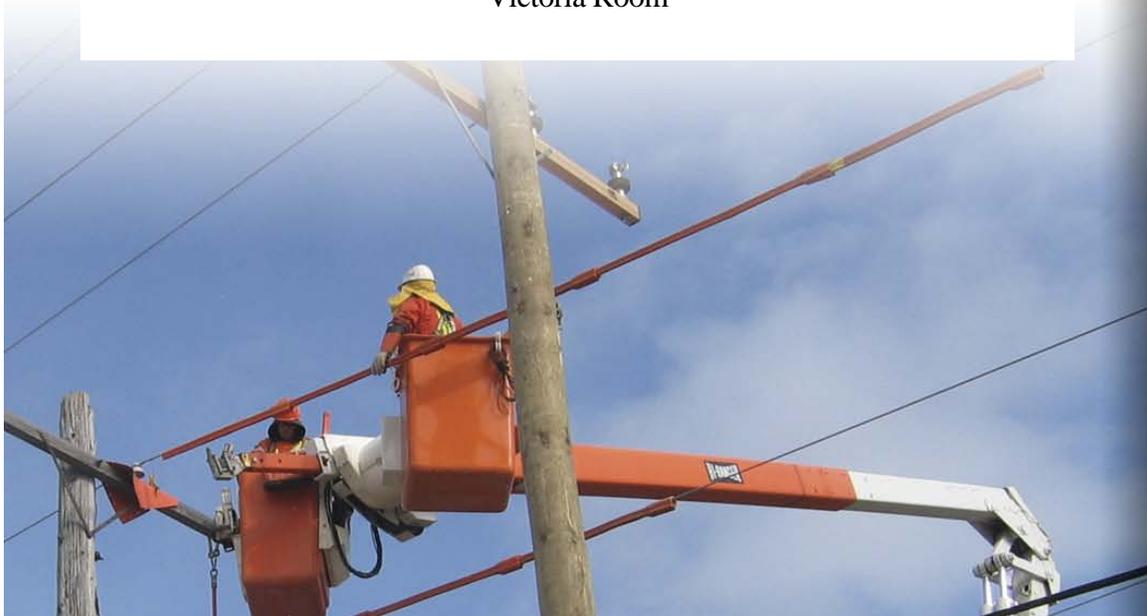# Stakeholder Consultation
2012/2013 Distribution Rate Application

September 8, 2010 Stakeholder Session

Responding to the OEB Directive on the Study of the Relationship Between Density and Cost Allocation

Meeting Notes

Metropolitan Hotel
108 Chestnut Street, Toronto
Victoria Room

Prepared for:
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
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Prepared by:
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1. BACKGROUND

Hydro One Networks Inc. is in the process of preparing its 2012/13 Distribution Rate Application for submission to the Ontario Energy Board (OEB) during the autumn of 2011 for rates effective January 1, 2012 and January 1, 2013.

In its Decision with Reasons on Hydro One Network's 2008 Distribution Rates Application the Ontario Energy Board (OEB) directed Hydro One to provide a study on the relationship between density and cost allocation (EB-2007-0681, pg. 30-31).

Hydro One has three different residential year-round customer classes and two General Service customer classes reflecting different density definitions. The current density definitions approved by the OEB are Urban (U), Medium Density (R1) and Low Density (R2). Urban density is defined as areas containing more than 3,000 customers with line density higher than 60 customers per kilometre. Medium density is defined as areas with at least 100 customers with line density higher than 15 customers per kilometre. All other customers are Low density. These density definitions were established by Ontario Hydro and have been in use for many years.

The Cost Allocation methodology used by Hydro One to apportion distribution line and transformer assets and costs to customer classes uses weighting factors as a means to reflect the differences in costs of serving its density-based rate classes. The weighting factors were developed by Hydro One based on feeder specific data and were used in Hydro One's Cost of Service application in proceedings EB-2007-0681 and EB-2009-0096.

A Phase 1 report prepared by John Todd of Elenchus Research was included in Hydro One Network's 2010/2011 Distribution Rates Application (EB-2009-0096). The Phase 1 report (which was presented to and discussed with stakeholders at a consultation session on May 25, 2009) outlined the principles and possible alternatives that could be considered to address the OEB directive. In its Decision on EB-2009-0096, at page 66-67, the OEB directed Hydro One to complete a study of the relationship between density and cost allocation (the "Study"). The OEB chose not to specify the precise methodology or approach to use, leaving it to Hydro One's discretion to determine how best to conduct the study taking into consideration timing, feasibility and cost. The results of this study are to be presented at Hydro One's next cost of service application.

Hydro One invited key stakeholders who have participated in previous Hydro One Networks rate proceedings to participate in a consultation session to provide input regarding the approach, methodology, scope and Terms of Reference (ToR) for the required study. Proposed discussion questions and a high-level outline of a density and cost allocation study ToR were emailed to stakeholders prior to the session. This document reports on the stakeholder consultation that took place on September 8, 2010.

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1.1 Welcome and Agenda

Ian Malpass (Director, Major Applications, Hydro One Networks) welcomed participants and provided an overview of the day's agenda. He thanked participants for their attendance and encouraged them to provide their ideas and perspectives regarding the methodology, scope and ToR for the density/cost allocation study that the OEB has directed Hydro One to complete, noting the importance of their input to how Hydro One addresses the OEB's directive and the specific approach taken to the study.

1.2 Introductions

Chris Haussmann of Haussmann Consulting Inc. (HCI) introduced himself as facilitator for the workshop. He then asked participants to introduce themselves. In attendance were representatives from the Association of Major Power Consumers of Ontario, Canadian Manufacturers and Exporters, Energy Probe, EnviroCentre, Federation of Ontario Cottagers' Associations, Ontario Energy Board, Ontario Federation of Agriculture, Powerstream, and Vulnerable Energy Consumers Coalition. Also present were Hydro One staff, John Todd, President of Elenchus Research (for only the first part of the session), and the HCI facilitation team.

The full list of participants, together with the agenda, is provided in Attachment #1. Attachment #2 presents the more detailed questions and answers raised in the discussions that followed each of the presentations.

2. PRESENTATIONS AND DISCUSSION

The following sections provide brief descriptions of the presentations made by Hydro One staff. Questions of clarification and discussion following each presentation are summarized in bullet form. Points in *italics* represent responses or comments from Hydro One. All meeting presentation slides are available on the Hydro One Regulatory Web site at:
http://www.hydroonenetworks.com/en/regulatory/

2.1 Review of 2009 Density and Cost Allocation Evidence

John Todd (President, Elenchus Research Associates) provided a brief review of the expert evidence with respect to density-based rates that Elenchus and Dr. Woo (on behalf of the School Energy Coalition) provided to the OEB in 2009 (EB-2009-0096). John's presentation covered the conclusions of the two sets of evidence, their similarities and differences, the issues that remain to be resolved, and suggestions with respect to how outstanding issues might be dealt with.

The Elenchus evidence concluded (Slide 3) that:

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- rate making principles provide little support for separate urban and rural classes based on customer or demand densities that affect causal costs;
- density-based definitions of urban and rural customer classes are more or less unique to Hydro One, with most utilities using municipal boundaries to define these classes; and,
- costs could be allocated to urban and rural customer classes using either sample data or engineering analysis.

John then outlined the conclusions (Slide 4) that flowed from Dr. Woo's expert evidence to the OEB:

- Hydro One Distribution's density-based rates are not adequately supported by a reasonably done cost allocation analysis and should be simplified to urban/rural rates;
- urban/rural cost allocation can be developed from available information, using a seven step process; and,
- the econometric model in Lowry, Getachew and Fenrick should be used to compute the log of total OM&A expenses for urban and rural areas.

John noted the similarities and differences in his and Dr. Woo's expert evidence to the OEB (Slide 5). Both sets of evidence suggest that density-based classes should be replaced with urban and rural classes based on (or linked to) municipal boundary definitions. Elenchus identifies the use of either sample data or engineering analysis as the most practical and cost effective way to allocate costs to urban and rural classes, while Dr. Woo's evidence proposes econometric analysis to define area-specific cost drivers. It is noteworthy that all three proposed cost allocation options are estimation techniques that estimate the cost *differences* between classes (however they are defined) that will then be used as the allocator, rather than a true cost allocation model in which drivers are used to allocate costs to classes.

All of the options for estimating urban and rural costs are imperfect and give rise to certain issues (Slide 6). Using the sample data approach would reflect actual Hydro One costs, but the results will vary with how representative the chosen urban and rural samples are of Hydro One's territory. The engineering method would generate actual urban and rural characteristics, but would reflect future costs, not embedded costs. In general, and in Ontario, cost allocation models are based on embedded costs. To do an engineering study that reflects what is embedded in Hydro One's system today could be very difficult and expensive. The econometric approach would be based on industry data, not Hydro One data, and therefore may not accurately reflect Hydro One's system characteristics. Furthermore, Dr. Woo's proposed econometric method is based on OM&A costs and excludes capital costs, although there may be ways to include capital costs in the analysis.

Based on the expert evidence provided to the OEB by Elenchus and Dr. Woo, John concluded his presentation by making the following suggestions for consideration, as appropriate, by stakeholders and Hydro One with respect to the study (Slide 7):

- Adopt urban and rural definitions consistent with standard practice (linked to Ontario municipal boundaries in an appropriate way);
- Address the details of the class definitions to determine whether it is practical to use municipal boundaries;

- Identify and assess alternate methods of determining urban and rural class costs
- Ensure chosen method is cost effective; and,
- If estimation method is used (rather than direct cost allocation), multiple estimation methods should not be ruled out.

The ensuing discussion focused on questions of clarification related to John's presentation, and general questions relevant to his expertise. John left the meeting following his presentation and related discussion. He did not participate in the discussion of the density/cost allocation ToR.

Discussion

The following summarizes the main points raised in the lively discussion that accompanied John Todd's presentation.

- It was noted that using municipal boundaries as delineators of urban and rural customer classes is problematic in Ontario. Due to numerous amalgamations, including the Harris government's province-wide reconfiguration of municipal boundaries, many municipalities contain a variety of urban population centres as well as rural areas with rural densities. Also, some municipalities are served in their historic urban centres by a local distribution company and by Hydro One in the remaining, more rural or new urban areas. While this traditional and widely applied means of delineating urban and rural customer classes may not be ideal or even applicable in Ontario, it does have the advantage of being an independent definition of the customer class. The definition of urban and rural classes should be based on a practical and objective definition of the customer classes.

- Concern was expressed that the discussion was focusing on the urban versus rural customer class definition. While it may be difficult to avoid the urban/rural paradigm when considering density, the OEB direction was to look at the relationship between density and cost allocation, not the definition of urban and rural customer classes. It was suggested that the study should focus first on the cost drivers that relate to density. Neither the current system, nor municipal boundaries, nor the number of customers per kilometre may be the correct cost drivers. The OEB did not ask Hydro One to go to the next step and define new customer classes. But people would like an examination of whether the current density-based customer class definition makes any sense from a cost allocation fairness perspective.

- The methodology that may be used to determine cost drivers was discussed at length. It was noted that:
    - The econometric model approach is technically feasible, but challenging in that the data base used should incorporate both OM&A and Capital expenses. There is great variability in cost drivers among Ontario utilities and it would be difficult to construct a model that incorporates them all. Missing one or more of the variables may result in an inaccurate coefficient for the density related cost drivers.

    - It may be wise to apply more than one method or model to the problem in order to increase the accuracy of the outcome.

- ▪ Neither the Elenchus nor the Woo study commented on the distinction between R1 and R2 rural rates. The intent is to characterize the cost drivers related to density. The findings may or may not reveal natural density-related customer class delineations, but these are not pre-determined. Of course, any variance of the R1 and R2 distinction would also affect the Rural and Remote Rate Protection (RRRP), which applies only to the R2 customer class.

- ▪ It may be helpful at the outset of the study to ask the question whether it is even possible to reach rigorous conclusions within a reasonable time period and at reasonable   cost.

- • It was suggested that the study might look at how cost allocation relates to density in other industries (e.g. telecommunications) and in other countries (e.g. Eastern Europe). The telecommunications industry has a very different business model (value for service) than the electricity industry (cost of service), and European countries operate under a very different regulatory regime, making comparisons difficult and complex.

- • When asked, no one suggested that Dr. Woo's submissions were not accurately represented in the discussion. One participant expressed the view that Dr. Woo's position was indeed fairly represented, and no one disagreed with that view.

2.2 Distribution Density Study: Background and Scope of Study

Henry Andre (Manager, Major Applications) provided further detail and history with respect to the OEB's past directives regarding the Distribution Density Study, presented an overview of Hydro One's existing density based rate classes and density weighting factors, and outlined next steps and potential elements of the scope of the study for discussion with stakeholders.

During the 2008 Distribution Rate Application (Slide 2), a number of interveners raised concerns as to whether the density weighting factors Hydro One uses in its cost allocation process accurately reflect the costs that are attributable to those rate classes and whether the weighting factors should also be applied to other rate classes. In response, the OEB's Decision with Reasons (EB-2007-0681, pgs. 30-31) addressed these issues by directing Hydro One to:
- • provide a more detailed analysis of the relationship between density and cost allocation;
- • consider whether the number of Residential and General Service classes is adequate and whether the approved customer class demarcations offer the best reflection of cost causation;
- • include consideration of alternative density weightings; and,
- • provide comparisons with the costs of distributors similar in size and location to Acquired Distributors.

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Hydro One addressed the density/cost allocation issue in its 2010/2011 Distribution Application with the Phase 1 report by Elenchus Research (Slide 3). The OEB also heard the School Energy Coalition's intervenor evidence. In response, the OEB's Decision with Reasons (EB-2009-0096, pgs. 66-67): reiterated its prior direction; indicated that it would not specify the precise methodology or approach Hydro One should use; and, asked Hydro One to work cooperatively with the parties while leaving it to Hydro One's discretion to determine how best to conduct the study, taking into account timing, feasibility, cost and project efficiency.

The current Hydro One Residential rate classes (Slide 4) that are density-based include the Urban, R1 (High Density) and R2 (Normal Density). General Service customers are also split by density and include Urban General Service Energy (UGSe – small commercial), Urban General Service Demand (UGSd – greater than 60 kW), General Service Energy (GSe), and General Service Demand (GSd). Residential and General Service customers within a cluster of more than 3,000 customers and with a line density of more than 60 customers/kilometre fall into the urban rate class.

Hydro One uses density weighting factors to allocate Overhead Lines and Transformers costs (Slide 5) that take into account both fixed costs (number of customers/line or Net Book Value (NBV) of transformer assets by class for each feeder) and variable costs (energy by customer class by feeder). The current methodology attempts to allocate costs across rate classes (Slide 6) by taking into account an admittedly limited number of factors (number of customers, length of feeders, energy consumed, NBV of transformers).

Henry indicated (Slide 7) that Hydro One fully intends to complete the Density Study as directed by the OEB, but that it is struggling with what the study should look like. It is therefore seeking input from stakeholders at this session on the scope of the study in order to help shape a Request for Proposal (RFP) and engage a suitable consultant before the end of the year. Following this consultation process, Hydro One intends to communicate to the OEB what it has heard from stakeholders and the approach it intends to follow to ensure that the OEB is satisfied that the proposed approach will fully address the OEB's Direction.

Henry then provided for discussion the potential elements of a draft scope of study and a proposed timeline (Slides 8-10). In order to address the OEB's directive to assess the relationship between density and cost allocation, the most challenging and key component of the scope will be to develop options for the "density" definitions (variation of status quo, feeders, municipal or regional boundaries, etc.) that will be evaluated by the study. Subsequent elements of the study (determine data to be collected, develop data collection methodologies, data gathering and analysis, rate class/weighting alternatives, cost allocation model results and impacts on customer bills) will be driven by the choice of definition options. Hydro One expects that an RFP can be issued and contract awarded to do the study by December 2010, with a final report available in August 2011, and submitted as part of the pre-filed evidence for the next cost of service application.

Discussion

Stakeholders asked questions throughout Henry's presentation. The following summarizes the points raised during that dialogue. The complete exchange can be found in Appendix 2.

- Two points of clarification arose at the outset:
    - It was explained that, currently, a density weighting factor of "1" is applied to four rate classes: Dgen, ST, StLgt and SenLgt, because these rate classes are not deemed to be density driven.
    - Also, a distinction is made between R1 and R2 to distinguish those customers (R2) who qualify for the RRRP subsidy. Some GSe and GSd farm customers do receive the RRRP subsidy. These will all be moved to R2 once rate harmonization is completed by the end of 2011. So all customers receiving RRRP will be in the R2 class at that time.

- There was extensive discussion about the order of tasks in the study. It was considered important to avoid bias in favour of the current classification by starting with definitions of density options before mining the data to ascertain whether there were logical breaks in the density/cost relationship that then indicated where the customer class breaks should be. By gathering as much data as possible on cost drivers and doing relatively "unstructured" analysis, Hydro One may find that the data shows there are drivers more important than density.

- It was suggested that Hydro One first should establish the relationship between density and cost. Once that is established, Hydro One should determine what data it can readily collect to quantify these density related cost drivers and how they relate to customer classes. The rate implications of the density definitions that result from this analysis could then be calculated.

- This raised the question of what data should be collected. A starting point would be the data Hydro One currently uses to determine density related cost allocation (customers and MWH per kilometre). Other suggestions included:
    - Differential analysis of service depot data (from some 40 service depots) such as travel distance to service calls, weather, forestry costs, planned/unplanned outages, and including customer density could provide a reasonable indicator of the real cost drivers fairly quickly and at limited cost;
    - Capital costs;
    - Asset age;
    - Future cost trends (e.g. forestry, Green Energy Plan programs such as Micro-Fit);

- It was also noted that the data collected should be relevant to cost allocation. The practicality and benefit/cost of data gathering and analysis should be key watchwords keeping in mind the impact on customers. It could turn out that density reviews may become a regular requirement in rate making.

- A great deal of data is already available through the OEB. Suggested data sources included:
  - PEG (Pacific Economics Group) report to the OEB;
  - The triple Rs (Reporting and Record Keeping Requirements) from the OEB year book
  - OM&A data; and,
  - Assessment of costs across the LDCs in Ontario.

- Other possible starting points mentioned were to:
  - Validate (or disprove) the current density-based class definitions using Hydro One sample data; and,
  - Identify an independent LDC with characteristics similar to an acquired LDC and compare their respective costs of service (this would require Hydro One to draw a sample from the acquired LDC area that has now been integrated into the Hydro One system).

- Provincial policy trends (e.g. no distance-based rates) also need to be respected.

- One participant felt that the study should also consider the experience of other jurisdictions beyond North America because operating under a different regulatory regime may in fact reveal density-related cost factors more clearly.

2.3 Prepared Questions Discussion

In preparation for the session, stakeholders received an agenda package that included a summary overview of the Terms of Reference and the six questions below to consider for discussion. The facilitator turned people's attention to these questions after the presentations and related discussion.

1. a) Is now the right time to study rate classification/density (in light of pending TOU rates, Smart Meters, rate increases, etc.)?

   b) How much tolerance is there for rate changes at this time?

2. Is density an appropriate factor to define rate classes?

3. Are there factors other than density that distinguish urban versus rural rate classes?

4. Is there value to more precisely determining the costs applicable to existing density-based residential classes?

5. What are the cost factors applicable to urban and rural rate classes?

6. How precisely should the data collected in the study reflect actual cost of service, and how should these best be determined (e.g., using sample data from Hydro One, using benchmark data from a variety of LDCs, engineering analysis, connectivity analysis)?

Discussion

Question 1

Hydro One expressed concern that a considerable amount of money and human resources could be devoted to this study when there was currently no appetite for making changes to customer classes or cost allocation that would result in rate changes creating winners and losers, especially in light of the many other changes still working their way through the system (e.g. rate harmonization, Green Energy Plan, Time of Use rates etc.). Hydro One sought assurances from intervenors that they would be receptive to cost allocation or customer class definitions if the study recommended this.

Intervenors responded that the OEB had ordered a study of the relationship between density and cost allocation without making any pre-judgments about carrying through with changes to rates or customer classes. In the first instance, intervenors support conducting the study to determine whether the current density-related cost allocation model is fair or not, and whether there are other, more valid cost drivers that should be reflected in the cost allocation model. In the absence of knowing the study findings, they could not commit to supporting changes to the cost allocation model or customer class definitions. However, it was noted that should the findings conclude that such changes are warranted, the OEB does have mechanisms for implementing change gradually without creating rate shock among ratepayers.

In relation to this question, the matter of cost of the study was also discussed. What would be a reasonable resource allocation given the uncertainty of concrete follow-through changes in cost allocation? Cost estimates provided ranged from $250,000 to $1.5M, depending on the study methodology used and the degree of data granularity collected. Intervenors were unable to provide a quantitative guideline as to what would be a reasonable cost, but stated that the cost allocation should be sufficient to provide useful information. In this regard, it was suggested that there were numerous sources of data readily available (see discussion in Section 2.2), and that the application of several methodological approaches to data analysis could help to produce a useful result with some confidence and at reasonable cost (see also discussion in Section 2.1).

It should be expected that the study will reveal the extent to which there exist cross-subsidies among customer classes. Depending on the extent of such subsidies, there may be more or less appetite for changing the cost allocation and customer class definitions.

Questions 2-5

These four questions relate to the nature of the distribution cost drivers and their relationship to density. They were discussed to varying degrees interchangeably throughout the dialogue. The following summarizes the key points raised in the discussion.

- The study should address two fundamental questions:
  i. Assess whether density related cost drivers or some other cost drivers should be used to allocate costs; and,

ii. In light of the knowledge gained from (i), how should customer classes be defined to create the greatest degree of fairness (i.e. cost-based rates).

- The scope of the study should try to take into account historic use patterns as well as the likely effect of future trends to the extent possible (e.g. urbanization, distributed generation, smart grid, conservation, MicroFIT program, Time of Use demand shifts).

- Vegetation and storm management costs are clearly related to density insofar as they are much higher in low density as opposed to high density areas. On the other hand, there are also costs unique to high density areas, such as underground facilities.

- It is conceivable that factors such as asset age and average customer distance from service depots may be more influential cost drivers than density. Old acquired systems with moderately high density service areas may be more costly to serve than farms on upgraded feeders being served directly from a transformer station without a substation.

Question 6

Study methodologies were discussed in the context of John Todd's presentation (see Section 2.1), but some additional comments were also made or reiterated in this portion of the meeting.

- Differential analysis of service-depot based data could provide a relatively quick method to identify cost drivers.

- Relative to other factors, it is unlikely that the effect of the Green Energy Plan will be a significant cost driver. The Green Plan should not be used as a reason to delay the study.

- With respect to applying more than one methodology to provide greater confidence in the results, one suggestion was to supplement the Hydro One sampling methodology with engineering studies and simulations where sample data are questionable or difficult to obtain.

- Two tasks the study should accomplish are:
  o Test the current density definitions to see if they stand up to the analysis of cost drivers; and,
  o Assess the advantages and disadvantages of using municipal boundaries to delineate customer classes in Ontario.

- The question was raised, whether the study would look only at customer classes that currently have density-based rates, or all classes. The original intent was to study only density-based rate classes. However, following the suggested approach, all rate classes may be affected if new cost drivers identify different rate classes.

Follow-up Stakeholder Consultation

Suggestions were made to obtain additional input from stakeholders at two different points in the study process:

- Circulate draft Terms of Reference to stakeholders for comment before finalizing them;

- Meet with stakeholders to present and discuss preliminary study results.

3. CLOSING REMARKS/NEXT STEPS

Ian Malpass thanked stakeholders for their participation and input, and noted that their contributions will help Hydro One shape the ToR. Hydro One will consider the suggestion to circulate a draft ToR before issuing an RFP, and to meet again with stakeholders before finalizing the study report.

Chris Haussmann reminded participants to complete and submit the Consultation Evaluation Form before the end of the week. The meeting was adjourned at 12:30 pm.

4. MEETING EVALUATION

Appendix 3 presents a copy of the questionnaire stakeholder participants were asked to complete to evaluate the meeting, and the consolidated returns from the six forms that were received. The comments indicate that most participants agree or strongly agree that:

- The information presented was clear;
- Stakeholder participants had adequate opportunity to share their views with Hydro One;
- The consultation session met their expectations; and,
- Overall, the preparation package was thorough and included all relevant and essential information for the session.

Additional comments received indicate that:
- The topic is a difficult issue to address;
- The discussion was open and animated, although more time could have been useful;
- Some preconceptions created initial confusion and took time to clarify;
- Responsiveness of Hydro One to suggestions remains to be determined.
- One participant disapproved of the facilitation (no detail provided).

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APPENDIX 1

AGENDA PACKAGE AND LIST OF PARTICIPANTS

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Stakeholder Consultation
2012-2013 Distribution Rate Application

Responding to the OEB Directive on the Study of the Relationship Between Density and Cost Allocation

Agenda
September 8, 2010
Metropolitan Hotel, Victoria Room (2nd Floor)
108 Chestnut Street, Toronto
9:00 a.m. – 12:15 p.m.

8:30 a.m. Registration and Continental Breakfast served		
9:00 a.m.	Welcome	Ian Malpass, Director, Major Applications, Hydro One Networks
9:05 a.m.	Introductions and Agenda	Chris Haussmann, Facilitator, Haussmann Consulting Inc.
9:15 a.m.	Review of 2009 Density and Cost Allocation Evidence	John Todd, President, Elenchus Research Associates
10:15 a.m.	Background and OEB Directives	Henry Andre, Manager, Transmission and Distribution Pricing
10:30 a.m.	**BREAK**	
10:45 a.m.	Facilitated Discussion of Questions	Chris Haussmann
12:00 p.m.	Next Steps	Henry Andre
12:05 p.m.	Closing Remarks	Ian Malpass
12:15 p.m.	**Adjourn**	

**Responding to the OEB Directive on the Study of the Relationship
Between Density and Cost Allocation
September 8, 2010**

List of Confirmed Participants[1]

Name	Association
Hydro One	
Andre, Henry	Hydro One
Cancilla, Enza	Hydro One
Frank, Susan	Hydro One
Innis, Ian	Hydro One
Malpass, Ian	Hydro One
Wilson, Mark	Hydro One
Facilitator/Consultants	
Haussmann, Chris	Haussmann Consulting Inc.
Mueller, Peter	Haussmann Consulting Inc.
Todd, John	Elenchus Research Associates
Stakeholders	
Bradbury, Douglas	Canadian Niagara Power Company Ltd.
Clark, Wayne	Association of Major Power Consumers of Ontario
Cowan, Ted	Ontario Federation of Agriculture
Dade, Christine	Powerstream Inc.
DeRose, Vincent J.	Canadian Manufacturers and Exporters (CME)
Harper, Bill	Vulnerable Energy Consumers Coalition
MacIntosh, David (plus 1)	Energy Probe
McGee, John	Federation of Ontario Cottagers' Associations
Silk, Dana	EnviroCentre
Thiessen, Harold	Ontario Energy Board
Thompson, Peter	Canadian Manufacturers and Exporters (CME)

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[1] Confirmed as of September 7, 2010

Discussion Questions for Density – Cost Allocation Consultation
September 8, 2010

1. a) Is now the right time to study rate classification/density (in light of pending TOU rates, Smart Meters, rate increases, etc.)?

   b) How much tolerance is there for rate changes at this time?

2. Is density an appropriate factor to define rate classes?

3. Are there factors other than density that distinguish urban versus rural rate classes?

4. Is there value to more precisely determining the costs applicable to existing density-based residential classes?

5. What are the cost factors applicable to urban and rural rate classes?

6. How precisely should the data collected in the study reflect actual cost of service, and how should these best be determined (e.g., using sample data from Hydro One, using benchmark data from a variety of LDCs, engineering analysis, connectivity analysis)?

DRAFT
Terms of Reference – Density Study

Introduction

Provide background material on the following:

- Evidence submitted on this issue in Hydro One Network's 2010/2011 Distribution Rates Application (EB-2009-0096).
- Decision with Reasons in EB-2009-0096.
- Decision with Reasons in Hydro One Network's 2008 Distribution Rates Application (EB-2007-0681).
- Existing density based rate classes and weighting factors used in Cost Allocation model

Scope of Work

Hydro One is seeking the services of an expert in the field of cost allocation and rate design to complete a Density Study. The consultant is required to complete the following items of work:

1. Develop options for the "density" definitions that will be evaluated as part of this study.

2. Develop methodology for collecting the data required to assess the relationship between costs and density for the various options.

3. Collect the necessary data.

4. Analyse data collected to develop rate class and weighting factor alternatives that will be put through the cost allocation model.

5. Evaluate cost allocation model results and assess the impact on customer's bills.

6. Prepare a final report documenting the work undertaken.

Schedule

Issue RFP and award contract: *by Dec 2010*
Develop study methodology and collect necessary data: *Jan to Apr 2011*
Analyze data and propose cost allocation model inputs: *May 2011*
Run cost allocation model, evaluate results and customer impacts: *Jun to Jul 2011*
Prepare final report: *Aug 2011*

APPENDIX 2

FACILITATED DISCUSSION
QUESTIONS AND ANSWERS

Answers are presented in italics

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Review of 2009 Density and Cost Allocation Evidence Discussion

- There is a problem using municipal boundaries in Ontario (Slide 3) because of the uniqueness of the political boundaries. For example, in the City of Ottawa, Ottawa Hydro serves the high density customers, but the vast majority of the land mass of the city is served by Hydro One. The same is true in Hamilton, where Horizon serves Hamilton, Stoney Creek and Dundas, and the remaining two-thirds of the land mass is served by Hydro One. Most or many utilities in Ontario do not serve the entire customer base within their municipal boundaries.

  The standard is that the historical boundaries of towns and LDCs were in alignment. Through the Harris and other amalgamations, these alignments have changed. I am not suggesting using municipal boundaries is an automatic or simple thing. However, given that using municipal boundaries is the standard approach and for other reasons provided in the evidence to the OEB, using municipal definitions, perhaps with some modifications, should be considered to develop a practical basis for defining the territory that is urban and rural for Hydro One. This may not be simple to do, but as the evidence to the OEB noted, other alternatives are at least as difficult to apply. One of the challenges of the whole urban-rural concept is coming up with appropriate definitions, and it is easy to get into an impossible morass around, for example, the level of granularity. So regardless of who does the study, you may want the ToR to reflect that you want a simple, practical and independent way to define urban and rural classes based on municipal boundaries.

- I agree that using municipal boundaries is a problem. I work in Ottawa/Eastern Ontario and deal with people all the time that say that the City of Ottawa is half the size of Prince Edward Island, so the urban-rural approach certainly won't work in the City of Ottawa. I am a bit concerned that the direction of the OEB to look at density and cost allocation seems to be morphing into urban and rural. There are many highly densely populated areas within rural areas. So you can't simplify things down to urban and rural classes. I'd like to get back to density. In addition, people living in urban versus rural areas are not similar. They have very distinct demographic and other characteristics.

  There is a wide variety of customers within all classes. One of the issues in defining rate classes is the extent to which different classes overlap in terms of their variety, rather than being distinct. The more overlap there is, the harder it is to define different classes.)

- Is the econometric model (Slide 4) a viable option?

  The simple answer is yes.)

- What is the basis of the econometric model (Slide 4) proposed by Dr. Woo – where does it get developed, how big is the population of data, what jurisdiction, etc.?

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Dr. Woo did not provide detail on the data exercise. He did a survey of several pieces of literature that had econometric models that identified costs in relation to density issues. He chose one of those pieces of work, the econometric model in Lowry, Getachew and Fenrick, in which one of the cost drivers is customers per kilometer of line (a density measure) as an illustrative example. But he is not using this driver to define customer classes. As you vary this driver, you have a coefficient that says that costs vary with the number of customers per kilometer of line. He did not do an econometric study, but had a table which illustrates that if the coefficient is x, the impact is y. What he is really saying is that the data is available, which is true for the inputs he identified. The limitation is that his model is based only on OM&A costs, not capital costs.)

- If you could get over this limitation, how do you determine what the parameters are and what the coefficients are going to be?

   Dr. Woo's expectation was that data available from Ontario LDCs could be used. These LDCs have different drivers – different number of customers/kilometer. So the input data for the analysis would be Ontario LDCs. For example, you know how many customers and how many kilometers of line they have. The costs per customer for all the LDCs are known. You plug in the three cost driver factors he had and run his equation. To the extent that the identified cost factors explain differences among the LDCs, you would have a model that explains the price difference and has reasonable coefficients on the cost drivers. However, econometric models have many technical problems. If you mis-specify an equation, you will end up with misleading coefficients. Dr. Woo has tried to identify an equation which explains differences in cost based on density-related factors, but is this a full explanation of the cost differences across LDCs? So I would say that the econometric approach is a viable alternative in Ontario and the data is available, but you have to recognize the pros and cons of this approach and the potential technical issues.

- There are problems in looking at Ontario LDCs. Some costs that show up in the rural don't show up in the local LDCs. For example, Hydro One's enormous forestry program doesn't show up in most local LDCs. The City of Toronto has relatively high rates and extremely high customer density. This can skew results, so you have to be careful to compare apples with apples.

   I agree. This is the type of practical problem I was referring to when I mentioned potential technical issues in the econometric approach. If part of the explanation for Toronto's high costs is the heavy density of utilities under the streets (especially in the downtown area), and if this factor is left out of the equation, you end up with a mis-specified equation and an incomplete explanation of cost differences because you have not captured all the drivers. It would be very difficult to get an equation with all the cost drivers in order to get at just the density related ones that are relevant for urban and rural. With respect to the ToR, you may want to specify that if an econometric technique is used, that it must be deemed to be appropriate by the researcher for estimating the difference in cost between urban and rural service.)

- If the purpose of the study is to find the best cost allocation method that somehow incorporates density in a manner that is acceptable to the OEB, and you are looking for measurement errors in a

method, you are ill advised to think in terms of a single model. You need more than one model to find errors. And you also have to look at more drivers than just density.

- In the last bullet on Slide 7, you should say "required", rather than "not ruled out".

- Are the suggestions on Slide 7 yours or Hydro One's?

  They are mine, not Hydro One's.

- Is there anything in the suggestions on Slide 7 that would be a concern for Hydro One? I also have the same question with respect to Jay Shepherd's letter.

  These are John Todd's ideas as to how we might move forward. Hydro One is open to a broad discussion and stakeholder ideas as to how we should move forward, and we can talk about this later this morning in the context of the ToR.

- John Todd is here today to speak to previous studies and the differences between the Elenchus and Dr. Woo studies. He will be leaving after his presentation and will not be present when we discuss the ToR, since Elenchus may be a bidder when the RFP is released later this year. So please limit your questions to ones of clarification and general expertise. (Facilitator)

- I understand how urban and rural definitions came about for utilities as people organized into towns. But I don't understand how this has anything to do with cost causation. I would like some discussion as to why the standard practice should be honoured and how this is fair to customers. In Ontario, we have gone from having municipal systems that, with the exception of police villages, generally were based on density because municipalities basically provide high density services. How do you handle the issue where you have a Brockville (a relatively tight municipality), and a Timmins (which used to call itself the largest city on earth), or a Huntsville where you have a large number of cottagers (urban folks, maybe on bigger lots) that are just outside that boundary who are getting a rural rate?

  In my OEB evidence I suggested that conceptually we should get rid of the urban/rural split. The OEB's directions do not seem to be in conflict with that. Most other jurisdictions have one company serving an entire area. Ontario has many LDCs; hence, there is an issue of comparability for Hydro One that is quite unique to Ontatio. From a rate design perspective, Ontario does not have distance-based rates even though the cost of serving customers who are further from a transmission line is greater. The OEB has explicitly said we don't want distance-based rates. There are many ways in which customers who are essentially residential differ, and the cost of serving them differs. But we do not break up the residential class into sub classes based on those cost drivers. I could not find a rationale for the urban and rural density-based definitions, or anything that is different about this split from other things we don't use to create sub classes. The OEB direction has not asked whether we should have an urban/rural split or even whether Hydro One should consider changing the definition. But to do what the OEB has asked Hydro One to do, it is difficult not to ask the question whether the definition is right or

whether it is something we can work with. So what I said in my evidence was that it might make sense to expand the scope to look at how we define urban and rural and whether we can come up with a more standard way of doing it, but it will be imperfect unless you are prepared to go to the trouble and expense of a high level of granularity (for example Google maps to identify areas of high/low density for all LDCs). Since this is likely not a practical approach, we are looking for a simplified way to draw boundaries around urban and rural areas. I have suggested municipal boundaries because this approach is based on using or adapting provincial rather than Hydro One definitions of urban and rural, thereby providing a certain independence or neutrality for the definition .

- Aren't you saying that Hydro One should abrogate its responsibility and simply follow Mike Harris's plans?

  We have to do something. This is my suggestion, but it is not my decision.

- The OEB's direction was to look at the effect of density on customer classes. It did not say give us a new definition of urban and rural. It didn't even use the words urban and rural. It might be better to start the conversation about the study with different words. Historically, the urban definition was developed by Hydro One not to produce a cost-based definition for customers but rather to stop amalgamations from other utilities. It was a defensive posture that Hydro One took around Ottawa and London to give away the least number of customers. So rather than have political elements drive urban and rural definitions, I would prefer that we follow the OEB's direction to look at density and see where that leads once we get into the data.

- The OEB did not ask that the definition be looked at. That is precisely the point. There is no cost justification for the current density definition. There is also no cost justification in using municipal boundaries. You may find that if you identify the proper cost drivers, municipal boundaries might be the right breakdown, but this should flow from the driver analysis rather than being the starting point of the process. Similarly, Dr. Woo's analysis assumes that customers/kilometre is the cost driver, which may not be the correct assumption to make. Maybe the first thing the consultant should do is look at cost drivers.

- The natural gas distribution industry does not serve rural customers because it is too expensive. In the telecom industry the monthly charge for a rural customer is far less than for an urban customer, the reverse of what happens in the electricity sector. It might be useful to look at how the telecom industry does it its cost allocation between urban and rural.

  The conceptual basis for cost allocation on the telecom industry is completely different from the electricity sector. In rural areas or small towns you pay a lower monthly fee because fewer of your calls are local. The basic monthly fee is a bit of a proxy for how much of your calling is local versus long distance. It is more of a value for service than cost of service concept. (John Todd)

- Neither John Todd nor Dr. Woo's analysis commented on Hydro One's further breakdown of the rural class into R1 and R2.

Neither of us commented on it. The concept is that there is a continuum – the lower the density, the higher the cost. The equation reflects this. The question then becomes where are the cutoff points? The convention elsewhere is that you simply have urban and rural. So if you want to study the cutoff points, finding the cost differential between R1 and R2 is difficult. There is also the complicating factor of the Rural and Remote Rate Protection (RRRP). So as some have suggested today, there may be an argument for staying with the current definitions, regardless of the rationale behind them.

- In your evidence, did you look at how other jurisdictions outside Canada and the U.S. deal with density and cost?

  I have in the past, but not for the work last year. We have done a number of cross-jurisdictional studies which suggest that other countries have very different regulatory regimes and therefore don't tell us much about how we should do things here.

- We should have a component of the study that addresses at an early stage whether it is possible to reach rigorous conclusions. It is quite possible that the data is sufficiently fuzzy that regardless of how good the models are and how thorough the work is, it may not be possible to reach rigorous conclusions. The data may simply not support the conclusions the theory points to.

- *This segment of today's meeting was to recall the history and how we got here. In the absence of Jay Shepherd to provide the Dr. Woo perspective, Hydro One asked John Todd to try and refresh our memory on this piece. Is there anything in the history that John Todd hasn't covered, is missing or we should be aware of?*

- I don't think the OEB necessarily agreed with either the Elenchus or Dr. Woo evidence when it came out with its conclusions. What the OEB said in its last report is what got you to this meeting today. The OEB has given you your marching orders in terms of what it wants to see. I think the key thing is what Henry Andre will cover in the next presentation.

- Since Dr. Woo and Jay Shepherd are not here, have the studies been fairly and accurately captured? Are we missing any key elements of the study?

- I think John Todd was quite fair to Dr. Woo.

NOTE: John Todd left the meeting at this point.

Distribution Density Study: Background and Scope of Study Discussion

- The first quote from the OEB directive on Slide 2 is the key one.

  Agreed.

- It is worth noting that the "1.00s" for the last four customer classes in Slide 6 are not the result of applying a weighting. They were simply set at 1.00.

  That's correct. Those classes are not density driven, so we simply set them at 1.00. Hydro One has also suggested that seasonal customers should have their weighting factor set at 1.00 because it is not a density based class. However, the OEB said in their decision that we should maintain the existing weighting factors that are in the current model.

- Why are there three residential but only two General Service classes (Slides 4 and 6)?

  Need to distinguish the residential customers who get the Rural and Remote Rate Protection (RRRP). All R2 customers get RRRP. R1customers (greater than 100 customers/customer cluster and more than 15 customers/kilometre) do not meet the legislative criteria. (Henry Andre)

- Some General Service customers (GSe and GSd) also get RRRP, for example farms with a house.

  When the current four year rate harmonization process designed to get us to a consistent set of rate classes is complete at the end of 2011, current GSe/GSd farm customers who get RRRP will be moving to R2. Under the new approved rate classes, only R2 customers will get RRRP after 2011.

- What OEB decision is the moving of GSe/GSd farm customers to R2 based on?

  This was part of the 2008 Distribution Rate Application. I believe the move to R2 resulted in a net reduction for farm customers previously in the General Service class. (Henry Andre)

- Would you do the three tasks on Slide 8 (density definition options, develop data collection methodologies, collect data) sequentially or simultaneously? Would you define the density options and then find the data, or would you look at the data and start to define a category or list of potential density definitions.

  It is a good point and a bit of a chicken and egg problem. If you can't get the data, why even consider that option. You have to have some confidence that the necessary data can be found to assess the options put forward. Nevertheless, I saw the three steps taking place chronologically.

- Looking at the data may lead to the identification of some additional definitions or taking some options off the table.

  I take your point, but perhaps you are confusing collecting the data (Slide 8) with data analysis (Slide 9). The data we see collecting is what drives costs, such as density, asset age, etc. At some point you have to analyze the data and then come to some conclusions as to what classes make sense and potential weighting factors, and then run the data through the cost allocation model to get a sense of the customer impacts.

- The OEB asked you to look at the relationship between density and cost allocation. If you are doing things chronologically (Slide 8), the second bullet (develop methodology to collect data required to assess relationship between costs and density for various density definition options) needs to comes first and needs to be divided into two pieces. Hydro One currently uses certain definitions (customers/kilometre, etc.) as cost drivers. The first question therefore is, are these the appropriate cost drivers to reflect differences in density across the province? In other words, establish the relationship between cost and density. Then it is a matter of determining what data can be collected that would allow you to put some quantification to those cost drivers and understand how these drivers vary across customer classes. Once you have the cost drivers and understand how they vary, you go to the first bullet (develop options for density definitions) and look for "natural or unnatural" density definitions that fall out. Having identified two or three definitions on this basis, you would then proceed to determine the implications of using these definitions (Slide 9).

  What data do you see getting collected?

- Perhaps Hydro One has the right cost drivers and obviously you have to have data on the cost drivers you are using. Hydro One has good data for various customer classes such as customers/kilometre for all its feeders, MWH/kilometre, etc. The question is, are these the appropriate cost drivers? How do a few versus many customers in an area affect the assets needed to serve those customers, and what is the cost? Are the existing cost drivers the right ones, or are there better ones, and if so can you get data for them? If I were to plot customers or MWH per kilometre and came up with a totally linear line, I would have a problem delineating classes because there are no natural break points. But if I had clusters, I could find natural break points and group like customers and separate unlike customers.

- It would be useful to have an explanation as to how the weighting factors (Slides 4-6) were determined.

  I can provide a slide on the methodology as part of the meeting notes (Appendix 4). It is geared to looking at the number of customers within a class that are supplied by various feeders, and how much of the feeder length they take up.

- Could you include in the study scope (Slide 8) other jurisdictions outside of North America with similar demographics, geography, trends over time (urban and rural areas) etc.

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The Elenchus Phase 1 Study provided a review of what is out there in other jurisdictions in terms of policy issues and criteria driving differences in costs. Further review of other jurisdictions is unlikely to be helpful in addressing the OEB's direction to complete the study. However, trends over time are a factor that the study could address.

- Hydro One's service costs are impacted by where it chooses to locate its service depots. Everyone thinks it's more expensive to put in a transformer on a farm because it is farther away. If the service depot is in Wingham, it is more expensive to replace a transformer in Exeter where there is no depot, effectively making this a rural service call. The marginal cost of maintenance therefore has more to do with the proximity of a service depot than urban versus rural or density. The fact that Hydro One chose some years ago to centralize its service depots may have saved some costs but boosted other costs. So one of the things you should look at is not urban versus rural but the cost of getting to the customer wherever they are. I think you will find that you have a lot of urban customers that have the same or higher service access costs as rural customers.

- So what specific data should be collected? (Facilitator)

- Travel distance to the customer from a service depot. Hydro One has about 40 service depots in 13 regions. Each depot will have distinctly different average service costs. The cost of a transformer and installing it once you are on site should be known. The travel cost is not density related because there will be long distance travel to both urban and rural areas. If you don't look at both density and where you put your depots, you will think that the cost driver is the rural area.

- It is a matter of identifying the critical cost drivers. Capital costs account for half the costs in the system and are more critical to get at than OM&A cost.

- Capital cost may prove to be the most important driver. However, eliminating OM&A to focus on capital cost is irrelevant because the key thing about capital cost is when the asset was installed. If asset age is included as a driver in the study, I think you will find that the rural installations are on average much older than higher density installations because the latter are things like sub divisions around Wingham that were built in the late 1980s not the 1940s and 1950s. So the rural services were paid for long ago and the interest cost is no longer there. The capital costs are in the high density areas. So you need to look at the age of capital in urban/rural, higher/lower density. Asset age and distance to a service depot will be far more consequential than the number of pig farmers per kilometre.

- We have to be practical about what data we collect. We could spend a lot of time getting greater granularity only to find that the cost cannot be passed on to a customer group. Does the data that some have suggested we collect even exist for us to harvest from? Does Hydro One track the cost of travelling to a customer from a service depot for all the service areas across Ontario? I doubt it.

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I would have to check. I know we are getting a lot more detail as a result of the new systems we are putting in place. The consultant will have to meet with Hydro One staff and get an understanding of what data is available.

- Yes, getting a handle on what data is available is an important step in order to understand what is possible and practical, now and in the future. Density will have to be studied and re-assessed perhaps every five years. There will be outliers and issues, and people will at the end of the study not be happy about how costs will be allocated. My concern is practicality and the cost/benefit of trying to get data and costs, and whether at the end of the day any of this can be allocated to customer groups. My biggest concern is the impact on customers. As for looking at jurisdictions outside North America, we have looked at this, for example with smart meters. Ontario is different to some extent, so we need to stay within North America. We even have difficulty comparing LDCs within Ontario. There are options for getting data. We have a lot of cost data - the PEG (Pacific Economics Group) report that the OEB has, the triple Rs (Reporting and Record Keeping Requirements) that the OEB has processed that we can get from the year book information, the OM&A data, and the assessment of costs across the LDCs in Ontario. A lot of people were unhappy with some of these methodologies. I think we should use the data that is already available through the OEB and other avenues.

I think there has been some confusion about what the first bullet on Slide 8 means? Before you can say what the relationship is between cost and density, you need to know what you are going to look at for density. Even though the OEB says distance isn't going to be a factor, should it be distance? If so, you need to have gradations if you are going to gather costs by some split, you need to know what the splits are. This is really what the first bullet is saying. How do you want the costs broken down? What are the options – customers/kilometre, distance from service centres, etc.? We may want more than one, but before we go out and look for data we need some ideas about how you want us to break things down. To the extent that these are different from what we currently do, we may have to go to the OEB and say that we have done our assessment and talked to our stakeholders who have suggested we use a new method. If, for example, this new method were distance (which the OEB does not want us to use), we would want the OEB to know about this before we proceed with the study so we are not subsequently told that they didn't want us to look at distance and we are using the wrong density definition.

- Perhaps the elephant in the room is the current definition. Maybe the first task of the study is to blow out of the water or validate the existing definition. If you blow it out of the water, use the work and data that got you to this conclusion to suggest alternative definitions or criteria. Given what John Todd suggested this morning, perhaps we are talking about the sample approach using Hydro One data that to some extent exists or could be developed, in which case you could take a sample of the areas that are now charged density based rates versus those that are not. I think you have to go after that initial definition and once you have validated it (or not), or said that it was made up in the sixties and doesn't make sense today, move on from there.

What does "validate" mean? If we find that there is indeed a differential, that the costs are different for different groupings, is this validation? This would not mean that there aren't better

groupings with more differentiation. It just says that these give you differential costs. These are bell curves with good differentiation between them. Is that good enough?

- What I meant by validate is that the data shows that you have a good definition or that you don't have the best definition and that there is a different definition that is close to that one that is even better that we developed because of the work that you did to validate the initial classification.

- The OEB gave you a clue as to one the first things you could do at a minimal cost. They want you to compare costs of distributors similar to the ones you acquired. That would be fairly easy to do. You have your definition of urban density and you must be able to find utilities that are still independent that could be compared to those urban density clusters. This would tell you whether the rates you've set for those clusters are in the ball park or not and what you are going to have to do. This would tell you if you are on the right track.

  The acquired LDCs are fully integrated into Hydro One's system and are no longer being tracked separately. But we certainly know the area that they represented. We could take the sample area that was formally an acquired utility and try to estimate what it costs to serve this area. But the costs themselves are not tracked by the former acquired utility.

- I would be careful about taking the clusters that were bought up by other utilities because there may be cross subsidization going on. You should be able to find similar utilities that are still independent and look roughly the same as one of your acquired utilities.

  Are you suggesting that doing this would achieve the objective of comparing density and cost allocation?

- It will give you a clue as to whether the rate you've set for urban density is correct and whether the criteria used make sense. Someone suggested earlier that there was no basis for setting up the urban density class in the first place.

  You are getting into something we do not all agree with. (Susan Frank)

- I did not say that the creation of the urban class was wrong, but that the way it was done and the motives at the time were not based on strict cost causality and trying to get fair allocation for everyone. It was done in the knowledge that the urban class would sit outside rural rate assistance. With respect to regional variations mentioned earlier, my sense is that this may not be a good approach because of the policy constraints.

  What do you mean by policy constraints?

- We would be opposing provincial policy, even though it is more costly to serve customers in the North than in the south for a variety of reasons that are driven by latitude (geography, climate).

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- With respect to the service centre issue mentioned earlier, this is a chicken and egg thing. I assume that Hydro One attempts to minimize service costs by optimizing where it locates its centres.

- Traditionally, Hydro One has looked at density with two surrogates - transformers and kilometers of line. You may want to break out your major capital and OM&A program costs. For example, forestry seems to be growing faster than in the past. The issue of whether you should look at past or future costs was raised earlier. When you are busy changing your programs to deal with things like reliability and aging assets, an understanding of future costs will help to set rates that will stand up over time. Many of the acquired LDCs had well aged assets in stable areas.

- On the issue of gathering the data versus choosing the methodology, to the extent that you think you have data that may be a driver of cost, you want to gather as much such data as possible and do relatively "unstructured" analysis without specifically asking preset questions. Technology is available to analyze data and find things that you may not have thought were there. You may find things in the data that tell you there are drivers more important than density.

  So it is how you mine the data?

- You may actually want to get someone who has no utility experience.

- One of the problems with North American utilities is that they have tended to be inward looking and reluctant to look at other jurisdictions. The OEB has suggested you look at other distributors in Ontario similar to your acquired LDCs and I doubt the OEB would be concerned if you also looked at an analysis of similar utilities in other jurisdictions that have different regulatory regimes. In fact, because they have different regulatory regimes, they may have more clearly identified costs based on density and perhaps other factors that could be applied in Ontario. I would also include in the scope some reference to the green energy plan and the implications of the Smart Grid. For example, there might be a school in a remote area that thinks it is paying too high a rate for electricity. What if this school were to take advantage of the MicroFIT program and install solar collectors, thereby receiving 80 cents/kwh for power it puts into the system beyond its own needs. Hydro One would have to get that power to your customers in the area, with implications for the system.

- A practical and efficient way to get at data and the real cost drivers might be to use differential analysis. There are about 40 service centres, each with different densities, travel costs, customer mixes, etc. Presumably Hydro knows in detail what gets spent by each centre. Differential analysis would produce an extremely accurate picture of costs/customer time at each centre. You could add for each centre your weather and forestry events, planned/unplanned outages, etc. Your first cut analysis would therefore provide a great deal of detail on cost factors by customer class and by program, the things you already track. You know your cost by operating centre, and if you know your historical capital cost by operating centre, you would have data that I doubt could be matched by sampling or any search of individual records. If you have more than 20 service centres, you will have tremendous statistical rigour. Fewer than ten might be a problem.

Are you suggesting that rather than using density of customers, we use the physical location of assets, and that customers connected to those assets would have different rates?

- Density will be one of the factors that you will know by service center because you know how many customers, customers by class, average travel distance, how much line, etc. you have per centre. You also know the number of trees/sq. mile, how many trees are close to lines, average age of assets, etc. by centre. Differential analysis will generate very detailed and quite precise indications about the relative importance of the relative costs of each of these factors. This approach will be low cost and will quickly tell you what the real cost movers are, of which density will likely only be one. And if density is not a key cost driver, you will know pretty quickly.

- You said you expect the study to be finished August 2011 (Slide 10) and that you intend to submit it in evidence as part of the next cost of service application. Does this mean near the end of the application?

  No. We will not be filing in August. It will be later than that.

- Don't you need to get 2012 rates?

  We intend to file late in 2011. There are issues in 2011 with Hydro One in particular that will make it difficult to file a distribution application earlier in 2011.

- Will the results of the study be part of the pre-filed evidence? (Facilitator)

  Yes.

- Do you intend to seek more stakeholder input on the study?

  We would provide an update on the study as part of the first stakeholder session on the cost of service application.

Prepared Questions Discussion

1. a) Is now the right time to study rate classification/density (in light of pending TOU rates, Smart Meters, rate increases, etc.)?

   b) How much tolerance is there for rate changes at this time?

2. Is density an appropriate factor to define rate classes?

3. Are there factors other than density that distinguish urban versus rural rate classes?

4. Is there value to more precisely determining the costs applicable to existing density-based residential classes?

5. What are the cost factors applicable to urban and rural rate classes?

6. How precisely should the data collected in the study reflect actual cost of service, and how should these best be determined (e.g., using sample data from Hydro One, using benchmark data from a variety of LDCs, engineering analysis, connectivity analysis)?

- *Rather than eliminating question #1, since Canadian Manufacturers and Exporters (CME) is in attendance today, I would be interested in hearing their reaction to #1. We've heard about their reaction to things that change rates.*

- Are you referring to CME's pre-filed evidence? Is this the evidence that you are proposing on relevance?

    Yes, your pre-filed evidence. We're saying that the CME is concerned that there are many things that are impacting customer rates today, so should we move on those items that will impact rates when we know that this study will have no impact on our overall revenue requirement but some customers will see increases while others will see decreases. Is the CME supportive of driving differences because of the allocation study at this time?

- The CME sees this as an issue that was decided two years ago and again in the last rate case. The OEB has made it clear that it wants this done. It is not up to the CME to now say that this shouldn't be done. We are looking forward and just want this study done in a cost effective manner. So let's move on.

    So is the CME supportive of differing rates based on a study like this? Why do it if there is opposition to changing rates?

- I think we need to see what the study says.

    It will change rates.

- Fair enough, but we don't know how it will change rates. We will not oppose the study simply on the basis that it will change rates. We need to see the study results. The OEB has made a decision to have the study done. It didn't say change the rates.

    But if we knew that we don't want class allocation to change rates, we would write to the OEB and say that there is no sense in doing the study and incur the cost if we are not prepared to change rates on the basis of cost allocation.

- CME cannot take the position that we don't ever want to change rates. We are not opposed to the study. Let's see what it says.

- So the CME is saying that there is an interest in getting greater clarity around density and cost allocation. (Facilitator)

- Yes. The CME has publically supported doing the study in accordance with the OEB's direction in previous rate cases. Is anyone opposing conducting the study?

  Not officially.

- There may be people who take issue with the way that the study should be done, but the CME does not oppose doing the study.

- The Green Energy Plan will have a huge impact on Hydro One's cost structure, including distribution, in the years ahead. It will impact Hydro One far more than any other utility. What is the point of doing the study now if Hydro One's cost structure may change because of the Green Energy Plan? You would have to do the study all over again. And with the Green Energy Plan coming down the pike, you do not want to change rates tomorrow.

- So what you are saying in terms of recommendations regarding the scope of the study is: (Facilitator)
  - consider the impact of the Green Energy Plan
  - to the extent possible, consider the future as well as the past
  - a better understanding of the relationship between density and cost allocation does not imply that rates need to change immediately

- *I think there is a fourth point. Why do the study now based on the current paradigm if the environment is going to change so much that the results of the study may not be valid and might have to be re-done.*

- That raises the question of the level of effort that should be put into the study if you do the study now (Facilitator)

- I think you do a "quick and dirty" study and submit it to the OEB.

- The differential analysis approach will give you a cost effective and relatively quick method to identify the cost factors. I don't think there are enough green energy customers, apart from conservation (which is simply load shifting) to make a significant difference to Hydro One's cost structure. Green energy is one of several hundred cost factors and will not have a significant impact on outages, or weather, or trees. In distributed generation, we have 16,000 solar panels if they all get built. This will not have a big impact on a million plus customers. Are there factors other than density? Almost certainly, and they are asset age, distance, the location of service depots, etc.

- I think you need to look at the "topography" of the system in relation to customer groups. For example, in many of the small utilities that Hydro One bought the customers are fairly dense but

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served by fairly inefficient systems (lots of losses, more station maintenance costs over the long term). In some of the rural areas, the feed is now directly out of transformer stations and sub-stations are no longer needed. You may find that when you look at the total topography, not all the costs are going in one direction towards high density, but in the opposite direction. Look at the major elements of cost. What we have in Ontario is history, with half a dozen different voltage levels that were brought in over time in different parts of the province, and over time a lot of the old stuff has been taken out. Ten years ago, Hydro One bought a lot of assets that had not been harvested for a long time. These were old, high density and perhaps higher cost to maintain. They may even have higher costs associated with them than some farms that don't even have a sub-station associated with them. This isn't a simple distribution transformer and rural line issue. It is about what assets serve specific customers.

- Vegetation management costs are very significant in the rural areas and almost nothing in urban areas of the system and should be allocated accordingly.

  Would you agree that another big element of Hydro One distribution costs is storm costs? A big factor in outages during storms is vegetation.

- Storm management costs are related to poor vegetation management programs. They are very closely linked. If you were up to date on vegetation management, you would not have so many storm outages. Last weekend I went through an eight hour outage, and they had just cleared the line but they missed a few trees which fell during the storm.

  We are trying to get the cycle down as short as possible.

- We have talked about using the sample method to get costs. Perhaps if you find that the data is not very good or meaningful, or that the data is hard to get using this approach, you could use engineering studies and simulations as a secondary approach. This might give you data from two different perspectives. I said earlier that you could test the current density definition to see if it is good or bad, and maybe you come up with something else. As we saw in the evidence from Elenchus and Dr. Woo, everyone else uses municipal boundaries rather than density. So if necessary, I would say that the last step in the analysis is to consider the pros and cons of using municipal boundaries in Ontario.

- Your suggestions are really about methodology and address question 6. (Facilitator)

- Does Hydro One have a sense for the impact on the cost of the study in relation to which approach is used – sampling, engineering, econometrics?

  We have not yet priced the study and we have not looked at what it would cost as a function of the three approach options. We initially thought we would use a single approach and one that provided rapid results, keeping in mind the OEB's direction regarding timeliness and cost efficiency. We had not considered multiple approaches, although that suggestion has been made today.

We have looked at and attempted to do this study before. Our initial sense when we assumed a simplistic single approach was that the study costs would be in the $250,000 range. Once you assume the need for more detailed and better data, multiple testing, feeder information, etc., you are likely in the $1- 1.5 M range. So this is not an inexpensive study. We would like to only do it once and then put the issue aside for 10 or 15 years. We don't want to have to repeat it. You will not get what you are asking for, for $250,000.

- Clearly, we must balance cost effectiveness with how much work we do. Once you get an idea of what the cost will be, I think you should come back to this group or the OEB with your assessment of what you think is cost effective to do.

  What is cost effective? What is the upper limit?

- I don't know. I can't tell you in a vacuum.

- How long has the current rate design been in place? Perhaps 30 or 40 years. Has it ever been looked at in all this time? Very little money has been spent in all these years to look at this question. Maybe this should be taken into account.

  The OEB probably has a better idea of costs because it had some proposals and started a rate design study and then stopped or delayed it.

- Density was not the issue in that work. It was more about fixed and variable costs in the context of harmonization. We are going back to at least one hearing prior to 2008. Customers in acquired utilities were assigned to Hydro One classes. The question that was being asked was how these classes to which customers were being assigned got formed in the first place because there were significant bill impacts (arbitrary 10%/year bill increases during the phase-in years). The short answer as to how the classes came about in the first place was that nobody remembered and that it might have had something to do with cost. Density-based rates and factors were really inherited, so the OEB was asked and did take a lot on faith. The OEB has never said do away with the existing system, but show us that it is a good idea and that it is better than the alternatives.

- We are actually doing two things. Hydro One has a cost allocation system that allocates certain costs using a density parameter. You could do that even if you had only one residential and one general service class. You could still use the density cost drivers to come up with different costs for each class and have an average rate for each class. Secondly, within those broad classes perhaps there is such a vast range of customer density that it might be worthwhile breaking them up into more than one class. Then you have to ask whether it is worthwhile splitting up the classes and what is the best way to do it. This study will do two things: how should we allocate costs (should we use a density-based cost driver to allocate between classes?), and what is the best definition of classes. These are very different questions but they both need to be addressed by the study.

- There was a question of cost effectiveness and how you measure it. Total distribution costs will remain the same. We don't expect to see a saving. But we should expect to see higher costs for customers who have been benefitting from hidden cross subsidies related to density or other factors, and lower cost for customers who have been paying that cross subsidy. When the study reveals these facts, a decision can be made with respect to the efficiency of either continuing or reducing or removing the cross subsidy. The density-related cross subsidy might be economically and socially productive or it might be shown to be destructive. This is where the cost effectiveness comes into this. If the cost of the study relative to the improved system efficiency over the years is low, then it will have been cost effective.

- I think there are two elements to cost effectiveness. Without looking at what the results will lead to, how much is this study going to cost? It will cost different amounts depending on whether we buy the Lamborghini, the Mercedes or the Pinto. We could go into a level of granularity to the point where the study has no return at all. I think we should ask how detailed the study should be in relation to the cost, and whether the price tag will be worth it.

  The bigger the scope the more it will cost. At some point you have to say the scope is too big, so rein in the scope or the cost will be too high.

- The other issue on cost effectiveness is that once you have the study results, you have to ask yourself whether it makes sense to change the status quo, given that there will be winners and losers. Is it worth doing? We have to look at this after the study is completed.

  Does it make sense to spend perhaps $1.5M if we are not prepared to have winners and losers and make changes to get closer to cost driven rates? If we are prepared to make big changes, then we need to get it right and that is an expensive study. If we are only prepared to do minor tweaking, perhaps we do a "quick and dirty" study. The extent to which we are prepared to make big changes seems to me to be the basis on which we should decide how much money we want to spend on the study.

- It is difficult to make decisions in the abstract and without knowing what the study will say. We can't say yes or no to big moves at this point. The OEB has said that this study is necessary and that they want it done. We can't make a decision about change in a vacuum. We need to see the study results first.

- Since the outcome of the study cannot be known before it is completed, can we give Hydro One a reasonable guideline in terms of the cost effectiveness of the study or an upper limit on its cost? (Facilitator)

- I think we are confusing change with shock. The biggest change that residential customers have experienced in recent years has been harmonization. The OEB and Hydro One were very careful to spread that out over time. If the study recommends big changes, it will likely be gradual.

- Do you have a suggestion as to what a reasonable cost would be to get there? (Facilitator)

- My criterion would be to do a study that produces results that provide the OEB with useful information and direction.

- Irrespective of the cost? (Facilitator)

- I don't think this is a $10M study.

- There are politics at play as well that need to be considered. Hydro One alluded earlier to filing late in 2011. This is probably related to the coming election. It may be prudent for Hydro One to file after the election.

- I believe that the study can be done using differential analysis at a reasonable cost – under $500,000. It will be worth it provided that people stick with the outcome and that the changes are phased in and that the transition costs are treated reasonably.

- Is there any disagreement with the earlier statement that the study should cost as much as it takes to get valuable and reasonably valid information? (Facilitator)

- We don't know how much it will cost to get valuable data at this stage. Surely there is something that is cost effective and will provide valuable information, but we can't simply agree to a blank cheque and say go get whatever you need and think is valuable.

- The sky is not the limit but surely we want to do this. There may be winners and losers, but what we are trying to do is come up with a more fair and accountable way of allocating costs.

- We are in favour of doing the study, but we can't commit carte blanche and in advance to have everything that comes out of the study implemented.

  My question was- if the study suggests changes and there are winners and loser, are you prepared to make some change? Or will you say this is not the time for changes with winners and losers because there are already too many other changes happening and we don't want another one. If we know today that we don't want any change, why do the study?

- Who knows what Ontario will look like when you file late next year. We are changing at a pretty rapid pace. I am not saying today that we don't want any change in the future. We will be having that debate in a year and a half from now, depending on what the study says and on the scope of the recommended changes, if any. The study may find the current density-based rates are appropriate).

  Our rates today are not cost based, and that is where we are going.

- I don't think the study is going to produce cost based rates.

Yes it will.

- Closer to cost based rates.

- One question is whether the study will tell you that you should be using different cost drivers or weightings in your allocation. If it does, it will impact the revenue/cost ratios for existing classes and the OEB has ways of managing this situation – modest adjustments every year or no adjustment, etc. The study may tell you to drill down further into the cost drivers which may reveal different ways to split or group customer classes so customers in the same class have similar cost characteristics from a density perspective. The study may also tell you that density is worth taking into account. We currently have different rates for R1 and R2, but we also have different load characteristics. Perhaps the load characteristics are driving the difference in rates as much as density. To date no one has really looked at this. Density may not be the critical issue. It may be something totally different. You have a system built around energy and you have different load factors, but we're looking at everything based on demand. You may come up with a different definition of cost, but I'm not sure how much this will help.

- On the Transmission side, Hydro One has spent a lot of money on studies and intervener funding (AMPCO) on very similar issues, no doubt well in excess of $200,000, and we still don't have answers. I think we need to acknowledge this and ask the question - what the most appropriate way is to divide up the pot.

  We are spending large amounts of money in our Transmission business to look at very similar issues – how do you change the allocation to make sure the right party pays. If this is the right time to do that in Distribution, we are ready to do so, and to do it carefully and thoroughly. I understand the earlier arguments that we need to use multiple approaches so that the results are comprehensive and defendable and we only do the study once. As long as I have some comfort that we are prepared to start some change based on whatever is determined by the OEB, I would feel that the money was well spent. What I struggle with is the concerns some have expressed today about customer impacts and that we may not be prepared to make any changes. The money will not be well spent if we are not prepared to do anything or if we are simply doing a study because it is interesting and informative. In the Transmission case, I think there is value in having spent a lot of money because I do think change is a possibility. I would like to know that this is the case in Distribution. I think I did hear the CME feels there is value in spending the money. I would still go to the OEB and say delay the study for green purposes because we don't know the cost and we will not deal with the customer impacts.

- You can't use the Green Plan to delay. On the contrary, because of the green issues we need to accelerate things.

- Let's get it done before the next election. We are prepared for winners and losers because this is normally how you reverse the current winners and losers. I think that Hydro One should have some time in the study schedule for stakeholder contact with the contracted consultant prior to finalization of the report.

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- Can you clarify what you mean by "before finalization of the report" and what the objective would be? (Facilitator)

- Stakeholders should meet with the consultant and Hydro One when the results of the model have been run. There may be other items that may need to be taken into consideration. This would be similar to what Union Gas is doing right now.

- I would be concerned that meeting with the consultant might skew the results of the study. My concern is that I'm not comfortable with the current ToR and I think it's important to get them right. Could we have another iteration?

- Getting stakeholder input on the ToR was the purpose of today's session. Are you saying that once today's input has been incorporated, send the ToR around to stakeholders again? (Facilitator)

- You could do a quick scan in advance for probable winners and losers of all kinds, not just density related – low volume demand customers, remote customers, customers who have more than one substation serving their area, etc.

- Maybe we should be using different language than winners and losers. We may want to say that people who have been underpaying in the past will be paying something that is a little closer to what they are actually getting.

- It may be worthwhile to touch base with stakeholders at the point in time in the study when you are defining what new customer classes/breaks/groupings/definitions you are going to test based on the analysis of the cost data that you got. There is a lot of time and work involved in running these through the cost allocation model, so you don't want someone to say later that you didn't run the right ones. It would be useful to get some agreement in advance before doing the detailed analysis.

- Think about how accurate the results have to be and how granular a solution we want. Different degrees of resolution produce different costs. It may be a bit easier to get on with the study if you start with a bandwidth of plus or minus 15% of cost to split out groups.

- It is still not clear to me whether the study will only look at customer classes that currently have density-based rates, or will it look at the entire retail system (sub transmission, street lights, distributed generation, seasonal, etc.).

  The intent is to focus only on the current residential and general service classes, but as was mentioned earlier, the data may suggest different ways to split classes.

- The first thing to do is identify what the cost drivers are and then figure out where it makes a difference in cost allocation in distinguishing customer classes.

APPENDIX 3

MEETING EVALUATION FORM

and

CONSOLIDATED RETURNS

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2012/2013 Distribution Density Study

Stakeholder Consultation

Consultation Evaluation Form

This session was a follow-up to the May 2009 discussion initiated by Hydro One for the purpose of conducting a dialogue with its stakeholders regarding the 2012/2013 Distribution Density Study ordered by the Ontario Energy Board.. Your feedback is important to us. Please take a few moments to fill out this evaluation form.

Name (optional):_____

Material presented in this session included an overview of the Density & Cost Allocation Study and Rate Implementation. Please rate each component by circling the appropriate number.

1. The information presented was clear:	Strongly Agree	Agree	Disagree	Strongly Disagree
Density & Cost Allocation Study	1	2	3	4

Comments:

_____

_____

2. I had adequate opportunity during this session to share my views with Hydro One on:	Strongly Agree	Agree	Disagree	Strongly Disagree
Density & Cost Allocation Study	1	2	3	4

Comments:

_____

_____

Please turn over…

_____

Thank you for your comments.

3. Hydro One was open to the   Strongly Agree Disagree Strongly
issues and recommendations I   Agree   Disagree
raised about:

Density & Cost Allocation   1   2   3   4
Study

Comments:

_____ _

_____

4. Overall, this consultation   Strongly Agree Disagree Strongly
session met my expectations: Agree   Disagree
                                      1   2   3   4

Comments:

_____

_____

5. Overall, the preparation   Strongly Agree Disagree Strongly
package was thorough and   Agree   Disagree
included all relevant and
essential information for the   1   2   3   4
session:

Comments:

_____

_____

Please provide us with any additional comments you may wish to make:

_____

_____

Please submit your completed forms before you leave, <u>or</u> fax to the number below **NO
LATER THAN September 15, 2010**. If you have any comments or questions, please
contact: Ms. Enza Cancilla, Manager, Public Affairs, Tel: 416-345-5892; Fax: 416-
345-6984 Email: enza.cancilla@HydroOne.com
_____
                    Thank you for your comments.

2012/13 Distribution Rate Application
Density and Cost Allocation Study
Stakeholder Consultation Session, September 8, 2010

hydro one

Six participants submitted comment sheets after the session was concluded. The table below presents the comment sheet responses received.

	Strongly Agree	Agree	Disagree	Strongly Disagree	No Response
1. The information presented was clear.		5	1		
Comments	• Good summary – assisted in the discussion. • Suitable to get discussion started, but several preconceptions created confusion, took time.				
2. I had adequate opportunity during this session to share my views with Hydro One.	4	1	1		
Comments	• Too short. • Very open and animated discussion.				
3. Hydro One was open to the issues and recommendations I raised.	1	2			3
Comments	• Hydro One was looking for input. • Remains to be seen. • Energy Probe suggested a meeting of intervenors with the appointed study consultant prior to preparing the report. VECC supported this. No response from Hydro One to date.				
4. Overall, this consultation session met my expectations.	1	4	1		
Comments	• Poor facilitation.				
5. Overall, the preparation package was thorough and included all relevant and essential information for the session.		6			
Comments					
Additional Comments	• Difficult issue and topic. Well done! • Shall send a list of service depot parameters.				

APPENDIX 4

DENSITY WEIGHTING METHODOLOGY

Excerpt from Exh. G2, Tab 1, Sch. 1 of Proceeding EB-2009-0096

3.0   DENSITY WEIGHTING FACTORS

Density factors have been incorporated as weighting factors for Overhead lines and Transformers, consistent with the customer classes approved by the Board that are based on Density definitions. The Density definitions are unchanged from Proceeding EB-2007-0681.

For lines, Customer Density weighting factors were developed by calculating for all feeders the number of customers by customer class on each feeder and assigning the total distance of the feeders to the various customer classes proportionally. A similar method was used to develop Demand Density weighting factors, by using energy by customer class by feeder and total energy supplied by feeder to assign the feeder length for each feeder to customer classes proportionally.

For transformers, Customers Density weighting factors were developed by calculating Net Book Value of Transformation Assets by feeder and assigning the total Net Book Value of Transformation assets by feeder to the various customer classes proportionally. A similar method was used to develop Demand Density weighting factors, by using energy by customer class by feeder and total energy supplied by feeder to assign the Net Book Value of Transformation assets for each feeder to customer classes proportionally.

Interrogatory Response Exh. H, Tab 12, Sch. 66 in Proceeding EB-2007-0681

Vulnerable Energy Consumers Coalition (VECC) INTERROGATORY #66 List 1

Interrogatory

Reference: Exhibit G2, Tab 1, Schedule 1, page 2

Preamble: *Section 3.0 outlines the approach used to determine the density weighting factors for lines and transformers. The text states that for lines "customer density weighting factors were developed by calculating for all feeders the number of customers by customer class for each feeder and assigning the total distance of feeders to the various customer classes proportionately".*

Question:

a) Please provide a schedule that sets out all of the USOA accounts that are allocated in whole (or in part) based on density weighted allocation factors.

b) With respect to the schedule provided per part (a), please indicate for each USOA account the density factors for each customer class used in weighting customer and/or demand allocators.

c) Please provide more details as to how the density factors for lines were determined, such as:
   - For which overhead lines (i.e. voltages) were density factors calculated? Related to this, for which categories of overhead lines (Sub-Transmission, Primary and Secondary) were density factors developed
   - It appears that the analysis was done by "feeder". Please describe what the definition of a "feeder" is in this context. Are feeder voltages specific?

d) Please provide an illustrative example of how the Customer density weightings for lines were determined assuming a small number of feeders that represent the cross-section of the line voltages in Hydro One's distribution system with a mix of customer classes connected to each.

e) To what types of transformers are weighting factors applied for purposes of allocation? In contrast, what transformation facilities are allocated without the use of density weighting factors?

f) Was the same definition of feeder (page 2, line 15) used for the development of the transformer weightings?

g) For purposes of the transformer weightings, is the feeder identification used to associate transformers to feeders based on the high or low side voltage of the transformer? Please provide the rationale for the choice.

h) Please confirm that for the Transformer Customer Density weightings the NBV of the transformers on each feeder were assigned to customer classes proportional to the number of customers by class using the feeder. Please provide an illustrative example.

Response

a. The following USofA accounts are allocated with density weights.

1830-3B	Bulk Fixtures - Retail
1830-4B	Primary Fixtures - Retail
1835-3B	Bulk Conductors - Retail
1835-4B	Primary Conductors – Retail
1850-2	Rural Transformers

The resultant Net Fixed Assets [NFA] and Operations & Maintenance [O&M] are thus also impacted because these asset accounts impact the NFA calculation while O&M allocation "piggy-backs" on the relevant asset.

A full listing impacted USofA accounts is contained in Exhibit G2, Tab 1, Schedule 1, Attachment A, E2 TB Allocation Details pages 124 to 134.

b. The density factors per rate class are presented below:

	Lines			Transformers	
	Customer	Demand		Customer	Demand
UR	0.19	0.18		0.77	0.75
R1	0.66	0.64		0.93	0.88
R2	1.61	1.42		1.23	1.12
Seasonal	1.20	1.60		0.87	1.28
GSe	1.11	1.15		1.00	1.04
GSd	1.14	1.18		1.05	1.01

UGe	0.24	0.18		1.03	0.79
UGd	0.31	0.30		0.76	0.94
Dgen	1.00	1.00		1.00	1.00
ST	1.00	1.00		1.00	1.00
St Lgt	1.00	1.00		1.00	1.00
Sen Lgt	1.00	1.00		1.00	1.00

c. All lines were included in the analysis to derive density weights. A feeder is a distribution line. Yes, feeders are voltage specific in that they connect from a station.

d. The following is a simplified overview of the density weights derivation.

Connectivity data exists to connect customer by rate class to feeders. The length of the feeder is also known. Based on the share of customer per rate class, a portion of the feeder is allocated to the rate class. This process is done for all over 3,000 feeders and total allocated km per rate class are determined.

Based on the total allocated feeder km per rate class, the km/customer metric is derived.

The weights are then determined by weighing the km/customer by total customers as outlined below for each class grouping, (i.e. Residential, General Service energy billed, General Service demand billed).

Connectivity Data

Feeder	Km	Class 1	Class 2	Class 3	Total Class
1	10	5	20	10	35
2	20	10	10	20	40
3	30	15	5	20	40
4	40	20	5	10	35
Totals	100	50	40	60	150

A

Allocated km

	Feeder	Km	Class 1 km	Class 2 km	Class 3 km
	1	10	1.4	5.7	2.9
	2	20	5.0	5.0	10.0
	3	30	11.3	3.8	15.0
	4	40	22.9	5.7	11.4
B	Total km	100	41	20	39

C=B/A	km/cust		0.81	0.50	0.65
A	Cust	150	50	40	60
D*	**Wts**		**1.22***	**0.76**	**0.98**
E=DxA (Check)	Wted Cust	150	60.8	30.3	58.9

D*= Wts $0.81 \times 150 / [\, 0.81 \times 50 + 0.5 \times 40 + 0.65 \times 60\,] = 1.22$

e. The transformation assets captured under USoA 1850-2 for the Rural retail customers are density weighted. The small transformation balance that has been isolated to serve the ST class as part of USoA 1850-1 is not density weighted.

f. For the transformation density weights, the feeder length is replaced with connected rural transformation Net Book Value per feeder. The feeder definition is consistent with that for Lines.

g. The association of transformation to feeders does not consider the high or low side connection. Based on Hydro One's Distribution Outage Response Management System, each feeder is listed with attached transformers by size category. For each feeder, the number of transformer per size category is added up and an average net book value per transformer size is used to estimate the net book value of transformation attached per feeder.

h. Yes, for the Transformer Customer Density Weights, the NBV of transformers is allocated to rate classes proportional to the number of customers by class using the feeder. The example presented in Part d with feeder km replaced with feeder NBV would be an illustrative example.