Toronto Hydro-Electric System Limited
EB-2010-0142
Exhibit L1
Tab 3
Schedule 1
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COST OF SERVICE STUDY FOR INDIVIDUALLY METERED SUITES IN MULTI-UNIT RESIDENTIAL BUILDINGS

Submitted to
Toronto Hydro-Electric System Limited
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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"). THESL was ordered by the OEB to file a Cost of Service study to determine the separate revenues and costs for suite-metered residential customers, who are presently served by THESL as part of its residential customer class.

BDR has now performed the study, based on 2009 cost and operating data, and 2009 consumption data from billing records. In the absence of a definition instituted by THESL and/or approved by the OEB, the suite-metered sub-class ("SMSC") was defined for purposes of the study as consisting of units in multi-unit residential buildings with more than six residential units, which are separately metered by THESL. The customers meeting this definition were identified from THESL's customer database, and their annual consumptions determined. From this population of nearly 120,000 customers, a random sample of 597 customers were selected and their hourly load shapes aggregated to produce a load shape representative of the SMSC load shape. Once applied to the consumption of the SMSC population and weather normalized, this load shape was subtracted from the weather normalized residential load shape to create a load shape for residential customers other than the SMSC. The demand statistics required for allocation of demand-related costs were computed based on these load shapes.

The OEB-approved cost allocation methodology and model were used in this study to make the results easily comparable with the study filed by THESL for its 2009 test year and for an updated base case.

The consulting team then reviewed each type of cost with THESL management or supervisory staff in various departments to determine what differences existed between SMSC and other residential customers in terms of either the assets or the business processes that serve them. It was determined that few significant differences exist in the area of customer service, but that there are significant differences in the assets providing services to the two types of residential customers.

The SMSC customers attract significantly higher costs for meter capital, meter-related expenses and meter reading, but it was discovered that these costs are more than offset by significantly lower costs associated with secondary infrastructure. Large multi-unit buildings are most frequently served at primary voltage and therefore have no secondary infrastructure. Wiring within the building is the property of the building owner or condominium corporation, and is not a cost to THESL. Based on information from THESL management, a determination was made of the number of smaller multi-unit residential buildings served through secondary infrastructure, and on that basis an estimate was made of the cost of secondary lines that should be allocated to the SMSC.

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 is separated, the suite-metered customers have a revenue-to-cost ratio of 120:100, while the non-suite-metered customers have a revenue-to-cost ratio of 86:100.

This study therefore indicates that suite-metered customers are paying their full cost of service, and more, and are not subsidized by other customers. Non-suite-metered residential customers and suite-metered customers are within the range of acceptable revenue to cost ratios identified by the OEB. Therefore, separation of the class might not result in immediate adjustments to the level of rates, but if an adjustment were to be made in the direction of unity, it would result in a rate decrease for SMSC customers and a rate increase for other residential customers.

It does not appear that separation of the residential class would have a significant impact on the allocation of costs to other customer classes.

2 CONTEXT OF THE STUDY

The Toronto Hydro-Electric System Limited ("THESL") is the electricity distribution subsidiary of Toronto Hydro Corporation serving nearly 700,000 customers in the City of Toronto, and is regulated by the Ontario Energy Board ("OEB" or "Board"). The OEB has the power to establish rate classes within THESLs operating area, and approves rates designed to recover revenue requirements from these classes.

Currently, THESL has seven primary rate classes:

- Residential,
- General Service less than 50kW (GS<50),
- General Service 50-999kW (GS 50-999),
- General Service 1000-4999kW (GS 1000-4999),
- Large Users (LU),
- Unmetered Scattered Load (USL), and
- Street lighting (SL).

The allocation of annual distribution revenue requirement to each class is based on an OEB-designed Cost Allocation Model, which uses various cost driver inputs to determine cost responsibility for each class.

In 2010, the Residential class consists of approximately 615,000 customers. The class is currently defined as:

> "Customers shall be residing in single dwelling units that consist of a detached house or one unit of a semi-detached, duplex, triplex or quadruplex

> house, with a residential zoning. **Separately metered dwellings within a town house complex or apartment building also qualify as residential customers**. Bulk metered residential buildings with up to six units also qualify as residential customers."

Historically, multi-unit residential buildings ("MURBs") have for the most part been bulk metered by Ontario electricity distributors, with their total loads qualifying for General Service rates. Recently, government and regulatory policy has encouraged the separate metering of each suite, so that customers become accountable for their own consumption and are thereby more likely to conserve and manage demands. The two mechanisms available to developers, condominium corporations or building owners are:

(a) Arrange with the licensed distributor[1] to meter the individual suites and common areas, and to provide all metering, meter reading, billing, collection, and customer services to each suite occupant. Under this option, the developer, condominium corporation or building owner is responsible only for the consumption of building common areas and facilities. The suite occupants are direct customers of the licensed distributor in all respects, in the same manner as any other residential customer.

(b) Become an "exempt distributor". In this case, the licensed distributor bulk meters the building and the developer, condominium corporation or building owner is the only customer of the licensed distributor for the premises. The exempt distributor will then contract with a licensed sub-metering service provider to provide sub-metering for each suite. The sub-metering service provider is responsible to meter the consumption, bill the suite occupants, and collect the revenues on behalf of the exempt distributor. The electricity consumption of common areas is funded through other mechanisms such as condominium fees. In this case, the licensed distributor has no direct relationship with the suite occupants and receives no information as to their levels of electricity consumption.

THESL charges the same regulated distribution rate for smart metering to unit-holders of condominium corporations as they do to ordinary residential customers.

In THESL's most recent rate hearing (to establish 2010 distribution rates)[2], an intervenor claimed that the rate that THESL is charging for condominium smart metering is not recovering the costs of these services. They argued that the cost of providing service to condominium corporations is greater than the cost of providing service to other residential consumers, and therefore that an unfair subsidy is being provided through the rate structure. One of the potential remedies suggested was to form a new rate classification for individually metered condominium units, separate from the existing residential rate class, with, presumably, a higher rate. The intervenor led evidence supporting its contention of higher costs to serve.

[1] In this case, the licensed distributor would be THESL.
[2] EB-2009-0139.

In its Decision, the OEB concluded that "no judgment can be made regarding cross-subsidization without a proper cost allocation study" and that "the results of a study completed by THESL will be informative to other utilities and to the Board as to how to advance utility rate structures on a province wide scale in response to the introduction of this competitive sub-metering business". [3]

The OEB ordered THESL to undertake a Cost of Service study for this potentially separate class of customers, and file it with the OEB. The study is to include an analysis of the implications of creating and maintaining a separate rate class for those customers served in this manner.

THESL retained BDR NorthAmerica Inc., a Toronto-based energy sector consulting firm with experience in cost allocation studies, and specifically in the OEB-approved cost allocation methodology and model for Ontario electricity distributors, to perform the required study. The work was carried out between August and November 2010. This report documents the methodology, results and conclusions of the study.

3 TERMINOLOGY

At issue is the distinction between residential premises that are units in multi-unit buildings, and residential premises of all other types. Various terminologies are in use to denote each of these groups. For consistency and simplicity in this report, we have chosen to adopt the terminology "Suite-Metered Customers" used by the OEB in its Decision in EB-2009-0139 to denote residential units in multi-unit residential buildings, for which THESL has installed a meter and provides all services directly. As a group, and without pre-judgment as to whether suite-metered customers should constitute a class separate from other residential customers, we will refer to them in this report as the Suite-Metered Sub-Class ("SMSC"). Membership in the SMSC for purposes of this study is discussed in Section 4.2.

For want of other established terminology, residential customers who are not suite-metered customers will be referred to as the Non-Suite-Metered Sub-Class, or the NSM Sub-Class ("NSMSC").

The terminology "residential customers" or "Residential Class" will refer to both the Suite-Metered Sub-Class and the NSM Sub-Class, i.e. the residential class as it exists today.

[3] EB-2009-0139, Decision dated April 9, 2010, page 30.

4 METHODOLOGY

4.1 *Year*

All data used in the study are 2009 historic data. Balances of accounts are from THESL's financial statements for 2009. Operating statistics, where used, are 2009 actual values, or estimates based on 2009. Load data was collected from billing records for 2009, and weather-normalized.

As a result, the data and results of the baseline cost allocation model run will be slightly different from that filed in EB-2009-0139, which presented a forecast test year.

4.2 *Class Definition and Identification of Suite-Metered Sub-Class Members*

The first challenge in the study was to define the suite-metered sub-class for purposes of the analysis and identify its members. No definition had previously been instituted by THESL, and its customer information database did not include any specific or individual field identifying a residential customer as a unit in a multi-unit residential building.

We therefore took as our starting point the existing definition of the residential class, which includes, as well as individual units in buildings of various sizes, "bulk metered residential buildings with up to six units". It appeared that the electricity service requirements of semi-detached dwellings and buildings of six or fewer units would more closely resemble those of a detached dwelling than of a larger multi-unit building with significant common areas and facilities.

We therefore sought to define the suite-metered sub-class as consisting of separately metered residential units in buildings with more than six residential units. Any common facilities and non-residential premises in such buildings would belong to the General Service Class, and would therefore be excluded from the suite-metered sub-class of the Residential Class.

THESL staff then prepared a query to the customer information database to identify the customers and produce a file with the annual consumption for 2009 for each customer in the class as defined. Consumption was annualized for each customer by a simple proration of the billed consumption. The data file was visually inspected, with particular attention to accounts with uncharacteristically large consumptions to ensure appropriate exclusion of common area accounts. Accounts identified as appropriate members of the SMSC, but for which there was zero consumption in one or more billing periods of the year, were retained in the population statistics. The population of the SMSC was thus

identified as consisting, in 2009, of 119,947 customers, averaging 389 kWh per customer per month of consumption on an actual (not weather-normalized) basis.

Table 4.1 compares the frequency distribution of monthly consumptions of the residential class and the suite-metered subclass.

Table 4.1 – Comparison of Frequency Distribution of Number of Customers by Monthly Consumptions, Residential Class and Suite-Metered Sub-Class, 2009 Data

Average Monthly kWh	Residential Class	Suite-Metered Sub-Class	Residential - Net of Suite Metered
0-600 kWh	32.24%	84.09%	18.67%
601-1,000 kWh	30.41%	10.80%	35.54%
1,001-1,500 kWh	22.06%	3.41%	26.94%
1,501-2,000 kWh	8.39%	1.10%	10.30%
2,001-2,500 kWh	3.25%	0.36%	4.01%
2,501-3,000 kWh	1.48%	0.13%	1.83%
3,001-4,000 kWh	1.14%	0.07%	1.42%
4,001-5,000 kWh	0.40%	0.02%	0.50%
More than 5,000 kWh	0.63%	0.03%	0.79%
Number of Customers	578,358	119,947	458,411

It is noted that the frequency of low use (under 600 kWh per month) customers is much higher in the suite-metered sub-class than for the residential class as a whole. While the reasons have not been specifically studied, it is expected that some or all of the following factors may play a part:

- Space heating and cooling provided centrally for the building, rather than by appliances in the suite;
- Hot water provided centrally for the building, rather than by a water heater in the suite;
- Lower heating energy requirements as a result of smaller floor space and reduced heat loss in a suite;
- More efficient appliances (in the newer buildings).

4.3 *Load Data Analysis*

4.3.1 Requirement for Load Statistics in this Cost Allocation Study

It is well-recognized methodology in cost allocation studies that costs driven primarily by peak utilization are allocated based on a measure of demand. The methodology adopted by the OEB for electricity distribution, and embedded in the approved cost allocation model, requires that for each customer class, the following statistics be collected: 1CP, 4CP, 12CP, 1NCP, 4NCP and 12NCP. "CP" means coincident peak, which is the

demand of the class at the time when the sum of the load of all classes is highest (i.e. the "system[4] peak"). "NCP" means the maximum demand of the class, whenever it occurs. By definition, a class CP cannot exceed its NCP, and because different classes peak at different times, the sum of the NCPs of all customer classes will be greater than the system peak. The CP and NCP for each class are computed on a monthly basis for the year. 1NCP means the single maximum demand for the year; 4 NCP means the sum of the four greatest monthly maximum demands; and 12 NCP means the sum of the monthly maximum demand in each of 12 months of the year. Correspondingly, 1CP, 4CP and 12CP mean the class demand at the times of the annual system peak, the four highest monthly system peaks, and the twelve monthly system peaks respectively.

In previous cost allocation studies filed by THESL with the OEB, the CP and NCP statistics have been estimated for it by Hydro One. In preparation for this study, THESL requested and received from Hydro One hourly load shapes for each of the following classes:

- 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).

These load shapes have been adopted for purposes of this study.

The load data analysis carried out by THESL and the BDR team for this study consisted of using the available hourly load data for suite-metered customers to produce a load shape for the suite-metered sub-class. The load shape of the non-suite-metered residential customers was obtained by subtracting the suite-metered sub-class load shape from the residential load shape. This approach eliminated any need for sampling and analysis of residential load shapes other than for suite-metered customers, or for reconciliation of the load shapes of two residential sub-classes to the load shape for the total class.

4.3.2 Sampling

It was initially anticipated that complete hourly data would be available for almost all customers in the suite-metered sub-class, but in the course of the analysis THESL staff confirmed to the consulting team that this was not the case for the year 2009, nor were

[4] For clarity, "system" refers to the system of the utility for which the cost allocation study is being done, so that the CP statistics were computed with respect to THESL's system peak, rather than the Ontario system peak.

systems in place at THESL to aggregate the hourly data for many thousands of customers to produce a sub-class load shape. As a result, a decision was made to proceed based on a random sample[5] of customers in the sub-class. The sample size was determined on the basis of the characteristic of kWh consumption. Since the kWh consumption of each member of the sub-class was known, the population standard deviation could be computed. Based on this statistic and a desired confidence level of .95, it was determined that a sample size of 600 customers would provide a confidence interval of plus/minus 80 kWh of the monthly mean consumption per customer.

On this basis, THESL staff selected a sample of 675 customers, to provide the flexibility to eliminate customers where there were large numbers of unexplained zero or non-read intervals in the data[6]. The result was that 78 customers were eliminated from the sample. There was no apparent pattern or common characteristic of the eliminated customers, and it is not believed that this approach biased the sample. The mean actual monthly consumption of the customers remaining in the sample was 417 kWh.

Table 4.2 compares the sample mean and frequency distribution to those of the population.

Table 4.2 – Comparison of Frequency of Number of Customers, Suite-Metered Sub-Class Population and Sample

Average Monthly kWh	Sample	Suite-Metered Sub-Class
0-600 kWh	82.58%	84.09%
601-1,000 kWh	12.73%	10.80%
1,001-1,500 kWh	3.52%	3.41%
1,501-2,000 kWh	1.01%	1.10%
2,001-2,500 kWh	0.17%	0.36%
2,501-3,000 kWh	0.00%	0.13%
3,001-4,000 kWh	0.00%	0.07%
4,001-5,000 kWh	0.00%	0.02%
More than 5,000 kWh	0.00%	0.03%
Number of Customers	597	119,947

[5] Random sampling means that each member of the population has the same probability of being selected for inclusion in the sample.
[6] This approach, rather than retaining the zero or non-reads, was adopted because, in discussion with THESL it was determined that error readings would be corrected by estimation in the normal process of billing a customer.

4.3.3 Constructing the Suite-Metered Load Shape

On an hour-by-hour basis, the loads of the sample customers were summed to produce an aggregate sample load shape. The sample consumption in each hour was then divided by the total annual consumption of the sample customers and multiplied by the total consumption of the SMSC population to produce a population load shape, the same "shape" as the sample.

Actual billing data was used for this analysis. Once a population load shape had been computed, it was returned to THESL staff, who normalized it for weather and provided the weather-normalized load shape to BDR. Normalization resulted in a sub-class load shape on the same basis as the load shape for the total residential class that had been provided by Hydro One (i.e. a weather-normalized load shape).

4.3.4 Computing the Non-Suite-Metered Load Shape

The weather-normalized suite-metered load shape was subtracted on an hour-by-hour basis from the total residential class load shape to compute the load shape for non-suite-metered customers. Table 4.3 compares key load statistics for the two sub-classes of residential customers, and Figures 4.1 through 4.4 compare daily load shapes graphically.

Figure 4.1 and Figure 4.2 illustrate the winter load shapes of the suite-metered and non-suite-metered subclasses. The graphs show the 24 hourly intervals of Wednesday, January 28, 2009, which was THESL's peak day for that calendar month, based on the normalized data. To create Figure 4.1, the hourly load for each sub-class has been divided by the number of customers so that each shape represents a theoretical "average" or "typical" customer in the sub-class, thereby eliminating the effects of number of customers on the scale of the graph. To create Figure 4.2, the load in each hour was divided by the total load for the year to obtain the percentages; this approach results in a comparable scale even though the level of consumption between the two sub-classes is different.

Figures 4.3 and 4.4 present the same analysis for the date of Thursday, July 16, 2009, THESL's peak day for that month, based on the normalized data.

Table 4.3: Comparison of Load Statistics for Suite-Metered and Non-Suite-Metered Residential Sub-Classes (Weather-Normalized)

	Suite-Metered	Non-Suite Metered	Residential Class	Total of Sub-Classes
Number of Customers	119,947	458,411	578,358	578,358
Annual MWh	568,047	4,550,156	5,118,203	5,118,203
Average kWh per Customer per Month	395	827	737	N/A
1 NCP	136.4	1,116.3	1,191.7	1,252.7
4 NCP	484.9	4,169.6	4,534.8	4,654.5
12 NCP	1,279.7	11,117.8	12,166.7	12,397.4
1 CP	66.0	980.4	1,046.5	1,046.5
4 CP	323.3	3,719.6	4,043.0	4,043.0
12 CP	957.2	9,893.0	10,850.2	10,850.2

Figure 4.1: Comparison of Sub-Class Load Shapes on a Per Customer Basis for January Peak Day (EST)

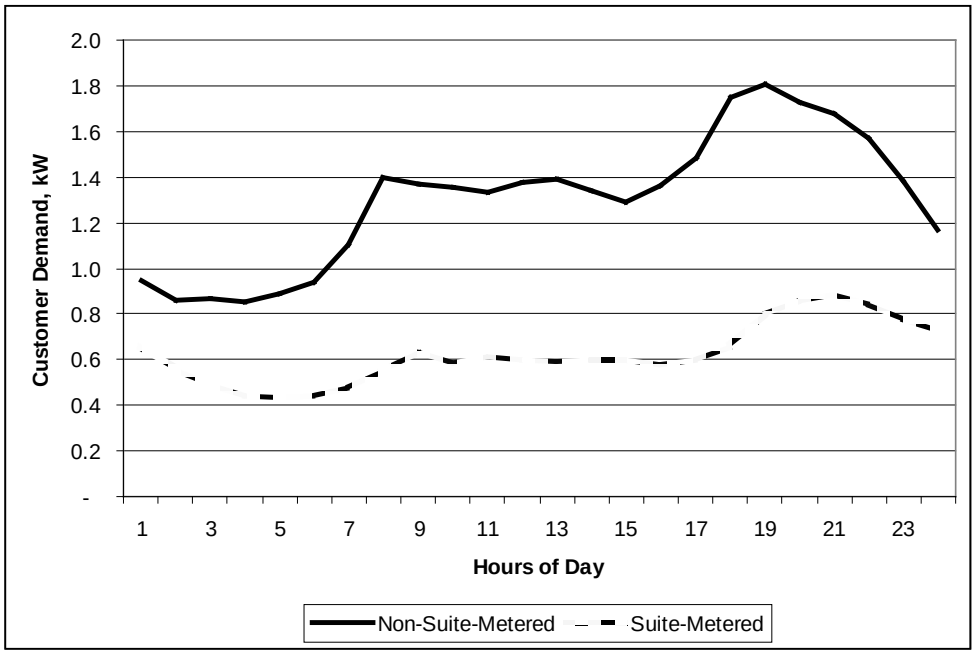


Figure 4.2: Comparison of Sub-Class Load Shapes on a Percentage of Annual Load Basis for January Peak Day (EST)

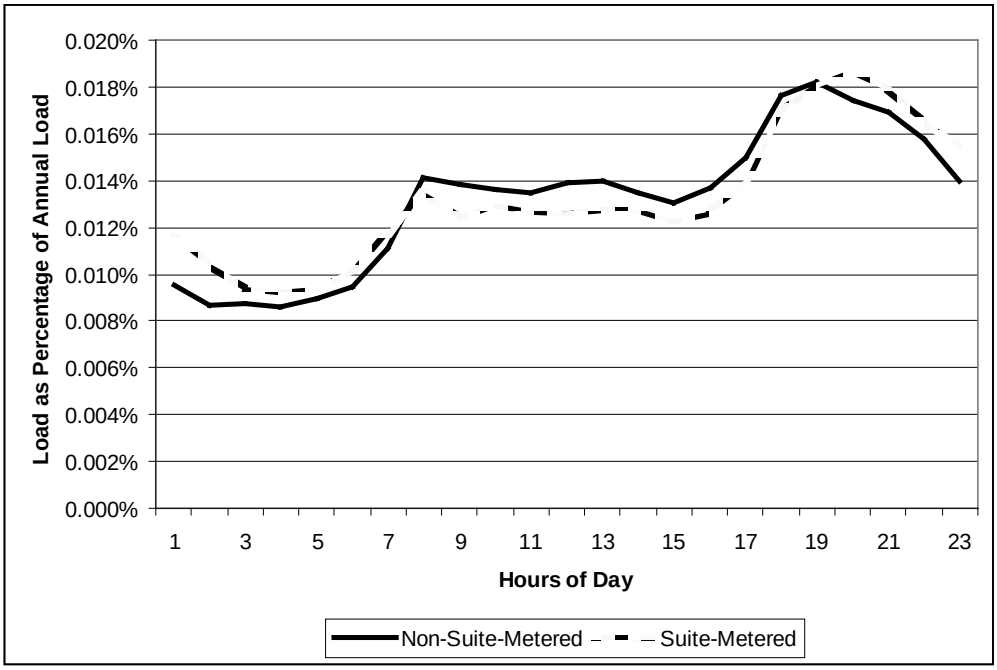


Figure 4.3: Comparison of Sub-Class Load Shapes on a Per Customer Basis for July Peak Day (DST)

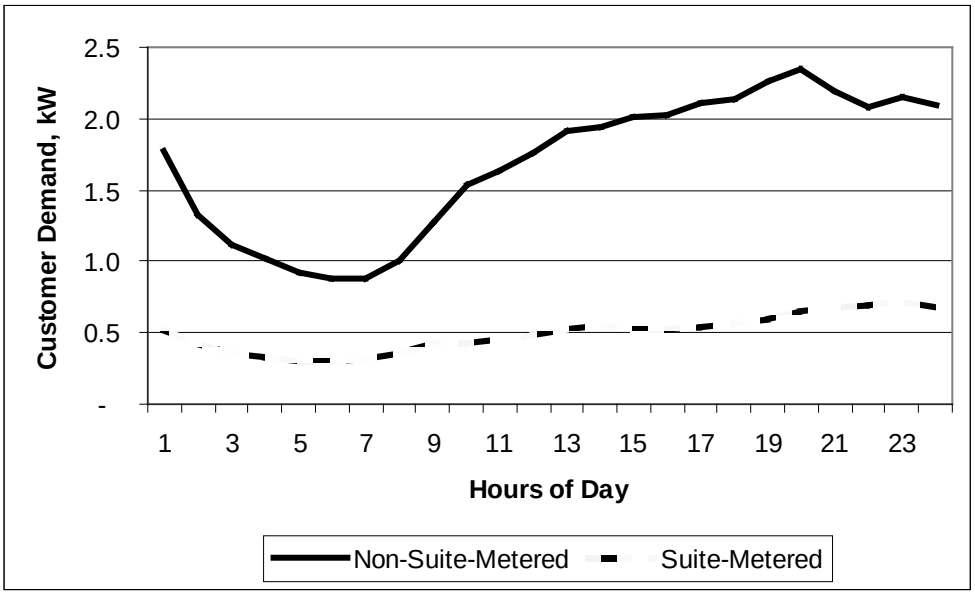
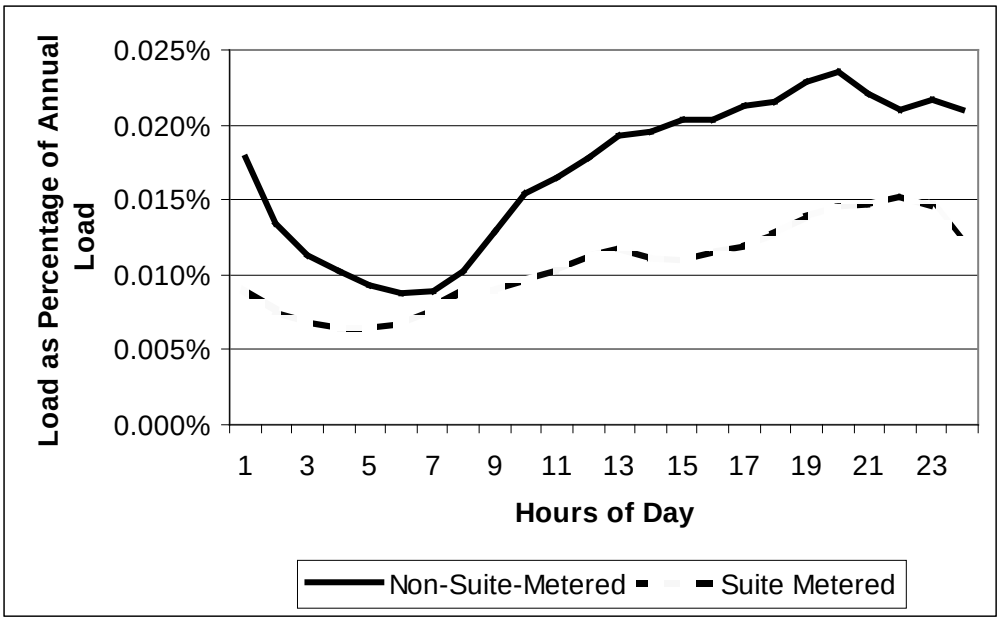


Figure 4.4: Comparison of Sub-Class Load Shapes on a Percentage of Annual Load Basis for July Peak Day (DST)



4.4 *Use of the OEB-Approved Cost Allocation Model*

As previously explained, THESL, like other Ontario LDCs, has based its existing cost allocation study on the methodology approved for electricity distributors by the OEB, and has used a model designed as part of an OEB stakeholder process. In performing this cost allocation study, BDR has 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 purpose of so doing was to make the results of this study easily comparable with a "base case" in which the approved cost allocation study for the 2009 test year was updated with 2009 actual cost data to obtain revenue/cost ratios for a single residential class and all non-residential classes.

The model structure allows data from an LDC's accounts in the approved form of Trial Balance to be directly loaded into the model for analysis. THESL provided the actual 2009 Trial Balance figures and updated the model with revised demand and customer statistics for each of the existing customer classifications. The results of this update to the model, without addition of a separate SMSC, form the base case, in comparison with which a second model "run" with the SMSC as a separate class can be considered.

THESL also provided the actual 2009 revenue for the SMSC and NSMSC, the number of customers, the factors for the breakdown of the SMSC CP and NCP data into Primary and Secondary.

BDR then used the functionality of the model, which allows a new customer classification to easily be created. The following discussion addresses the specific treatment of the SMSC in the cost allocation modeling process. Numeric references where given are to Schedules within the cost allocation model.

4.5 *Cost Analysis*

4.5.1 Identification of Cost Issues

In performing a high quality cost allocation study, the issue arises of the treatment of differences in processes, procedures and distribution facilities between classes where the use of simple allocation factors (demand or number of customers) will not adequately reflect cost causation. For example, the OEB-approved methodology ensures that General Service customers served at primary voltage do not attract costs of secondary infrastructure to their class, and that unmetered connections do not attract an allocation of metering and meter reading costs.

The challenge in this study was to determine whether there are differences in the process, procedures, and distribution facilities to serve SMSC and NSMSC that affect the costs that should be allocated to them. Once such differences have been identified, the impact on cost has to be quantified, and then an appropriate treatment within the approved cost allocation model needs to be implemented.

As mentioned in Section 4.2, small multi-unit buildings with more than six units were included in the definition of SMSC. These types of buildings have distribution characteristics that are very similar to residential class single dwelling customers (such as fully detached homes), and not similar to high-rise buildings. Taking into account these differences within the defined sub-class presented additional challenges in the cost analysis.

The approach taken was to list the functions that are involved in serving any customer. The list formed a basis for discussion with THESL subject matter experts to identify the differences if any between service to SMSC and NSMSC. BDR has, with the concurrence of THESL, confined adjustments to the cost function where a clear difference exists in processes or facilities.

Table 4.4 List of Functions Reviewed in the Study

Function		Cost Level for Suite-Metered Compared with Non-Suite-Metered	Materiality
Main	**Sub**	**S=same; L=lower; H=Higher**	**L=Low; M=Medium; H= High**
Customer Service	Account set up	S	
	Connection	S	
	Billing	S	
	Inquiry	S	
	Bad debt	S	
	Disconnect	L	L
	Trouble Calls - no power	S	
Field Service	Dispatch - Field Service Trucks	L	M
	Dispatch - Trouble Crew	S	
Meter	Installation - Labour	S	
	Capital costs	H	M
	Meter reading	H	L
	Meter maintenance	H	L
Distribution	Planning	S	
	Primary Lines	S	
	Secondary lines - Capital	L	H
	Secondary lines - O&M	L	H
	Duct Banks	L	M
	Poles - Capital	L	H
	Poles - O&M	L	H
	Transformers Capital	L	M

4.5.2 Analysis of Specific Costs

4.5.2.1 Customer Service

Account Set Up – Changes in occupancy are believed to be more frequent for rental premises than for owner-occupied premises; therefore there would be more move-in, move-out transactions for the LDC where a tenant has responsibility for the electricity bill. However, no reliable information is available for either SMSC or NSMSC to support making a distinction in the attribution of this cost; and the net effect on the revenue/cost ratio would be minimized because the Account Set Up Charge will largely cover the costs.

Connection, Billing and Inquiry – The connection cost mentioned here is only for the paper work portion; the installation of meters and the planning is discussed below. There are no identifiable differences between NSMSC and SMSC for these particular functions.

In summary, the amounts allocated to SMSC and the NSMSC in accounts 5305 Billing Supervision, 5315 Customer Billing, 5320 Collecting, 5325 Collection Charges are identical as shown in Table 4.5 below.

Bad Debt – It is possible that some tenants are more prone than owners to incur bad debts, but THESL has not collected statistics to support a conclusion one way or the other. Also, it is difficult to determine accurately how many SMSC are rentals and how many are owner-occupied. Therefore, it is assumed that there are no differences between SMSC and NSMSC as to the proportion of bad debt. The difference in allocation of bad debt expense is accounted for by the difference in distribution revenue per customer.

Disconnect – When LDC's have exhausted all avenues of collection, they may have to resort to disconnecting the customer. For houses in residential areas, the disconnection could occur at the pole, and a special crew will be sent out to perform the task. For SMSC, staff can simply disconnect at the meter panel within the building. There will be some difference in cost, but according to THESL staff, the frequency (and therefore materiality) of this cost is not high.

Trouble Calls (phone calls received by dispatchers) – THESL does not maintain caller statistics by type of dwelling. In a no power or lights out situation, an SMSC customer is likely to call the building superintendent rather than calling THESL, or would check whether hall lights are out before calling. However, it is possible the SMSC customer may call the number on their bill from the LDC. A NSMSC customer can take steps to determine whether the problem is specific to the premises or part of a

broader system outage by looking out the window to whether street lights or lights in neighbouring houses are out, but may still call the LDC to advise them or find out when the situation will be rectified. In conclusion, it is difficult to determine whether there is a reliable pattern of behaviour by sub-class that would impact costs in this category.

4.5.2.2 Field Service

When the dispatcher receives trouble calls from customers, they note the addresses and determine what the causes are.

Trouble Crew - If an outage is caused by problems at stations or transformers, then a wide area and various classes of customers will be affected. In this case, the dispatcher will send out a 'trouble crew'. To the degree that costs arise at shared facilities whose costs are determined by the usage of many customers in different classes, it was concluded that allocation on the basis of demand is the correct approach, and no special adjustment within the cost allocation model needs to be made.

Field Service Trucks – If the dispatcher determines that the problem is isolated, a Field Service Technician will be sent out to investigate the problem. The task could include checking the connection from the pole. In the case of the SMSC, no crew will be dispatched since it will be the building superintendent's responsibility to restore power to the residence.

In summary, the allocation to SMSC and NSMSC accounts 5070 Customer Premises Operation Labour and 5075 Material and Expenses, were the same on a per-customer basis as seen in Table 4.5.

4.5.2.3 Meter

During the discussion with THESL staff, it was noted that for some of the SMSC, a more expensive type of meter (Quadlogic) is being used and THESL staff have updated the meter capital cost in I7.1 in the Cost Allocation Model to reflect the higher costs. Meter-related costs for the SMSC include the meter-types used by THESL for suite-metered customers. The allocated cost per customer is $179 for the NSMSC compared to $297 for SMSC.

There is no quantifiable difference in the labour cost to install these meters at the SMSC premises, as compared with meter installations for NSMSC customers.

The allocated cost per customer for meter expense 5065 is $3.74 for NSMSC and $6.20 for SMSC.

Table 4.5 Summary of Allocations by Account

ALLOCATION BY RATE CLASSIFICATION			Total	Allocated	Unit cost per customer		
Source O4 Cost allocation model			Number of Customers:		489492	119947	
USoA Account #	Accounts	O1 Grouping	Residential Non-Suite-Metered	Residential - Suite Metered	Residential Non-Suite-Metered	Residential - Suite Metered	Ratio of Cost Per Customer, Suite-Metered to Non-Suite-Metered
1808-2	Buildings and Fixtures < 50 KV	dp	9,895,343	957,467	20.2	8.0	39%
1820-2	Distribution Station Equipment - Normally Primary below 50 kV (Primary)	dp	33,600,235	2,907,178	68.6	24.2	35%
1830-4	Poles, Towers and Fixtures - Primary	dp	61,855,996	11,330,431	126.4	94.5	75%
1830-5	Poles, Towers and Fixtures - Secondary	***dp***	90,286,101	3,052,465	184.4	25.4	14%
1835-4	Overhead Conductors and Devices - Primary	dp	46,302,253	8,481,384	94.6	70.7	75%
1835-5	Overhead Conductors and Devices - Secondary	***dp***	67,583,584	2,284,920	138.1	19.0	14%
1840-4	Underground Conduit - Primary	dp	270,823,762	49,607,963	553.3	413.6	75%
1840-5	Underground Conduit - Secondary	***dp***	158,615,922	5,362,615	324.0	44.7	14%
1845-4	Underground Conductors and Devices - Primary	dp	122,744,808	22,483,699	250.8	187.4	75%
1845-5	Underground Conductors and Devices - Secondary	***dp***	71,889,116	2,430,485	146.9	20.3	14%
1850	Line Transformers	dp	268,207,377	20,484,518	547.9	170.8	31%
1855	Services	dp	203,360,503	14,949,672	415.5	124.6	30%
1860	**Meters**	**dp**	87,770,969	35,653,222	179.3	297.2	166%
1995	Contributions and Grants - Credit	co	- 103,626,670	- 9,672,787	- 211.7	- 80.6	38%
2105	Accum. Amortization of Electric Utility Plant - Property, Plant, & Equipment	accum dep	- 881,441,173	- 106,582,179	- 1,800.7	- 888.6	49%
5065	Meter Reading Expense	di	1,829,749	743,258	3.7	6.2	166%
5070	Customer Premises - Operation Labour	di	1,962,761	480,962	4.0	4.0	
5075	Customer Premises - Materials and Expenses	di	950,740	232,973	1.9	1.9	
5085	Miscellaneous Distribution Expense	di	1,290,522	127,079	2.6	1.1	40%
5105	Maintenance Supervision and Engineering	di	1,689,337	166,351	3.5	1.4	40%
5120	Maintenance of Poles, Towers and Fixtures	di	2,681	253	0.0	0.0	39%
5125	Maintenance of Overhead Conductors and Devices	di	3,535,591	334,240	7.2	2.8	39%
5150	Maintenance of Underground Conductors and Devices	di	4,529,522	579,803	9.3	4.8	52%
5160	Maintenance of Line Transformers	di	70	5	0.0	0.0	31%
5175	Maintenance of Meters	cu	2,116	860	0.0	0.0	166%
5305	Supervision	cu	186,195	45,626	0.4	0.4	100%
5310	Meter Reading Expense	cu	468,741	424,224	1.0	3.5	369%
5315	Customer Billing	cu	4,924,304	1,206,670	10.1	10.1	100%
5320	Collecting	cu	6,148,443	1,506,638	12.6	12.6	100%
5335	Bad Debt Expense (ratio of dist revenue)	cu	3,592,559	714,397	7.3	6.0	123%

The meter reading costs as calculated by the model was also higher for the SMSC at $3.54 per customer as compared with $0.96 for the NSMSC.

The model contains appropriate logic to attribute meters of each type and level of cost to the class in which they are used. No other adjustment needed to be made in the analysis.

Meter-related costs are the only type of costs identified in the study as significantly higher for SMSC than for NSMSC customers.

4.5.2.4 Distribution

Planning – THESL staff believes that while it takes more effort to plan for a multi-unit residential building than for a detached or semi-detached home, the per suite cost for SMSC related to planning as compared with a residential sub-division is approximately 50% less.

Since THESL staff estimate that the cost of planning for SMSC is about half of that of NSMSC, all the assets and depreciation costs were adjusted (planning costs are capitalized). Since the material costs will not change, only the staff time can be reduced. It is estimated that staff time makes up between 5-10% of the capital cost, so a value of 6% was used. As a result, the amount of the required adjustment was calculated as 3 % (50% of 6%) of all the capital assets. Finally, the resulting adjustment amount is further reduced by 30% which represents the proportion of SMSC customers who are similar to NSMSC in terms of their planning requirements[7].

Since capital planning costs are allocated based on CP or NCP rather than being separately identified and directly assigned, it is not possible to apply an adjustment in the input stages of modeling to reflect the differences in cost. Therefore the adjustment needs to be made after the allocation on the basis of CP or NCP to residential class as if SMSC is a sub-class of Residential. In order to keep this adjustment transparent, for purposes of this study the adjustment is made in Schedule O5 Details by Class and Accounts. Since the impact is only 0.9% (6% x 50% x 30%) or $350,000 of the capital amount that has been allocated to the SMSC of $39 million, the amount is not material in comparison with the reduction of the allocated secondary costs of over $64 million.

Secondary Lines - This is the most critical component in distinguishing the costs of service for the SMSC from the NSMSC. The distribution configuration for a large multi-unit residential building, whether bulk metered or suite metered from the LDC's point of view, is very different from the NSMSCs in that the multi-unit residential building is

[7] There are 3456 buildings in which the suites qualify under the definition established for the SMSC for this study (see Section 4.2). THESL staff determined that small buildings were more similar in planning requirements to a non-suite-metered residential customer than to a large multi-unit residential building. Based on total load, the number of buildings is 1030, or 30% of the total.

generally fed from the primary circuits. THESL supplies power to multi-residential buildings at high voltage (as would be the case for large commercial and institutional buildings), whereas for other residential customers the voltage is stepped down and the customer receives supply through secondary lines at lower voltage. As a result the cost of the secondary capital and maintenance do not apply to the large multi-unit buildings.

However, the smaller buildings included in the SMSC are similar in their requirements to single dwellings and to smaller General Service customers, and may be served by the secondary circuits.

To reflect this, a reduced component of secondary capital and maintenance expense was allocated to the SMSC, based on their NCP at various levels of supply. It is estimated that approximately 30% of the multi-unit buildings are of a load level that would be served by the secondary infrastructure.

The reductions in the allocated costs per customer are as follows: 1830-5 Poles Secondary: $159 approximately; 1835-5 Overhead Conductors and Devices: $119 approximately; 1840-5 Underground Conduit – Secondary: $280 approximately for a total reduction of around $64 million. A corresponding adjustment was made to Accumulated Depreciation. (See Table 4.5)

Operating and Maintenance –THESL staff responsible for these activities identified certain functions that would be reduced for the SMSC, as compared with the NSMSC. They are pole maintenance, and pole inspections. Since the operating and maintenance expenses follow the allocation of the assets, a reduction in asset allocation will result in the reduced allocation of operating expenses also. The major areas are: 5125 Maintenance of Overhead Conductors: $532,000 approximately; 5150 Maintenance of Underground Conductors: $530,000 approximately.

Trouble Crews in the Field – THESL staff believe that this cost may be lower for SMSC customers than for other residential customers on a per customer basis but there is no data on which a reduction could be supported. As a result, no change was made to the allocation basis in the model.

Poles – THESL staff believe that the cost of poles would be lower on a per customer or per kWh basis for SMSC customers than for other residential customers, but no data are currently available to support an estimate of the appropriate reduction. As a result, no reduction was made.

Transformers – The larger multi-unit residential buildings could have their own transformers or be fed from THESL-owned transformers. Residential rates do not reflect the issue of customer-owned transformers. If the building has a customer-owned transformer, a credit is applied to a General Service account associated with the building.

Since the NSMSC generally requires further transformation on the secondary lines they will attract an allocation of costs related to line transformers. To the degree that buildings with customers in the SMSC are served at primary voltage, they have been excluded from an allocation of line transformer costs. As a result there is a reduction in account 1850 Line Transformer allocation to the SMSC in the amount of $45 million dollars approximately.

Table 4.5 provides a summary of the allocation of costs by account.

4.5.2.5 Directly Allocated Costs

THESL staff confirmed that certain administrative and marketing costs were incurred directly related to suite-metering. On an estimated basis, $400,000 was directly allocated to the SMSC.

5 RESULTS

5.1 *Scenario Analysis*

As described in Section 4, the quantitative analysis of this cost allocation study involved two scenarios. Both scenarios use 2009 actual cost data and 2009 actual load data, normalized for weather. The scenarios are as follows:

- The 2009 "base case": Involves updating the approved 2009 test year cost allocation study with actual cost and weather normalized load data for the year, but includes no changes to the customer classifications. The purpose of commencing with this scenario was to verify the reasonableness of allocations to all classes, and to establish the most recent revenue/cost ratio for the residential class, with which other scenarios can be compared; and
- A scenario treating suite-metered customers as an entirely separate class.

Table 5.1 compares the base case of a single residential class with a scenario in which a separate suite-metered class is created.

In the initial study plan, the issue was considered of whether the SMSC should be treated as a "class" or as a "sub-class". At the time of the OEB's stakeholder sessions that resulted in development of the cost allocation methodology and model for electricity distributors, there was extensive discussion of the issue of whether an identifiable group of electricity customers[8] should be treated as a separate class, and the ramifications of treatment as a class, rather than a "sub-class". The distinction is potentially important

[8] Unmetered Scattered Loads ("USL"), which are treated as a separate class by some Ontario LDCs and as a sub-class of the General Service under 50 kW by others.

because there will always be some element of diversity between groups of customers; if a new class is created, the NCP approach will result in the sharing of what was previously intra-class load diversity with other customer classes.

However, when the results of the treatment of the SMSC as a separate class were reviewed, it was seen that the two new classes in aggregate (the SMSC and the NSMSC) did not attract allocations of significantly more costs than did a single residential class. In fact the difference is less than 0.4%.[9] The separation of the residential class into two classes therefore does not appear to have a significant adverse impact on other customer classes. It was therefore concluded that no further analysis of the "sub-class" alternative was necessary.

The consulting team also considered whether it would be necessary to make sensitivity tests of the results, given that estimates were made of cost differences based on the judgment of THESL staff. However, overall it was determined that any cost differences between SMSC and NSMSC other than for metering, to the extent that such differences exist, involve *lower* costs of service for the SMSC customers. Since the results of the unadjusted new class case show a revenue to cost ratio well above unity, and well above the revenue to cost ratio for the residential class as a whole, it was concluded that such additional analysis would not qualitatively change the study results.

[9] See Table 5.1. The total of the allocated revenue requirements of the SMSC and the NSMSC in column 4 of the Table is, $230,881,235, whereas the allocated revenue requirement of the single residential class in column 1 is $230,062,408.

COST ALLOCATION STUDY

2009 Actual Cost and 2009 Load Data, Weather Normalized
Toronto Hydro-Electric System Limited
Comparison of Key Cases
Monday, November 15, 2010
Sheet O1 Revenue to Cost Summary Worksheet - First Run

		Base Case	New Suite-Metered Class, No Cost Adjustments		
		1	2	3	4
Rate Base Assets		Total Residential	Residential Not Suite-Metered	Suite-Metered	Total of Suite-Metered and Non-Suite-Metered
crev	Distribution Revenue (sale)	$194,531,614	$162,264,558	$32,267,056	$194,531,614
mi	Miscellaneous Revenue (mi)	$12,629,440	$10,568,164	$2,060,118	$12,628,281
	Total Revenue	**$207,161,054**	**$172,832,722**	**$34,327,174**	**$207,159,896**
	Expenses				
di	Distribution Costs (di)	$35,940,904	$32,342,587	$3,318,848	$35,661,435
cu	Customer Related Costs (cu)	$24,822,402	$20,065,607	$5,355,608	$25,421,215
ad	General and Administration (ad)	$27,680,831	$23,901,187	$3,694,832	$27,596,019
dep	Depreciation and Amortization (dep)	$74,728,991	$66,400,373	$8,532,604	$74,932,977
NPUT	PILs (INPUT)	$11,759,064	$10,454,422	$1,301,180	$11,755,602
INT	Interest	$31,507,623	$28,011,923	$3,486,425	$31,498,348
	Total Expenses	**$206,439,814**	**$181,176,098**	**$25,689,497**	**$206,865,596**
	Direct Allocation	**$0**	**$0**	**$400,000**	**$400,000**
NI	Allocated Net Income (NI)	$23,622,593	$21,001,719	$2,613,920	$23,615,639
	Revenue Requirement (includes NI)	$230,062,408	$202,177,818	$28,703,417	$230,881,235
	Rate Base Calculation				
	Net Assets				
dp	Distribution Plant - Gross	$1,693,162,606	$1,508,650,227	$182,032,098	$1,690,682,325
gp	General Plant - Gross	$244,652,437	$218,013,511	$26,226,495	$244,240,006
cum d	Accumulated Depreciation	($992,977,182)	($884,704,336)	($106,972,924)	($991,677,260)
co	Capital Contribution	($114,542,239)	($103,626,670)	($9,672,787)	($113,299,457)
	Total Net Plant	**$830,295,622**	**$738,332,732**	**$91,612,882**	**$829,945,614**
	Directly Allocated Net Fixed Assets	**$0**	**$0**	**$0**	**$0**
COP	Cost of Power (COP)	$407,001,525	$364,056,515	$44,602,229	$408,658,744
	OM&A Expenses	$88,444,137	$76,309,381	$12,369,288	$88,678,669
	Directly Allocated Expenses	$0			
	Subtotal	***$495,445,663***	***$440,365,896***	***$57,371,517***	***$497,337,413***
	Working Capital	**$61,841,244**	**$54,966,219**	**$7,161,080**	**$62,127,299**
	Total Rate Base	**$892,136,866**	**$793,298,951**	**$98,773,962**	**$892,072,913**
	Equity Component of Rate Base	**$356,854,746**	**$317,319,580**	**$39,509,585**	**$356,829,165**
	Net Income on Allocated Assets	**$721,240**	**($8,343,377)**	**$8,237,677**	**($105,700)**
	Net Income on Direct Allocation Assets	**$0**	**$0**	**$0**	**$0**
	Net Income	**$721,240**	**($8,343,377)**	**$8,237,677**	**($105,700)**
	RATIOS ANALYSIS				
	REVENUE TO EXPENSES %	90.05%	85.49%	119.59%	89.73%
	EXISTING REV - ALLOCATED COSTS	($22,901,353)	($29,345,096)	$5,623,757	($23,721,339)
	RETURN ON EQUITY RATE BASE	0.20%	-2.63%	20.85%	-0.03%

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

In drawing conclusions from the analysis, BDR notes that, as with any cost allocation study, the results must be considered as indicative, rather than precise. Although the basics of cost allocation methodology are widely accepted, cost allocation has been described as more of an art than a science. This is because judgment is called for in methodology decisions and in estimation of values for which complete data do not exist. The OEB has recognized these issues by approving a range of revenue to cost ratios as acceptable for rate-setting, rather than requiring distributors to aggressively adjust the revenue levels of customer classes on the basis of the cost allocation study.

In that context, based on the analysis summarized in Table 5.1, the key facts are:

- The THESL residential class as a whole has a ratio of revenue to cost of about 90:100, based on 2009 rates and costs and the OEB approved cost allocation methodology. As a class, residential customers are under-contributing to the revenue requirement—that is, receiving a cross-subsidy from other customer classes.
- When divided into two classes, suite-metered and non-suite-metered, the suite-metered customers have a revenue to cost ratio of about 120:100, and non-suite-metered customers have a revenue to cost ratio of about 85:100.
- The analysis supports a conclusion that the costs to serve suite-metered customers are lower by comparison with revenue than for non-suite-metered residential customers. According to these results, suite-metered customers contribute about twenty percent more in revenue than the costs to serve them, in effect cross-subsidizing other residential customers.

Table 5.2 sets out a comparative revenue/cost ratio computation for suite-metered and non-suite-metered customers on an average per customer basis.

Table 5.2: Comparison of Revenue/Cost Ratios of Suite-Metered and Non-Suite-Metered Sub-Classes on an Average Per Customer Basis		
	Non-Suite Metered	**Suite-Metered**
Total Revenue	**$377**	**$286**
Distribution Expenses	$71	$28
Customer Related Expenses	$44	$45
General and Administration Expenses	$52	$31
Depreciation and Amortization	$145	$71
PILs	$23	$11
Interest	$61	$29
Net Income	$46	$22
Direct Allocation		$3
Total Revenue Requirement	**$441**	**$239**
Ratio of Revenue to Revenue Requirement (Cost)	**85%**	**120%**

The analysis shows that the cost of customer service (call centre, billing, etc.) are the same for a customer in either group, but differences in the distribution configuration and business processes related to suite-metered customers result in relatively lower total costs. The overall lower cost level is the effect of a combination of some higher costs and some lower costs. For example, the allocated average per customer cost of meter-related assets is $179 for a non-suite-metered customer and $297 for a suite-metered customer. This is consistent with the fact that THESL has used more expensive metering equipment for suite-metered customers. However, for the reasons explained in Section 4, suite-metered customers attract a lower cost related to secondaries. The average per customer allocation of overhead secondaries is $324 for a non-suite-metered customer, and $45 for a suite-metered customer. The allocation of assets drives the allocation of distribution operating and maintenance expenses, a portion of administrative and general expenses, depreciation and amortization, payments-in-lieu of tax, and the costs of capital (interest and return on equity).

5.3 *Conclusions as to Customer Classification and Rates*

This study indicates that suite-metered customers are paying their full cost of service, and more.

One of the potential remedies suggested was to form a new rate classification for individually metered condominium units, separate from the existing residential rate class. It appears that if this were to be done, at present the revenue/cost ratio for the non-suite-

metered residential customers is within the band that the OEB has approved and would therefore not require an immediate rate adjustment, and the ratio for the suite-metered customers is not sufficiently far above the band that a rate adjustment would be significant, either to that class or to other classes. However, should an adjustment be made, either as a result of a refinement to the OEB's policy or on approval of a proposal by THESL to that effect, the result would be an increase in rates to non-suite-metered customers, and a rate reduction to suite-metered customers.

On the basis of our analysis, separation of the SMSC from the residential class does not result in a significant increase in the total costs allocated to the SMSC and the NSMSC (less than 0.4%), and therefore, correspondingly, does not confer a significant benefit on other customer classifications. As a result, BDR suggests that if the OEB were to approve a rate treatment for the SMSC as a sub-class of residential—i.e. the residential rate with some form of credit or adjustment—such credit or adjustment could be computed after cost allocation modeling, or as an addition to the cost allocation model, following determination of the SMSC revenue requirement through the normal process of modeling as a "class".