100 for the non-suite-metered customers.

As a result of the November study, BDR concluded that suite-metered customers are paying their full cost of service, and more, and are not subsidized by other customers.

In its Decision and Order on Motion dated January 21, 2011, the OEB ordered that:

> "2. Toronto Hydro produce an alternative scenario to the one provided in the study, which would be to divide the residential customer class into three sub categories. These would be: (i) the 9,243 suite metering customers as of the end of 2009, (ii) the approximately 110,000 remaining customers in the study's suite metered subclass ("SMSC") and (iii) all of the other residential customers, using the Board's approved methodologies. As discussed in the filed study, no secondary services costs should be allocated to the three residential customer sub categories specified herein by the Board, unless these costs would otherwise exist for Toronto Hydro's account; i.e., be a cost to Toronto Hydro. In undertaking this alternative scenario, Toronto Hydro, through its expert BDR would be free to attach to it, any caveats or concerns which it had about the revised scenario.
>
> 3. Toronto Hydro request that BDR provide any further scenarios, in addition to the alternative scenario described by the Board, or any further information or analysis that BDR determined would be helpful in assessing whether and to what extent any cross-subsidy may exist between the different types of Toronto Hydro customers relative to the suite metering customers.
>
> 4. Toronto Hydro file with the Board and copy to all parties to the proceeding on or before January 31, 2011, an assessment of the time that will be required to produce the alternative scenario which the Board has ordered (part 1 of this Order) and if necessary, any further scenarios, information or analysis that Toronto Hydro (part 2 of this Order), through its expert, BDR, determines would be helpful to the Board."

As a result of Toronto Hydro's assessment in response to item 4 above, it was determined that the alternative scenario(s) as set out in items 2 and 3 above should be performed by BDR NorthAmerica Inc. ("BDR") and completed for filing with the Board on February 18, 2011. This report documents the methodology and results of that work.

3 CLASSIFICATIONS AND TERMINOLOGY

In the November cost of service study, 119,947 customers were identified as individually metered suites in multi-unit residential buildings, and these were defined to constitute the suite-metered subclass or "SMSC".

As described in Section 4.2 below, THESL staff identified 48 multi-unit residential buildings that it considers as respondents to its recent initiatives to provide separate metering for suites, and 9,149[1] customers in those buildings were considered to constitute

[1] In prior information filed with the Board, and in the Board's Decision and Order on Motion, reference is made to the figure of 9,243 as the number of program customers. The source of this figure may be a transposition of the figure 9,423, which represents the total of suite meters installed by THESL in 2008 (3,889) and 2009 (5,534) per EB-2010-0142 Exhibit D1, Tab 8, Schedule 7, page 5 of 5. The correct figure would include any meters installed prior to 2008, but would also exclude any meters installed for which the customer's account was not yet active. This reflects the

the customer class as defined by the Board in item 2(i) of its January 21, 2011 Decision and Order on Motion. All of these customers are served with Quadlogic meters. For purposes of this scenario therefore, and to distinguish them from other individually metered suites, these customers are referred to as the "Quadlogic customers". In the November cost of service study, the Quadlogic customers were included in the SMSC. Separation of the Quadlogic customers into a new class for modeling purposes results in an SMSC with only 110,798 customers (119,947 minus 9,149). For purposes of this report, the 110,798 customers are referred to as "other suite-metered" customers.

As in the first cost of service study, residential customers who are not suite-metered customers in multi-unit residential buildings (489,492 customers)[2] will be referred to as the Non-Suite-Metered Sub-Class, or the NSM Sub-Class ("NSMSC"), as they were in the November study.

The terminology "residential customers" or "Residential Class" will refer to the program customers, the other suite-metered customers and the NSM Sub-Class, i.e. the residential class as it exists today, as was the case in the November study.

4 METHODOLOGY

4.1 *Cost Data*

The cost data for this study are the same costs used in the first cost allocation study, i.e. actual costs for THESL in the year 2009.

4.2 *Electricity Consumption and Load Data Analysis*

4.2.1 Load Data for the Quadlogic Customers

The work of the November cost of service study resulted in identification of 119,947 suite-metered customers, averaging 389 kWh per customer per month of consumption on an actual (not weather-normalized) basis. From these customers, a random sample was selected and the hourly loads of the sample customers were aggregated in each hour to yield a sample load shape. The sample load shape was applied to the SMSC total annual

same approach to determining the "number of customers" for cost allocation purposes that applies to all customer classes.

[2] In the November study report, certain tables were presented showing the NSMSC as having 458,411 customers, rather than 489,492 customers. The figure of 458,411 was erroneously taken by BDR from a different data source. However the correct figure of 489,492 customers was used in all modeling to allocate costs and compute revenue-to-cost ratios, and the error therefore has no impact on the analysis or the conclusions.

load to produce an estimated population load shape. This load shape was weather-normalized by THESL staff, and the weather-normalized load shape was subtracted from the weather-normalized load shape of the residential class to produce a weather-normalized load shape for the NSMSC.

The load data analysis for the current study was focused on separating the SMSC load and load shape created in the November study into two components: the Quadlogic customers' load shape and the other suite-metered customers' load shape.

THESL staff provided BDR with files containing the hourly consumption data by suite for 48 buildings with 9,222 suites. For example, data for a building with 36 suites would be organized as 36 rows of hourly consumption figures, with each row containing 8760 figures (365 days x 24 hours). The data in these files were the source of both the annualized total kWh consumption of the program customers, and their class load shape for the base scenario. On review of the data, it was shown that some of the suites in the data files did not have consumption associated with them at any time during 2009. 73 records without consumption were therefore eliminated from the data set, leaving 9,149 customer records for analysis.

It was separately verified by THESL that the number of residential customers with Quadlogic meters and with active accounts at the end of 2009 was 9,149. This was therefore accepted as the number of program customers for purposes of this study.

4.2.2 Computing Representative Load Shape for the Quadlogic Class

In analyzing the data, all values greater than zero were assumed to be valid. Where the data included a value of zero for an hourly interval, the possibilities included valid zeros (no consumption or a power outage) and invalid zeros (data errors). The data included both short gaps (a small number of intervals with zeros, surrounded by intervals with positive readings) and long gaps (for example, weeks or months of zeros), either surrounded by positive readings or preceding or following all positive readings for 2009. Short gaps were assumed to be errors (unless applicable to the whole building) and filled on an estimated basis. Long gaps were assumed to be a valid absence of consumption in the actual 2009 period, but it was also assumed that this pattern of consumption (or lack of consumption) would not be representative of future periods, when the suites would be fully occupied.

The data were reviewed to determine whether there were a sufficient number of suites or buildings that represented a relatively complete year of valid consumption history, that could serve as a sample from which a load shape could be constructed for the class. In view of the fact that a data set was available for every customer, it seemed preferable to use all available data rather than attempt a random sampling approach which would

exclude some of the available data. It was determined that relatively complete data existed for 20 buildings consisting of more than 4,000 suites. For this purpose, the data was considered "relatively complete" for a building if:

- there were 5 or fewer intervals in which there were no positive values for any of the suites in the building;
- January consumption in total for all suites exceeded December consumption. This comparison would indicate the expected relative levels of consumption from the beginning of the year; and
- a computation to fill the gaps with the average per-suite value for the building, for that interval, resulted in a change of less than eight percent (8%) to the total consumption for the building[3].

The gaps were then filled for these 20 buildings, and the resulting total loads for each interval were summed on an interval by interval basis. The summed load shape was used in the base case as the representative load shape for the class.

4.2.3 Total Annual kWh Consumption

In the case of this study, which is focused on a very small and new customer population, in premises for which there is for the most part little or no consumption history, the loads described above have been annualized so that each customer is assumed to be connected and consuming electricity over the full year. Such an assumption is especially important in producing a result that would be indicative of the revenue-to-cost ratio that would exist in the long term, and as such, be helpful to the Board in responding to an issue with long term potential effects on the customers, and on any other customers that might in the future be served by Toronto Hydro in the same way. Of the 9,149 suites determined to be active accounts as of the end of December, 2009, only 8,471 showed consumption exceeding 10 kWh in December, and only 5,462 showed consumption exceeding 10 kWh in January, 2009. On average through the year, only 70% of the customers were actually consuming and producing revenue for THESL at points in time during 2009. It was therefore considered necessary to adjust the total annual metered consumption in computing the demand-based cost allocation factors and as the determinant of the class revenue.

The approach taken was to estimate the consumption that would have occurred had all the suites been occupied continuously from January 1, 2009. After correction of the data for the 20 buildings used for development of the load shape, the average monthly consumption for the 4,117 suites in those buildings was computed to be 355.4 kWh. The total kWh of consumption for the year for the class of 9,149 customers could then be computed as 9,149 customers x 355.4 kWh per month x 12 months, or 39,018,655 kWh.

[3] In fact, with only two exceptions the resulting change to total consumption for the buildings was less than 3%, and most changes in value were less than 1%.

4.2.4 Weather Normalization of the Quadlogic Customers' Load Shape and Consumption

Once BDR had prepared a load shape and estimated total consumption for the class, THESL weather normalized the data in the same manner as was done for the SMSC in the first cost allocation study. This resulted in a normalized total consumption of 39,600,733 kWh, or 361 kWh per customer per month.

This average consumption can be compared to the average monthly consumption established in the first cost allocation study for the SMSC as per Table 4.1:

Table 4.1: Computation of Statistics for "Other" Suite-Metered Customers

	SMSC Per First Cost of Service Study	"Quadlogic" Customers	"Other" Suite Metered
Number of Customers	119,947	9,149	110,798
Annual MWh Weather Normalized	568,047	39,601	528,446
Average kWh per Customer per Month	395	361	397

4.3 *Load Data Analysis for Other Customer Classes*

In the November cost of service study, hourly weather-normalized load shapes were provided to BDR by THESL for the following customer classifications:

- Residential
- General Service between 50 and 1000 kW, interval metered
- General Service between 50 and 1000 kW, non-interval metered
- General Service less than 50 kW
- General Service between 1000 and 5000 kW
- General Service greater than 5000 kW (Large Users)
- Street Lighting, and
- Unmetered Scattered Loads (USL).
-

At that time, BDR prepared a load shape for the SMSC class as defined in the November cost of service study, based on a sample, and subtracted it on an hour-by-hour basis from the residential load shape to compute the residual or "NSMSC" load shape.

Once the Quadlogic class load shape had been prepared as described in Section 4.2 and weather-normalized by THESL, BDR followed the same methodology of subtracting it on an hour-by-hour basis from the weather normalized SMSC load shape. This resulted in a load shape for the "Other Suite-Metered Customers".

4.4 *Computation of Load Statistics*

The report of the November cost of service study explains the customer class statistics that are required as allocators of demand-related costs, i.e.: 1CP, 4CP, 12CP, 1NCP, 4NCP and 12NCP.

Table 4.2 summarizes these statistics as computed for the Quadlogic customers and the Other Suite-Metered customers in this study for the base scenario.

Table 4.2: Statistics for Base Scenario		
	Other Suite-Metered	**Quadlogic**
Number of Customers	110,798	9149
Annual MWh Weather Normalized	528,446	39,601
Average kWh per Customer per Month	397	361
1 NCP	129.1	7.9
4 NCP	457.3	31.1
12 NCP	1,201.6	85.1
1 CP	61.4	4.7
4 CP	301.5	21.9
12 CP	888.1	69.1

4.5 *Comparison with Results of November Study*

As in the November cost allocation study, BDR used THESL's cost allocation model as filed in its previous cost of service application as the basis for all cost allocations, except as specified in this report. The results of this study are easily comparable with the scenarios presented in the November cost allocation study.

In the course of modeling for this study, two errors were discovered in the November study that affect the revenue-to-cost ratios for suite-metered customers. One is a formulaic error in the November analysis that resulted in an under-allocation of meter capital to the general service class. As a result, there was a corresponding over-allocation of these costs to residential customers, including both suite-metered ("SMSC") and non-suite-metered ("NSMSC"). The second error pertains to the level of marketing costs associated with THESL's suite-metering program. When collecting the data specific to costs of the suite-metering program and the suite-metering customers, BDR was advised that THESL's marketing initiatives had a cost of approximately $400,000. BDR erroneously interpreted this to mean that the annual level of marketing expense was $400,000, when in fact that figure represents a total spending plan covering several years. In the course of data collection for this study, THESL clarified to BDR that the suite-metering marketing expense for 2009 was just under $90,000.

To provide a base against which the current analysis can be compared, the model was therefore re-run based on two residential sub-classes, as per the November study. Table 4.3 sets out the results. By reviewing Table 4.3 in comparison with Table 5.1 of the November study, it can be seen that overall the corrections have negligible impact on the revenue-to-cost ratios.

It is important to note that the overall residential class revenue-to-cost ratio is **90:100**. This figure provides the context for assessment as to whether there are cross-subsidies within the residential customer class.

Table 4.3 Cost Allocation from BDR November Report, Revised to Correct Error

Rate Base Assets		1 Residential Non Suite Metered	2 Residential Suite Metered	3 Sum of Residential (Col 1+Col 2)
crev	Distribution Revenue (sale)	$162,264,558	$32,267,056	$194,531,614
mi	Miscellaneous Revenue (mi)	$10,541,913	$2,049,455	$12,591,368
	Total Revenue	**$172,806,472**	**$34,316,511**	**$207,122,982**
				$0
	Expenses			$0
di	Distribution Costs (di)	$32,342,587	$3,318,848	$35,661,435
cu	Customer Related Costs (cu)	$19,843,658	$5,265,451	$25,109,109
ad	General and Administration (ad)	$23,783,197	$3,646,903	$27,430,100
dep	Depreciation and Amortization (dep)	$65,749,116	$8,268,058	$74,017,175
INPUT	PILs (INPUT)	$10,375,983	$1,269,318	$11,645,301
INT	Interest	$27,801,751	$3,401,052	$31,202,803
	Total Expenses	**$179,896,292**	**$25,169,630**	**$205,065,923**
				$0
	Direct Allocation	**$0**	**$400,000**	**$400,000**
				$0
NI	Allocated Net Income (NI)	$20,844,145	$2,549,912	$23,394,057
				$0
	Revenue Requirement (includes NI)	$200,740,437	$28,119,542	$228,859,980
	$1			**0**
				$0
				$0
	Rate Base Calculation			$0
				$0
	Net Assets			$0
dp	Distribution Plant - Gross	$1,497,989,910	$177,701,798	$1,675,691,708
gp	General Plant - Gross	$216,566,709	$25,638,794	$242,205,503
accum dep	Accumulated Depreciation	($878,184,708)	($104,324,603)	($982,509,311)
co	Capital Contribution	($103,520,233)	($9,629,552)	($113,149,785)
	Total Net Plant	**$732,851,677**	**$89,386,437**	**$822,238,115**
				$0
	Directly Allocated Net Fixed Assets	**$0**	**$0**	**$0**
COP	Cost of Power (COP)	$364,056,515	$44,602,229	$408,658,744
	OM&A Expenses	$75,969,442	$12,231,202	$88,200,644
	Directly Allocated Expenses	$0	$400,000	$400,000
	Subtotal	***$440,025,957***	***$57,233,432***	***$497,259,389***
0.124819	**Working Capital**	**$54,923,788**	**$7,143,844**	**$62,067,633**
	Total Rate Base	**$787,775,466**	**$96,530,282**	**$884,305,747**
	($0)			**0**
	Equity Component of Rate Base	**$315,110,186**	**$38,612,113**	**$353,722,299**
				$0
	Net Income on Allocated Assets	**($7,089,821)**	**$8,746,880**	**$1,657,060**
				$0
	Net Income on Direct Allocation Assets	**$0**	**$0**	**$0**
	Net Income	**($7,089,821)**	**$8,746,880**	**$1,657,060**
	RATIOS ANALYSIS			
	REVENUE TO EXPENSES %	86.08%	122.04%	90.50%
	EXISTING REVENUE MINUS ALLOCATED COSTS	($27,933,966)	$6,196,969	($27,933,966)
	RETURN ON EQUITY COMPONENT OF RATE BASE	-2.25%	22.65%	0.47%
	Revenue to Expenses % from BDR November Study	85.49%	119.59%	89.73%

4.6 *Cost Analysis*

4.6.1 Identification of Cost Issues

In performing the November study BDR listed and carefully reviewed the cost functions with THESL staff to determine which costs might be differently incurred in serving suites in a multi-unit residential building, as compared with other types of residential premises. It was determined that the key areas of difference are in meter-related costs (capital and reading), and costs stemming from secondary infrastructure.

It was considered that similarly, only these two cost types represented a significant quantifiable source of difference in cost incurrence between the Quadlogic customers and other customers in suites. They were therefore given particular attention in this study.

4.6.2 Meter Capital

By the definition of the Quadlogic class, all of the customers have Quadlogic meters. The cost applicable to a Quadlogic meter, $440, was therefore applied as the meter capital allocator to the full number of customers in the class (9,149). Correspondingly, 9,149 meters at $440 each were deducted from the Other Suite-metered class.

4.6.3 Secondary Lines and Related Facilities

For purposes of the November study, an estimated weighting factor of 30% was applied to the SMSC to reduce the allocation of the cost of secondaries, reflecting the understanding that large multi-unit buildings will not be served by such equipment.

For this study, given that the Quadlogic customers represent a small number of specifically identified residential complexes (48), THESL staff examined drawings of the connection configuration of all of the buildings. On this detailed and specific basis, it was determined that eight percent (8%) of the suites are served by secondary facilities. The allocation of secondary costs to the Quadlogic class was therefore weighted in this study by a factor of 8%.

Table 4.4 of this study shows the summary of allocations for the relevant accounts.

Table 4.4 Summary of Allocations by Class and Account, from Sheet O4 of Base Scenario

ALLOCATION BY RATE CLASSIFICATION

			1	2	10
USoA Account #	**Accounts**	**O1 Grouping**	**Residential Non Suite Metered**	**Residential Suite Metered**	**Quadlogic customers**
1565	Conservation and Demand Management Expenditures and Recoveries	dp	$6,115,046	$879,335	$105,297
1805-1	Land Station >50 kV	dp	$102,751	$9,224	$718
1805-2	Land Station <50 kV	dp	$381,260	$34,226	$2,665
1806-2	Land Rights Station <50 kV	dp	$193,681	$17,387	$1,354
1808-1	Buildings and Fixtures > 50 kV	dp	$299,270	$26,865	$2,092
1808-2	Buildings and Fixtures < 50 KV	dp	$9,895,343	$888,306	$69,160
1815	Transformer Station Equipment - Normally Primary above 50 kV	dp	$4,571,616	$410,395	$31,952
1820-2	Distribution Station Equipment - Normally Primary below 50 kV (Primary)	dp	$33,592,887	$2,778,104	$163,208
1820-3	Distribution Station Equipment - Normally Primary below 50 kV (Wholesale Meters)	dp	$4,032,134	$459,490	$34,505
1830-4	Poles, Towers and Fixtures - Primary	dp	$61,850,716	$10,532,783	$822,173
1830-5	Poles, Towers and Fixtures - Secondary	dp	$90,397,890	$2,820,740	$77,217
1835-4	Overhead Conductors and Devices - Primary	dp	$46,298,301	$7,884,306	$615,437
1835-5	Overhead Conductors and Devices - Secondary	dp	$67,667,264	$2,111,462	$57,800
1840-4	Underground Conduit - Primary	dp	$270,800,646	$46,115,626	$3,599,714
1840-5	Underground Conduit - Secondary	dp	$158,812,315	$4,955,516	$135,655
1845-4	Underground Conductors and Devices - Primary	dp	$122,734,331	$20,900,875	$1,631,490
1845-5	Underground Conductors and Devices - Secondary	dp	$71,978,127	$2,245,977	$61,483
1850	Line Transformers	dp	$268,951,809	$18,929,620	$244,124
1855	Services	dp	$203,874,232	$13,844,265	$304,846
1860	Meters	dp	$78,252,874	$22,207,579	$6,730,759
1995	Contributions and Grants - Credit	co	($103,686,323)	($8,858,816)	($497,445)
2105	Accum. Amortization of Electric Utility Plant - Property, Plant, & Equipment	accum dep	($876,628,397)	($92,283,591)	($8,679,115)

Table 4.4 Summary of Allocations by Class and Account, from Sheet O4 of Base Scenario

ALLOCATION BY RATE CLASSIFICATION

			1	2	10
USoA Account #	**Accounts**	**O1 Grouping**	**Residential Non Suite Metered**	**Residential Suite Metered**	**Quadlogic customers**
5005	Operation Supervision and Engineering	di	$7,731,865	$706,533	$40,759
5010	Load Dispatching	di	$2,920,277	$266,853	$15,395
5012	Station Buildings and Fixtures Expense	di	$1,660	$149	$12
5016	Distribution Station Equipment - Operation Labour	di	$538,116	$44,502	$2,614
5017	Distribution Station Equipment - Operation Supplies and Expenses	di	$94,880	$7,847	$461
5020	Overhead Distribution Lines and Feeders - Operation Labour	di	$579,250	$50,805	$3,422
5025	Overhead Distribution Lines & Feeders - Operation Supplies and Expenses	di	$316,206	$27,734	$1,868
5035	Overhead Distribution Transformers- Operation	di	$15,938	$1,122	$14
5040	Underground Distribution Lines and Feeders - Operation Labour	di	$521,313	$61,972	$4,533
5045	Underground Distribution Lines & Feeders - Operation Supplies & Expenses	di	$1,669,745	$198,494	$14,518
5050	Underground Subtransmission Feeders - Operation	di	$0	$0	$0
5055	Underground Distribution Transformers - Operation	di	$540,999	$38,077	$491
5065	Meter Expense	cu	$1,631,327	$462,958	$140,315
5070	Customer Premises - Operation Labour	cu	$1,962,761	$444,277	$36,686
5075	Customer Premises - Materials and Expenses	cu	$950,740	$215,203	$17,770
5085	Miscellaneous Distribution Expense	di	$1,291,977	$118,060	$6,811
5105	Maintenance Supervision and Engineering	di	$1,691,242	$154,545	$8,916
5110	Maintenance of Buildings and Fixtures - Distribution Stations	di	$3,784,001	$339,690	$26,447
5112	Maintenance of Transformer Station Equipment	di	$0	$0	$0
5114	Maintenance of Distribution Station Equipment	di	$458,792	$37,942	$2,229
5120	Maintenance of Poles, Towers and Fixtures	di	$2,683	$235	$16
5125	Maintenance of Overhead Conductors and Devices	di	$3,538,067	$310,319	$20,901
5130	Maintenance of Overhead Services	di	$322,917	$21,928	$483
5135	Overhead Distribution Lines and Feeders - Right of Way	di	$1,815,799	$159,261	$10,727
5150	Maintenance of Underground Conductors and Devices	di	$4,531,349	$538,674	$39,399
5160	Maintenance of Line Transformers	di	$70	$5	$0
5175	Maintenance of Meters	cu	$1,887	$535	$162
5305	Supervision	cu	$186,195	$42,146	$3,480
5310	Meter Reading Expense	cu	$484,748	$97,369	$239,838
5315	Customer Billing	cu	$4,924,304	$1,114,631	$92,039
5320	Collecting	cu	$6,148,443	$1,391,719	$114,919
5335	Bad Debt Expense	cu	$3,592,558	$659,906	$54,491

5 RESULTS AND CONCLUSIONS

5.1 *Base Scenario*

Table 5.1 sets out the allocated costs and revenues, and computes the revenue-to-cost ratios for total residential and each of the three sub-classes.

It is noted that this exercise has subdivided the SMSC from the November study into two sub-groups: the Quadlogic customers, with a relatively low revenue-to-cost ratio and the Other suite-metered customers with a high revenue-to-cost ratio. The key difference in the cost profile of these two customer groups is the high cost of Quadlogic meters, although the effects are partially mitigated by the lower proportionate level of secondary costs.

At a revenue-to-cost ratio of **95:100**, the Quadlogic customer revenue-to-cost ratio is therefore very different than for customers in multi-unit buildings who are not served with Quadlogic meters (**130:100**), but is not significantly different from the overall revenue-to-cost ratio for the residential class, of **90:100**, or of the largest residential sub-group, which is the non-suite-metered customers, with a revenue-to-cost ratio of **86:100**.

Table 5.1 Revenue to Cost Summary , Sheet O1 of Model -- Base Scenario

Rate Base Assets		1 Residential Non Suite Metered	2 Residential Suite Metered	10 Quadlogic customers
crev	Distribution Revenue (sale)	$162,264,558	$29,832,688	$2,434,368
mi	Miscellaneous Revenue (mi)	$10,548,305	$1,878,090	$160,049
	Total Revenue	**$172,812,863**	**$31,710,778**	**$2,594,417**
	Expenses			
di	Distribution Costs (di)	$32,367,142	$3,084,747	$200,014
cu	Customer Related Costs (cu)	$19,882,961	$4,428,744	$699,701
ad	General and Administration (ad)	$23,940,184	$3,220,561	$368,779
dep	Depreciation and Amortization (dep)	$65,889,721	$7,250,595	$761,437
INPUT	PILs (INPUT)	$10,395,082	$1,127,551	$107,952
INT	Interest	$27,852,925	$3,021,198	$289,250
	Total Expenses	**$180,328,015**	**$22,133,395**	**$2,427,133**
	Direct Allocation	**$0**	**$0**	**$90,000**
NI	Allocated Net Income (NI)	$20,882,512	$2,265,119	$216,863
	Revenue Requirement (includes NI)	$201,210,527	$24,398,515	$2,733,996
	Rate Base Calculation			
	Net Assets			
dp	Distribution Plant - Gross	$1,500,802,491	$158,052,081	$14,691,647
gp	General Plant - Gross	$216,958,451	$22,861,073	$2,089,984
accum dep	Accumulated Depreciation	($879,876,140)	($92,624,611)	($8,710,198)
co	Capital Contribution	($103,686,323)	($8,858,816)	($497,445)
	Total Net Plant	**$734,198,478**	**$79,429,726**	**$7,573,987**
	Directly Allocated Net Fixed Assets	**$0**	**$0**	**$0**
COP	Cost of Power (COP)	$364,056,515	$41,486,816	$3,115,413
	OM&A Expenses	$76,190,287	$10,734,052	$1,268,494
	Directly Allocated Expenses	$0	$0	$90,000
	Subtotal	***$440,246,802***	***$52,220,868***	***$4,473,907***
0.1248194	**Working Capital**	**$54,951,354**	**$6,518,179**	**$558,430**
	Total Rate Base	**$789,149,832**	**$85,947,905**	**$8,132,418**
	($0)	**Rate Base Input equals Output**		
	Equity Component of Rate Base	**$315,659,933**	**$34,379,162**	**$3,252,967**
	Net Income on Allocated Assets	**($7,515,152)**	**$9,577,382**	**$77,284**
	Net Income on Direct Allocation Assets	**$0**	**$0**	**$0**
	Net Income	**($7,515,152)**	**$9,577,382**	**$77,284**
	RATIOS ANALYSIS			
	REVENUE TO EXPENSES %	85.89%	129.97%	94.89%
	EXISTING REVENUE MINUS ALLOCATED COSTS	($28,397,664)	$7,312,263	($139,579)
	RETURN ON EQUITY COMPONENT OF RATE BASE	-2.38%	27.86%	2.38%

5.2 *Alternative Scenarios*

5.2.1 Selection of Alternative Assumptions

In its Decision and Order on Motion, the Board requested that BDR "provide any further scenarios, in addition to the alternative scenario described by the Board, or any further information or analysis that BDR determined would be helpful in assessing whether and to what extent any cross-subsidy may exist between the different types of Toronto Hydro customers relative to the suite metering customers."

This section of the report is intended to respond to that request.

BDR noted in the course of its analysis that although THESL has provided individual metering to some suites in multi-unit residential buildings for several decades, the installation of Quadlogic meters did not commence until 2006, and substantial volumes of these meters did not commence until 2007. Therefore in the view of BDR, if the Board is considering any action on rate classification or rate levels, it is important from the standpoint of rate stability, to consider how the results of this type of study might be affected by the sorts of changes to cost levels or improvements to the quality of data that might reasonably be expected in the next several years.

BDR discussed with subject matter experts in THESL the expected trends in costs of meters and meter reading, relevant to this class.

With respect to the meters themselves, THESL advised BDR that with more experience in the suite metering program and some scale in its suite metering activities, it could structure the tender for procurement of meters and installation to be more competitive, especially if alternative equipment is offered into the market. The possibility therefore exists of a relative reduction of unit capital costs for meters to serve its suite metering program. However, the magnitude of such a reduction cannot be identified. As a result, BDR has not developed a scenario addressing meter capital costs, but would point out that a reduction in such costs would improve the revenue-to-cost ratio of the Quadlogic class.

With respect to meter reading, THESL advised BDR that that reading of the Quadlogic meters is currently being done for THESL by an arms' length party, and that the costs exceed the cost of reading of an "urban outdoor" meter by a factor of about seven (7) times.

THESL has already purchased software that will enable it to take over this activity for itself, and expects to implement the change in a very few months. The costs for meter reading associated with the Quadlogic class would therefore consist only of the capital-

related costs (depreciation, interest, return on equity and PILs), and a telephone line to each building (not each customer). BDR made a high level review of the cost information provided for the software and telephone lines, and concluded that even with a generous provision for start-up costs and at the 2009 number of customers, meter reading costs for Quadlogic meters would be expected to move closer to the cost for reading other "smart" meters. If the number of customers in the Quadlogic class increases, the relative cost of meter reading in-house by THESL will reduce the per-customer cost levels still further, since the costs for in-house service are largely fixed.

To address this, BDR has prepared an alternative scenario in which meter reading costs for the Quadlogic customers are reduced; the weighting factor has been changed from 7 in the base scenario to 2 in this alternative scenario. We believe that in view of the potential for reduction in these costs, a weighting factor of 2 represents a reasonable and perhaps conservative scenario.

In Section 4.2 of this report, BDR commented on the many gaps and low or zero values in the hourly load data, and on the fact that some of the 9,149 customers in the class actually had no consumption data at all. BDR attributes this to many of the buildings in the program being new in 2009, and therefore the suites in those buildings being unoccupied or only inconsistently occupied during the year.[4] In BDR's view it is reasonable to forecast that in a later period, the data would be more complete, and the total consumption registered by the meters for these same suites would be higher than the amounts in the data available for this study. Incorporating an underestimate of the customers' load (and therefore of the revenue) as a result of a temporary situation, while allocating full year costs, would clearly push the revenue-to-cost ratios down, and would not demonstrate to the Board what could be expected in the way of cost recovery from the class on a stable, long term basis.

Use of the data from the most complete 20 buildings resulted in an average consumption statistic of 355 kWh per customer per month, once some efforts had been made to fill gaps with average values. While there is certainly a possibility that 355 kWh is in fact a good estimate of the average levels of consumption for the suites when fully occupied (monthly consumptions of 250 kWh per month or less are not uncommon for occupants of small suites), our confidence in this statistic is not high. We therefore wish to ensure that the Board has a good sense of the impact on cost allocation study results if the consumption and revenue figures are too low.

For this purpose, BDR turned to its best alternative source for an estimate of the average kWh monthly consumption for a cross-section of suites in Toronto multi-unit residential buildings, and this is the data for the 119,947 member aggregate Suite-Metered Sub-Class

[4] An alternative interpretation is that the gaps and low values are technical errors. If so, the same considerations apply, since the errors would be predominantly in the direction of reducing load.

("SMSC"). With meters for this large number of suites providing consumption figures, an average consumption of 389 kWh per customer per month (or 395 kWh weather – normalized), BDR has concluded that this value represents a reasonable alternative estimate for the average monthly consumption of the present Quadlogic-metered suites. A scenario has therefore been developed in which consumption has been estimated using these figures; the load shape from the 20 relatively complete buildings in the Quadlogic class has been applied in this scenario, consistent with the base scenario.

For the reasons stated, BDR also has concerns about the validity of the Quadlogic customer load shape obtained in the study. An available alternative estimated load shape is the load shape for the suite-metered (SMSC) load shape. This load shape has therefore been applied to the total consumption as discussed above (395 kWh per suite per month) to produce a fourth scenario.

Table 5.2 summarizes the changes made to produce each scenario. Table 5.3 compares the results of the scenarios.

Table 5.2 Scenario Definitions

	Meter Reading Cost	Quadlogic kWh per Month	Quadlogic Load Shape
Base Scenario	Multiplier 7	355	From 20 buildings in Quadlogic class
Meter Reading Scenario	Multiplier 2	355	From 20 buildings in Quadlogic class
Consumption Scenario	Multiplier 2	389	From 20 buildings in Quadlogic class
Load Shape Scenario	Multiplier 2	389	Suite Meter Sample Load Shape

Table 5.3 Comparison of Scenario Revenue-to-Cost Ratios

Scenario	Non-Suite-Metered	Other Suite-Metered	Quadlogic
Base Scenario	85.89%	129.97%	94.89%
Meter Reading	85.87%	129.93%	103.53%
Consumption	85.87%	129.90%	104.29%
Load Shape	85.86%	130.30%	103.24%

5.3 *Conclusions as to Cross-Subsidization within the Residential Class*

Using the base case, the Quadlogic customers revenue-to-cost ratio is 95:100, which is well within the boundaries set for acceptable ratios by the OEB, and would also be acceptable by more stringent definitions.[5] Furthermore, while a class at any ratio below unity is by definition receiving a subsidy from other customers, in determining whether the subsidy comes from other *residential* customers, the comparison must be to the overall residential class ratio, which is at 90:100, based on 2009 actual costs.

Furthermore, a scenario reflecting confidently expected changes in meter reading costs raises the revenue-to-cost ratio for the Quadlogic customers to a level above unity (i.e. full cost recovery through the rates). While other technology and pricing changes may create additional improvements, they cannot be predicted as confidently as the meter reading cost change, and therefore have not been reflected.

[5] For example, New Brunswick uses a range of 95-105 to define target revenue-to-cost ratios for NB Power.