TECHNICAL CONFERENCE UNDERTAKING - JT 3.1

JT 3.1

To please provide a revised version of Appendix 2-AA, and Sec-49 Attachment A, on the same basis as Jt1.1. Please also provide update opening 2021 rate base and revenue requirement impact during the plan of any update to the 2020 in-service addition forecast.

RESPONSE:

A response to this undertaking will be provided in full on August 5, 2020.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.2

JT 3.2

To determine whether the fleet maintenance costs are material and if so to report on them.

RESPONSE:

Fleet maintenance costs for the 2016-2021 period are shown in Table A.

Table A – Summary of 2016-2021 Fleet Maintenance Costs ($'000,000s)

	2016 Historical Year	2017 Historical Year	2018 Historical Year	2019 Historical Year	2020 Bridge Year	2021 Test Year	CAGR[1]
Fleet Maintenance[2]	$0.7	$0.7	$0.9	$0.9	$0.8	$0.7	(2.2%)

[1] CAGR represents the compound annual growth rate between 2016 and 2021.
[2] This includes materials and outside services.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.3

JT 3.3

Re DRC 8, (a) to provide updated actuals (b) to provide the associated growth rate projected out over the 2021-2025 test period.

RESPONSE:

a) As per the analysis set forth in Attachment DRC-8(A): Hydro Ottawa Electric Vehicle Charging Impact Analysis - City of Ottawa Service Area, the population of electric vehicles ("EVs") within the utility's service territory is estimated by applying the proportion of EVs to light vehicles ("LVs") across Ontario to the forecasted population of LVs in Ottawa. Per the reference list in Attachment DRC-8(A), Ontario's 2018 actual sales statistics were taken from the Electric Mobility Canada ("EMC") report entitled *Electric Vehicle Sales in Canada in 2018*. This report was retrieved from EMC's public website on August 15, 2019. As of the time of writing this response, the report containing Ontario's 2019 actual sales statistics has not been released. As a result, the 2019 figures in Table A below remain estimates.

b) Table A shows the estimated EV population and year-over-year growth trends for the 2019-2025 period.

Table A – Projected Ottawa EV Population and Growth Rate

Year	Ottawa EV Population	EV Population Growth (%)
2018	2,959	61.0%
2019 (F)[1]	4,832	63.3%
2020 (F)	7,655	58.4%
2021 (F)	11,631	51.9%
2022 (F)	16,970	45.9%
2023 (F)	23,863	40.6%
2024 (F)	32,508	36.2%
2025 (F)	43,105	32.6%

[1] (F) denotes forecast.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.4

JT 3.4

To do modelling on the transformer size and the number of homes that would be connected should we use a 10 percent peak load rather than 50 percent on-peak.

RESPONSE:

According to the information presented in Attachment DRC-8(A): Hydro Ottawa Electric Vehicle Charging Analysis - City of Ottawa Service Area, if current trends continue, electric vehicles (“EVs”) will represent over 60% of light vehicles (“LVs”) by the year 2039. Underground residential distribution (“URD”) transformers are installed to last for at least 30 years. EV technology is growing rapidly, with larger batteries and longer ranges, which will affect how customers charge their vehicles. URD subdivisions, once built, cannot be modified easily to accommodate these changes. If additional transformation is required in a URD subdivision due to it being undersized, it is an expensive and customer-invasive project.

In assessing the impact of EVs at the URD transformer peak (which is not the same as system peak), it was recognized that the scale of EV charging (assumed at 7.7 kW for a Level 2 charger, though an 11.5 kW model is currently available) compared to Hydro Ottawa’s average historical residential consumption at the time of peak transformer loading (4.5 kW average for 12 customers diversified according to diversity factors in the *Ontario Electrical Safety Code*) holds the potential to shift the timing of when an individual URD transformer would experience its peak load.

In modeling the “worst-case” protective scenario, it was assumed that any individual padmounted transformer will be subjected to 100% EV loading (each unit connected to the transformer having one EV using a Level 2 charger) at the transformer peak time. This assumption was made through considering (a) the expected amount of EV penetration by 2039, and (b) the expectation that after an extended outage, the cold-load pickup driven by the combination of home appliance, space heating, and EV load will realistically lead to an extended period of peak loading and must be protected against.

To anticipate technological improvements to residential load management, it was assumed that by the time 100% EV penetration is experienced on an individual transformer, demand response options will be in place to limit the total EV coincident loading down to 50% during peak load. By making these assumptions about on-peak charging load, Hydro Ottawa is balancing current and future customer needs against a “worst-case” load increase, while mitigating risk of additional transformation and circuitry being added into already developed underground residential subdivisions.

During this early adopter phase, understanding the future state of EVs with certainty is simply not possible, so a conservative estimate is considered to be appropriate at this time. Hydro Ottawa is reviewing these assumptions and will be improving its modeling of EVs and their impact on transformers as additional data and studies become available. As such, caution is suggested when interpreting what a 10% on-peak EV load represents at the transformer level, both now and in the future. Using a 10% on-peak load instead of 50% on-peak load yields the results presented in Table A.

Table A – Transformer Sizing

XFMR Size (kVA)	Maximum # of Homes		
	New Standard	Current Practice	10% on-peak
50	5	10	7
75	8	25	13
100	12	37	18
167	20	51	37

TECHNICAL CONFERENCE UNDERTAKING - JT 3.5

JT 3.5

To indicate the impact of amazon's electrification plans on the load forecast.

RESPONSE:

Due to privacy concerns, Hydro Ottawa does not provide customer-specific information regarding loading or load forecasts, and is therefore not able to provide a response to this undertaking.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.6

JT 3.6

To provide details on funding and cost sharing mechanisms for the light rail transit project

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RESPONSE:

Hydro Ottawa's cost sharing methodology with respect to the City of Ottawa's Light Rail Transit ("LRT") project depends on the scope of work being completed. Work for the LRT project occurs through three separate capital programs:

New Commercial - the connection assets to provide service to the power stations. Projects under this program are expected to be 100% customer-funded.

Plant Relocation - the relocation of existing overhead or underground equipment to accommodate road work or LRT requirements. Depending on the specific scope of work, projects may be 100% customer-funded or cost-shared with Hydro Ottawa through applicable provisions of the *Public Service Works on Highways Act*.

System Expansion - the extension of Hydro Ottawa's main electrical system subject to economic evaluation based on customer load and future revenue, as specified in the OEB's *Distribution System Code* ("DSC") and the DSC's Appendix B. Projects under this program are offset based on the economic evaluation process.

For the completed years of 2016-2019, the customer contribution overall was 75%, with the specific customer contribution for the above programs being the following:

- **New Commercial**: 100%
- **Plant Relocation**: 80%
- **System Expansion**: 35%

TECHNICAL CONFERENCE UNDERTAKING - JT 3.7

JT 3.7

To clarify hydro ottawa's knowledge of refurbishment programs that involve injections

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RESPONSE:

Hydro Ottawa does not currently refurbish wood poles through the use of injection technology.

Hydro Ottawa has knowledge of wood pole refurbishment programs and technologies through participation in the Centre for Energy Advancement through Technological Innovation's ("CEATI") Distribution Line Asset Management program with other electrical power utilities. In particular, Hydro Ottawa sponsored the CEATI report *Wood Pole Refurbishment Technologies - Technology Watch*, published in July 2020. As part of its continuous improvement activities, Hydro Ottawa will evaluate best maintenance and renewal practices as well as perform needs and benefit assessments of emerging technologies, such as those identified in the CEATI report.

Technologies that Hydro Ottawa has reviewed include the following:

- The use of boron rods has been explored for use on wood poles to prevent internal decay; however, the cost was prohibitive in applying this technology across the entire asset class.
- A technology review was completed on the use of steel struts to temporarily support and strengthen the pole and a trial application has yet to be initiated.
- The use of a filling compound for woodpecker holes is currently in use; however, it is used to deter further damage by the woodpeckers rather than refurbish the pole.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.8

JT 3.8

To confirm the annual growth based on the load forecast in use for the purposes of this application, including customer growth rate and average compounded customer growth rate for 2021, 2022, 2023, 2024, and 2025

RESPONSE:

Using the customer count for 2021-2025, as presented in UPDATED Exhibit 3-1-1: Load Forecast, Hydro Ottawa anticipates total customer growth over the 2021-2025 period of 3.50%, as shown in Table A.

Table A – Total Customer Growth 2021-2025

Rate Class	2021	2025	Difference	Growth Rate
Residential	316,346	327,975	*11,629*	**3.68%**
GS <50 kW	25,391	25,987	*596*	**2.35%**
GS >50 kW	3,188	3,044	*-144*	**-4.52%**
Large User	11	11	*0*	**0.00%**
TOTAL	**344,936**	**357,017**	***12,081***	**3.50%**

Based on the same customer count for 2021-2025, the compound annual growth rate (“CAGR”) over the 2021-2025 period is forecast to be 0.86%, as shown in Table B below.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.9

JT 3.9

To calculate whether there would have been earnings sharing if the dead band of 150 basis points had been in place during the last term.

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

Table B – 2021-2025 Customer Count CAGR

Rate Class	2021	2022	2023	2024	2025	CAGR
Residential	316,346	319,386	322,306	325,150	327,975	**0.91%**
GS <50 kW	25,391	25,554	25,704	25,846	25,987	**0.58%**
GS >50 kW	3,188	3,153	3,117	3,081	3,044	**-1.15%**
Large User	11	11	11	11	11	**0.00%**
TOTAL	**344,936**	**348,104**	**351,138**	**354,088**	**357,017**	**0.86%**

TECHNICAL CONFERENCE UNDERTAKING - JT 3.10

JT 3.10

To advise what became of the voltage profile management initiative and provide an update.

RESPONSE:

Hydro Ottawa continues to review new and emerging technologies and potential Conservation Voltage Reduction ("CVR") options. In 2019, Hydro Ottawa partnered with a vendor to pilot a Grid Edge Volt/VAr Control ("VVC") solution. The units were deployed on feeders in the Kanata North area at predetermined pole mounted transformer locations as a non-wires alternative to assist with capacity constraints in this area. The primary focus of the project is to reduce energy demand to deliver energy savings and improve power quality at the secondary voltage locations. The units have been fully deployed and six-week voltage reduction testing in the Kanata North area commenced in early July 2020. The pilot project is expected to be completed by the end of 2020.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.11

JT 3.11

To provide an update on the further loss reduction studies referred to in the last sentence of p.3 of IRR ED-1 Att. A and to file the further studies.

RESPONSE:

Hydro Ottawa acquired the tool to extract all of the information required to build the network model directly from the Geographical Information System ("GIS") Database. Some roadblocks were encountered for enabling the full functionality of the Switching Optimization Module ("SOM") at a system level, including accuracy of the network model as well as equipment specification information required for this type of analysis. Hydro Ottawa is working on improving the accuracy of the network model and equipment information to be able to run system engineering analysis since it will also contribute to the successful deployment of the Advanced Distribution Management System ("ADMS") platform. Timelines will be in alignment with the ADMS.[1]

[1] For more information on the ADMS project, please see Section 2.4 of Attachment 2-4-3(E): Material Investments.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.12

JT 3.12

To provide an update on the voltage conversion work, included completed and planned projects.

RESPONSE:

Table A provides an update on voltage conversion work completed or planned to be completed by Hydro Ottawa.

Table A – Voltage Conversion Projects & Year of Completion

Voltage Conversion Project	Year Completed/Planned
Uplands 8kV	2011-2012
Kilborn 4kV	2012
Woodroffe 4kV	2013-2016
Prince of Wales Voltage Conversion	2015
Rideau Valley Voltage Conversion	2015
Convert Vaults on SA19	2016
Richmond Voltage Conversion – Shea	2016
Richmond Voltage Conversion – McBean	2016
Goulbourn St Voltage Conversion	2016
Glen Cairn Voltage Conversion	2018-2019
Richmond South Egress – Garvin East	2019
Richmond Voltage Conversion – Huntley	2018
Richmond Voltage Conversion – Perth East	2019
Richmond Voltage Conversion – Perth West	2018
Goulbourn Street Voltage Conversion	2016
Convert Vaults SA24/SA14	2018
Burke St (Richmond) Volt Conversion	2020
Fortune St Rebuild	2020
West 12kV Voltage Conversion	2020-2025
South Nepean Rural 8kV	2023-2024
Navan Road 8kV Voltage Conversion	2023

TECHNICAL CONFERENCE UNDERTAKING - JT 3.13

JT 3.13

To provide an update on a revised loss formula by the end of 2012 using newly available smart meter data.

RESPONSE:

This undertaking relates to section 5 of the document that was submitted as Attachment ED-1(A): H4-3-1 Distribution Loss Update. This document was originally made available on the public record in conjunction with Hydro Ottawa's 2012 distribution rate application. Section 5 of this document noted that Hydro Ottawa had planned to leverage newly available Smart Meter data to assess and, if necessary, develop a revised loss formula by the end of 2012.

In 2015, Hydro Ottawa published a working procedure for calculating losses. Though the general methodology of quantifying the losses has not changed, various factors used in the formula – such as loss factors and the cost of transmission, distribution, and energy – have been subsequently updated.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.14

JT 3.14

Mr. Elson's omnibus undertaking.

RESPONSE:

Please see Hydro Ottawa’s responses to undertakings JT 3.10, JT 3.11, JT 3.12, and JT 3.13.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.15

JT 3.15

To file an update on the line loss plan and to advise whether the 5 percent decrease goal was achieved and maintained.

RESPONSE:

As context for this response, Hydro Ottawa notes that this undertaking relates to information that was previously submitted by the utility as part of its interrogatory responses in this proceeding. Attachment ED-1(A): H4-3-1 Distribution Loss Update is a copy of a document that was originally made available in conjunction with Hydro Ottawa's 2012 distribution rate application.[1] This document provided an update on a plan that was formally adopted by the utility in 2006 to reduce line losses by 5%. A copy of the original plan has been appended to this undertaking response as Attachment JT 3.15(A): Plan to Reduce Line Losses by 5% (2006).

Hydro Ottawa has not updated its *Plan to Reduce Line Losses by 5%* since the submission of the Distribution Loss Update that was filed in the 2012 rate application proceeding.

However, Hydro Ottawa confirms that, on average, the 5% loss target was achieved over the 2016-2019 period. As shown in Table 2.1 of Attachment JT 3.15(A), the average losses in the original study were 3.17% over the previous five-year period of 2001-2005. A 5% reduction against these historical losses equates to a target of 3.02%.[2] In recent years, this target has been achieved on average but not consistently sustained. Hydro Ottawa's most recent five-year actual losses equated to 3.09%, as shown in the UPDATED version of Table 1 in UPDATED Exhibit 8-9-1: Loss Adjustment Factors, and reproduced below to include the five-year average.

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[1] Hydro Ottawa Limited, *2012 Electricity Distribution Rate Application*, EB-2011-0054 (June 17, 2011).

[2] As likewise shown in Table 2.1 of Attachment JT 3.15(A), the original plan provided a target reduction in kWh rather than %. In order to normalize based on total purchases and sales, the reduction target has been converted into % for purposes of this undertaking response.

Table 1 – UPDATED FOR 2019 ACTUALS – Losses as a Percentage of Purchases for the Previous Five Years[3]

	2015	2016	2017	2018	2019
Electricity Purchases (MWh)	7,622,794	7,600,820	7,410,784	7,612,656	7,466,403
Electricity Sales (MWh)	7,374,808	7,374,415	7,190,875	7,367,818	7,240,881
Losses (MWh)	**247,987**	**226,405**	**219,909**	**244,838**	**225,521**
Losses %	**3.25%**	**2.98%**	**2.97%**	**3.22%**	**3.02%**
5-Year Average	**3.08%**	**3.05%**	**2.92%**	**3.03%**	**3.09%**

[3] Totals may not match due to rounding.

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HYDRO OTTAWA LIMITED
A PLAN TO REDUCE LINE LOSSES BY 5%

TABLE OF CONTENTS

1.0 Introduction

Hydro Ottawa Limited ("Hydro Ottawa") is a distributor as defined in, and is licensed as such under, the *Ontario Energy Board Act, 1998*. Hydro Ottawa holds Electricity Distribution Licence ED-2002-0556 and was created in 2000 from the amalgamation of five municipal electric utilities: Gloucester Hydro, Goulbourn Hydro, Kanata Hydro, Nepean Hydro and Ottawa Hydro. Hydro Ottawa also provides electricity distribution in the Village of Casselman (located just outside of Ottawa), having acquired the assets of Casselman Hydro Inc. in 2002.

Hydro Ottawa's service territory covers more than 1,104 square kilometers and serves over 280,000 residential, commercial and industrial customers. The majority of its customers are located in an urban environment however there are large rural areas with few customers.

On August 2nd, 2005 Hydro Ottawa filed an Application with the Ontario Energy Board (OEB) under section 78 of the *Ontario Energy Board Act, 1998*, c. 15 (Schedule B) as amended for Order or Orders approving or fixing just and reasonable rates for electricity to be implemented on May 1, 2006. Although a settlement was reached with intervenors and accepted by the OEB for a majority of the Application, the treatment of line losses was one of two contested issues. Evidence on these two issues was heard on January 23rd, 2006 and the OEB issued their Decision with Reasons on April 12th, 2006.

In that Decision With Reasons, the Board directed Hydro Ottawa "to file a plan to reduce its line losses by at least 5% within 90 days of this Decision. That plan should include concrete estimates of the costs of achieving this goal as well as the anticipated benefits".

The issue with respect to line losses, which was identified by various intervenors and the Board in its report, is that provincially there is a substantial cost to losses, and with the present accounting treatment of losses there is no financial incentive for Local Distribution Companies (LDCs) to reduce their losses. Reducing line losses provincially would not only save consumers money but also free up much needed capacity. The Board chose not to change the current accounting treatment at this time, but instead chose to require two LDCs, Toronto Hydro and Hydro Ottawa, to file reports outlining their plans to reduce losses.

Distribution line losses are the difference between the amount of energy delivered to the distribution system and the amount of energy customers are billed. There are two types of losses: technical and non technical and although they cannot be eliminated totally, they can be minimized.

Technical losses are primarily due to heat dissipation resulting from current passing though conductors and from magnetic losses in transformers. Non-technical losses occur as a result of theft, metering inaccuracies, estimates used to account for unmetered loads, and estimates used for year-end accruals required to match the time period for purchases and sales.

2.0 Determination of Distribution Losses

2.1 Calculation Methodology

In order to calculate Hydro Ottawa's annual distribution losses, a standard methodology is followed: Total purchases are determined from the Independent Electricity System Operator (IESO) invoices, Hydro One Networks Inc. (HONI) invoices (for embedded distribution points) and load supplied from embedded generators. Total kilowatt hour (kWh) sales are determined from the kWhs billed for the year plus an accrual for energy consumed in the year but not yet billed, less the kWhs which were billed at the beginning of the year but were consumed in the previous year.

Most of Hydro Ottawa's customers are billed on a bi-monthly basis. Using cycle billing, approximately 7,500 meters are read each day, on average. These meter reads are stored in the Customer Information System (CIS) until pricing becomes available from the IESO 10 business days later, at which time bills can be issued to customers. With a two-month billing cycle and the additional ten days for pricing, it is the middle of March before all energy has been billed for the previous year. An estimate is made of the next bill to all customers and then this bill is prorated between the two years based on the number of days in each period. Year-end financial statements include an estimate of what is still to be billed for energy consumed to year-end (called unbilled revenue), and therefore kWh sales for the year also includes an associated estimate. As such, roughly 10% to 15% of the recorded kWh sales are estimated for each year. Even if this estimate is as accurate as 99%, this would result in an estimating tolerance within the same range as the 5% reduction in losses being targeted by Hydro Ottawa. This makes the evaluation of results for a distribution loss reduction program challenging.

As Smart Meters are deployed across Hydro Ottawa's service territory, the required estimation of kWhs will be reduced and will be totally eliminated by 2010 when all customers have Smart Meters. Hydro Ottawa will then have precise load data and loss information and therefore will have the opportunity to conduct much better analysis of system loss reduction programs.

2.2 Historical Losses

Table 2.1 show total losses for Hydro Ottawa and its predecessor utilities over the previous eleven years for which Hydro Ottawa has recorded data. The OEB's Report of the Board for the 2006 Electricity Distribution Rate (EDR) Handbook (RP-2004-0188) issued May 11th, 2005, stated "The Board has therefore concluded that 2006 will focus on identifying those distributors with high average losses and requiring them to report on those losses and provide an action plan as to how the distributor intends to reduce the level of losses. Any distributor whose 3-year average of distribution losses is higher than 5% will be required to make this report". Hydro Ottawa's 3-year average of distribution losses (distribution losses as a percent of wholesale kWh purchased) has never been higher than 3.9%.

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Table 2.1
HYDRO OTTAWA
HISTORICAL DISTRIBUTION LOSSES

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Electricity purchases (kWh)	6,933,773,330	6,936,520,413	6,922,859,558	6,827,117,133	7,256,355,639	7,377,703,307	7,592,117,791	7,751,077,843	7,755,187,001	7,702,017,686	7,911,789,396
Electricity sales (kWh)	6,673,568,280	6,711,026,810	6,683,647,838	6,627,048,083	7,018,458,913	7,022,819,690	7,351,475,971	7,470,558,035	7,483,288,326	7,514,934,346	7,663,197,036
Losses (kWh)	260,205,050	225,493,603	239,211,720	200,069,050	237,896,726	354,883,617	240,641,820	280,519,808	271,898,675	187,083,340	248,592,360
Losses %	3.75%	3.25%	3.46%	2.93%	3.28%	4.81%	3.17%	3.62%	3.51%	2.43%	3.14%
Losses % 3-year average			3.49%	3.21%	3.22%	3.67%	3.75%	3.87%	3.43%	3.18%	3.03%
5% loss reduction (kWh)	13,010,253	11,274,680	11,960,586	10,003,452	11,894,836	17,744,181	12,032,091	14,025,990	13,594,934	9,354,167	12,429,618

<u>2.3 Factors Affecting Distribution Losses</u>

From Table 2.1 it can be seen that Hydro Ottawa's losses fluctuate from year to year. There are various reasons for this:

Weather – The magnitude of the technical losses is very much dependent on the peak load on the various components in the distribution system and this in turn is dependent on the weather. Extremes in temperature, both high and low, directly affect the peak load that Hydro Ottawa's distribution system will experience and hence the annual losses. Furthermore, non-technical losses can also be affected. As discussed in Section 2.1, Hydro Ottawa estimates the amount of energy consumed by customers to year-end but not yet scheduled to be billed by prorating an estimated bill based on the number of days of service in each of the two years. If the weather changes significantly from one year to the next (for example, a very mild December and a very cold January), the accuracy of the estimate is affected.

Accrual estimate – As discussed in Section 2.1, roughly 10% to 15% of annual kWh sales recorded in each year are based on an estimate.

Power diversion – The magnitude of energy lost due to theft varies from year to year depending on the economic climate, law enforcement activities and the prevalence of particular types of illegal activities.

Construction and Maintenance Activities – Depending on the level and location of construction and maintenance activities throughout a particular year, losses can vary. For example, if power needs to be re-routed due to construction, it may use a longer conductor run than normal, which would increase losses.

<u>2.4 Reduction of 5%</u>

As illustrated in Table 2.1, based on Hydro Ottawa's historical losses, a 5% reduction in losses would mean a reduction of approximately 12,000,000 kWh per year.

<u>2.5 Comparison of Distribution Losses in the Province</u>

Table 2.2 provides information on the loss factor for secondary metered customers < 5000 kW, approved by the OEB as part of the 2006 EDR process, for a majority of LDCs in Ontario. It is recognized that there are many factors contributing to an LDC's loss factor, some of which are not in its control. Hydro Ottawa's placement on this table as one of the best in the province is a reflection of the work that has been done in the past years to keep distribution losses as low as possible. Since many of the most cost effective strategies have already been implemented, future loss reduction strategies can be cost prohibitive for the results achieved unless other benefits are also realized. This cost/benefit analysis had to be a consideration in developing this loss reduction plan.

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Table 2.2
3-YEAR DISTRIBUTION LOSS FACTORS
FOR SECONDARY METERED CUSTOMERS < 5 MW

Festival Hydro	1.0281		Grimsby	1.0502
Guelph	1.0319		West Perth	1.0502
CNP-Port Colborne	1.0322		Waterloo North	1.0505
Kitchener-Wilmot	1.0329		Barrie Hydro	1.0510
Hydro Ottawa	1.0344		Innisfill	1.0539
Peterborough	1.0350		Essex	1.0544
Milton	1.0351		Sioux Lookout	1.0547
Hydro One Brampton	1.0356		Veridian	1.0549
Halton Hills	1.0368		Greater Sudbury	1.0559
Brantford	1.0370		Norfolk	1.0560
Orilla	1.0370		Haldimand	1.0565
Kingston	1.0375		Niagara Falls	1.0572
Toronto Hydro	1.0376		Parry Sound	1.0586
North Bay	1.0387		Welland	1.0599
Enwin	1.0390		Pennisula	1.0601
PowerStream	1.0393		Whitby Hydro	1.0601
Fort Frances	1.0406		Middlesex	1.0608
Orangeville	1.0406		Grand Valley	1.0612
London Hydro	1.0421		Hawkesbury	1.0635
Tillsonburg	1.0422		Aurora	1.0639
Terrace Bay	1.0426		Midland	1.0651
Horizon	1.0428		CNP-Eastern Ontario	1.0715
Burlington	1.0429		Wellington North	1.0726
PIC	1.0430		Wasaga	1.0739
Enersource	1.0433		Cambridge and N. Dumfries	1.0743
Erie Thames	1.0433		Rideau St. Lawrence	1.0772
Woodstock Hydro	1.0440		ELK	1.0791
Bluewater	1.0446		Kenora	1.0812
Oshawa	1.0466		Atikokan	1.0817
Lakefront	1.0471		Collus	1.0838
Central Wellington	1.0472		Thunder Bay	1.0847
CNP-Fort Erie	1.0479		Wellington	1.0847
Brant County	1.0495		Tay	1.0866
Chapleau	1.0497		Gravenhurst	1.0884
Peterborough-Apshodel	1.0500		Renfrew	1.0898
Peterborough-Lakefield	1.0500		Hydro One	1.0920
Niagara on the Lake	1.0501			
Source: 2006 Electricity Distribution Rate Orders				

3.0 Evaluation of Results of Programs

As discussed in Section 2.1, the extent to which annual kWh sales are estimated each year means that the recorded distribution losses can vary significantly from year to year. Furthermore, Section 2.3 discussed various factors that can affect losses in a particular year by amounts exceeding the 5% target for the loss reduction strategy. For these reasons, it is not possible to evaluate the effectiveness of a distribution loss reduction program by reviewing the loss factor at the end of the year. Evaluation of program results should be based on an engineering analysis of each individual program within the overall strategy.

4.0 Strategies for Reducing Distribution Losses

Hydro Ottawa has initiated an Asset Management Strategy that is intended to manage existing assets based on their age, condition and criticality. The process allows ample opportunity for regulatory, financial and other objectives to be considered alongside engineering considerations, to achieve a balanced, sustainable program. Hydro Ottawa commits to including the reduction of distribution losses as one of the objectives that will be considered when assessing the replacement of conductors and transformers and any other asset that can affect distribution losses.

Although minimizing distribution losses is an ongoing component in the design, procurement, construction and operation of Hydro Ottawa's distribution system, there are a number of specific initiatives that have been considered in order to reduce losses by 5%. The decision on which initiatives will be implemented is based on feasibility, resource availability and a cost/benefit analysis. Benefits of these programs may go beyond reducing distribution losses. The strategies that were considered are as follows:

<u>4.1 Voltage Profile Management System</u>

Changing the voltage profile at the distribution system level can result in reduced system peaks and therefore reduced losses. This type of operation is termed Conservation Voltage Reduction (CVR). There are a number of products on the market that can be used to accomplish the voltage reduction. Hydro Ottawa has undertaken a pilot project for the installation of an automatic control system, called AdaptiVolt™, to regulate the voltage at a distribution station that has transformers with under load tap changers (ULTC). This system will reduce the distribution voltage by a small amount, while ensuring that the voltage seen by customers remains within Canadian Standards Association (CSA) voltage limits throughout the feeder length. For every 1% drop in voltage one can expect 0.5% to 1.5% load reduction depending on the load characteristics of the feeder. Hydro Ottawa will evaluate the performance of the AdaptiVolt™ system with respect to possible future installations.

Another solution for implementing Conservation Voltage Reduction at distribution stations with ULTCs would be to lower the station bus voltages by changing the regulator settings on the tapchanger controls installed at the stations. Installation of end-of-line voltage monitors that report back to the control room SCADA system could be used to measure the impact of this initiative.

4.2 System Optimization

This initiative aims at identifying opportunities to improve the delivery efficiency of the overall distribution system. Line losses in the system are influenced by the amount of load supplied on the different feeders. The ability to reconfigure the system to change how particular loads are supplied gives the system operator the opportunity to reduce system demand and energy losses. It is important to note that the optimal 'open point' for losses may not be implemented due to reliability considerations. However, if it is determined that changing the 'open point' will reduce losses and not adversely affect reliability, then crews will be dispatched to change the system configuration.

Balancing the load on 3 phase circuits can also reduce the losses from a feeder. This is most easily achieved with a distribution analysis program such as that being used by Hydro Ottawa.

4.3 Voltage Conversion

Distribution system line losses on a power system vary as the square of the line current. By changing the distribution voltage in a particular supply area to a higher level, the line current on the feeders will be reduced. If the voltage is doubled, the current is reduced by 50% and hence the line losses are reduced by 75%.

By increasing the distribution voltage from either 4 kV to 13.2 kV or 8 kV to 27.6 kV, line losses are expected to be reduced by about 90%. In addition, since the distribution transformers have to be replaced, the transformation losses will also be reduced since today's equipment is considerably more efficient than the units that were installed 20-30 years ago. Other loss savings will accrue from the removal of 13.2 kV to 4 kV station transformers from the system.

Hydro Ottawa does not expect that the loss savings alone will cost justify the voltage conversion program. However, by retiring distribution station equipment that is nearing its end of life, Hydro Ottawa will forego the costs of replacement of this equipment and the ongoing operation and maintenance costs.

4.4 Power Factor Correction

Using capacitors to improve power factor can also result in reduced line losses. By providing reactive power onto the feeder, capacitors reduce the current and therefore the losses. Capacitors also increase the voltage at the point in the system that they are installed. By raising the voltage at the end of a feeder it then becomes feasible to lower the voltage at the feeder source, i.e. the distribution station. This action will result in a lowering of the overall load on the feeder, and hence a reduction in losses.

Hydro Ottawa is planning on installing banks of capacitors on one of its 28 kV systems that has relatively long feeders. Both fixed and switched capacitor installations are contemplated to provide a greater degree of voltage control for varying load levels.

4.5 Transformer Loss Evaluation and Loading Practices

Transformer losses include no-load losses that are independent of loading and load losses that vary with loading. Reviewing the purchase specifications for transformers to determine if greater operational efficiency can be achieved economically provides an opportunity for reducing both no-load and load losses. Hydro Ottawa's current design specifications require the use of high efficiency transformers even though this results in a higher up front capital cost. These design specifications undergo regular reviews to ensure that they encompass best practices. In addition, studying transformer loading practices to determine the optimal number of residential customers connected to a single distribution transformer and implementing the results (see Section 4.6 below) can reduce distribution losses.

4.6 Transformer Replacement and Removal

Overloaded and underloaded transformers will have proportionately higher losses than an optimally loaded transformer. An infrared (IR) scan of a distribution transformer can identify an overloaded situation that can be rectified by installing a larger size transformer. Underloaded transformers can be identified based on a review of customer loads and then can be removed as load is consolidated to one larger transformer. Underloaded transformers can occur when a previously electrically heated area converts to natural gas so that less transformation capacity is required.

4.7 Re-conductoring

Planned system sustainment programs will see the replacement over time of a large proportion of poles in Hydro Ottawa's system area. In many of the older parts of the system, the line conductor is much smaller than that called for in the current standards. Hydro Ottawa intends to study the savings associated with replacing the aged conductor in these areas so as to achieve lower system losses.

4.8 Dry Core Transformer Losses

A typical design for a high-rise building includes an upstream main transformer for the central service and multiple downstream dry-core type transformers to facilitate individual metering for consumers. Dry-core transformers have a much higher loss rating than oil filled transformers. Hydro Ottawa has charges approved as part of the 2006 EDR for the additional losses occurring as a result of these dry-core transformers. The loss amount is determined from a schedule based on the size of the dry-core transformer. Charging for the incremental losses encourages customers to ensure that they use the optimal size of dry-core transformer and hence minimize losses. Hydro Ottawa will be recording these dry-core transformer losses as part of the kWh sales.

4.9 Power Diversion Programs

The identification and elimination of instances of power diversion results in fewer non-technical losses and an improvement in the overall distribution loss factor. Hydro Ottawa works with the Ottawa Police Department and the Electrical Safety Authority to disconnect cases of power diversion and to recoup any lost revenue. When power diversion has been identified, an estimate is made of the lost energy, based on equipment at the premise. A reduction in power diversion activities will improve Hydro Ottawa's measured distribution losses however may not benefit the overall provincial grid if the power diversion activities only move to another service area. For this reason, Hydro Ottawa has not included these amounts in the calculation for the 5% distribution loss reduction.

4.10 Updating Records for Streetlight and Unmetered Scattered Load

Hydro Ottawa bills the City of Ottawa for energy consumption by streetlights based on a physical survey of the number and size of lights. By updating this survey, Hydro Ottawa achieves a more accurate reflection of the number of streetlights installed in the City.

Hydro Ottawa is in the process of metering the actual consumption of a sample number of the devices that make up the unmetered scattered load, e.g. cable amplifiers and traffic lights. The billing for these devices is currently based on an estimate and with the better data obtained from the sample there will be a more accurate estimate of the consumption.

By having more accurate measurements for unmetered load (both streetlighting and scattered) Hydro Ottawa can minimize its non-technical losses and consumers have better information on which to base conservation decisions.

4.11 Effects of Conservation and Demand Management (CDM) Programs

On December 10, 2004 Hydro Ottawa received approval to spend the third installment of its incremental market adjusted revenue requirement (MARR) on a CDM Plan. One component of that program was directly related to Distribution Loss Reduction and to date Hydro Ottawa has accomplished the following:

Voltage Profile Management System
- Pilot Program at Centrepointe substation
- Completed the infrastructure and propagation studies at 8.32 kV Centrepointe substation
- Contracted for purchase and installation of the AdaptiVolt™ system at Centrepointe substation

Power Factor Correction – Pilot Program
- Created the capacitor general materials specification document for the project
- Identified practical installation locations and potential installation issues
- Analyzed the Fallowfield F2 feeder for power factor correction

Hydro Ottawa's Conservation and Demand Management Residential, Commercial and Industrial Programs assist customers in reducing their energy consumption. This, in turn, reduces Hydro Ottawa's distribution losses.

5.0 Summary of Programs to be Implemented

Hydro Ottawa has reviewed the various strategies for reducing distribution losses and has developed the following comprehensive program:

5.1 Voltage Profile Management System

It is anticipated that there will be a 3% reduction in the peak load at the Centrepointe substation as a result of the installation of the AdaptiVolt™ system. With a peak load of 15 MW this would mean an estimated savings of 450 kW. Once the results of the

Centrepointe substation pilot have been assessed, Hydro Ottawa will determine whether to install the AdaptiVolt™ system at other stations. Hydro Ottawa has potentially 20 stations with an installed capacity of about 300 MVA where CVR systems could be deployed. Hydro Ottawa will also be investigating the use of other less expensive means for reducing distribution voltage, such as changing the regulator settings on the tapchanger controls.

5.2 System Optimization

Once Hydro Ottawa has completed installation of its Geographic Information System (GIS), system models will be set up using a Distribution System Analysis Computer Program. The software provides optimizing routines to identify where the system 'open point' switches should be located to minimize line losses. The optimal location of open points can then be determined and if there are no operational issues and reliability will not be adversely affected, switches will be installed. It is anticipated that a potential demand savings of 2 MW system wide can be achieved through the use of system optimization.

5.3 Voltage Conversion

Work will be proceeding with the conversion of the Sunnyside and Winding Way areas in 2007. The conversion of 2 MW of load will result in a distribution loss reduction of approximately 345,000 kWh. There are a number of other areas that could also be converted, however reductions in distribution losses do not justify doing the conversion alone. Hydro Ottawa will be reviewing the business case for each area to determine whether to proceed with the conversion. It is anticipated that two other areas will have sufficient ancillary benefits to justify the cost of proceeding. The conversion of 18 MW of load would result in a distribution losses reduction of approximately 3,100,000 kWh.

5.4 Power Factor Correction

The pilot program consists of the installation of two oil filled capacitor banks of approximately 1000 kVAR each on the Fallowfield F2 feeder. The feeder chosen has a lagging power factor of less than 85% and it is expected that with the installation of the capacitors the power factor will improve to 95%. As a result there would be a reduction in load of 500 kW. It is anticipated that after the results of the pilot program are reviewed, there will be at least two other circuits identified which would benefit from power factor correction. Installation of capacitors on these circuits would result in a load reduction of 1500 kW.

5.5 Transformer Loss Evaluation and Loading Practices

A consultant has been retained to examine the loss evaluation formula in Hydro Ottawa's transformer specifications and determine if changes are required to improve efficiencies. They will also examine life cycle costs including losses associated with various loading schemes. This report is expected by the end of August 2006. Since the study is not yet complete, it is not possible to quantify the benefits that may result from implementing any recommendations.

5.6 Transformer Replacement and Removal

An infrared (IR) survey has been done in a selected area of Hydro Ottawa's service territory to determine loading on padmount type transformers. The results will be reviewed in order to identify any candidates for replacement. When End-of-Asset-Life poles lines are replaced (especially in urban areas) excess transformation will be removed. At this point it is not possible to quantify the impact of these replacements and removals.

5.7 Conservation and Demand Management

When fully implemented, Hydro Ottawa's Conservation and Demand Management Residential, Commercial and Industrial Programs, for the 3rd tranche spending, are expected to reduce annual energy use by 50,000,000 kWh. Based on a conservative estimate, Hydro Ottawa anticipates ongoing CDM programs would save an additional 40,000,000 kWh annually.

5.8 Updating Records for Streetlight and Unmetered Scattered Load

Updating of streetlighting and scattered load records will result in an estimated distribution loss reduction of 1,371,799 kWh.

5.9 Dry Core Transformer Losses

The recording of dry core transformer losses as part of Hydro Ottawa's sales will reduce distribution losses by an estimated 2,958,895 kWh.

The following Table 5.1 summarizes the costs and benefits of each component of Hydro Ottawa's Distribution Loss Reduction Program:

EB-2005-0381
Filed: July 11, 2006

Table 5.1
HYDRO OTTAWA LIMITED
DISTRIBUTION LOSS REDUCTION PROGRAM[6]

	Estimated Total Cost	Estimated Savings/Load Affected kW	Estimated Savings/Energy kWh/year[4]	Estimated Loss Reduction kWh/year[5]
Voltage Profile Management System-Pilot at Centrepointe	$550,000[1]	450	2,877,660	86,330
Voltage Profile Management System	$11,000,000[2]	9,000	57,553,200	1,726,596
System Optimization	$125,000[1]	2,000	12,789,600	383,688
Voltage Conversion-approved	$1,650,000[3]	2,000	12,789,600	345,319
Voltage Conversion	$13,500,000[2]	18,000	115,106,400	3,107,873
Power Factor Correction-Pilot	$125,000[1]	500	3,197,400	95,922
Power Factor Correction	$500,000[2]	1,500	9,592,200	287,766
CDM Programs-3rd tranche Conservation and Demand Management	$7,463,000		50,000,000	1,500,000
CDM Programs-2nd generation	To be determined		40,000,000	1,200,000
Update of Streetlight and Scattered Records	N/A			1,371,799
Recording of Dry Core Transformer Losses	N/A			2,958,895
Total				13,064,188

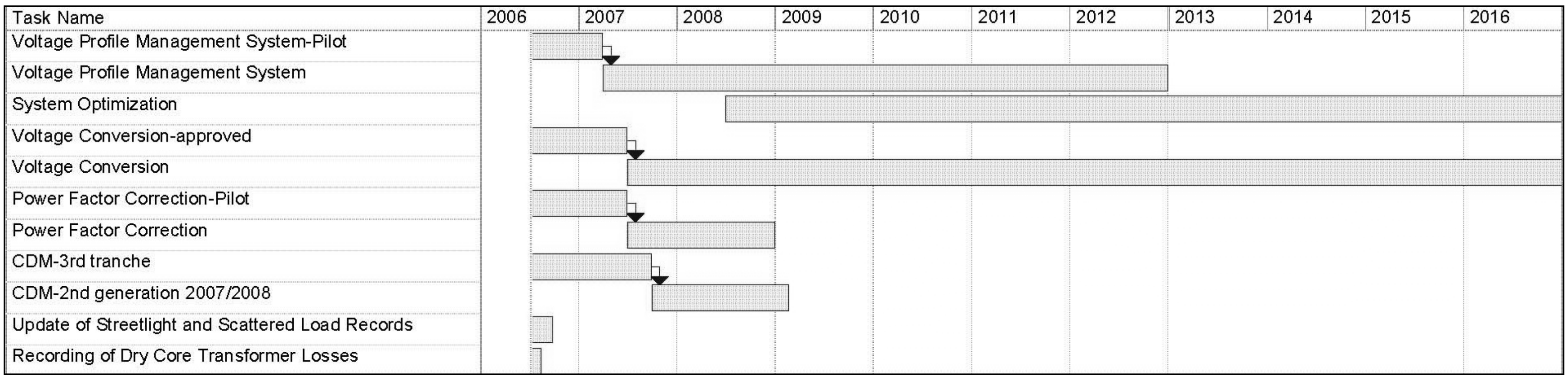
Notes:
1. *Included in CDM budget.*
2. *Only a high level estimate until further analysis can be completed.*
3. *$150,000 of $1,650,000 for Voltage Conversion from CDM budget.*
4. *Based on Load Factor of 73%.*
5. *Based on three-year average losses of 3%.*
6. *Specific programs outlined in this table are subject to further feasibility review and the undertaking of pilot projects. Actual results of programs may be below or exceed estimates.*

6.0 Final Plan

Table 6.1 provides a simplified schedule for the implementation of Hydro Ottawa's Distribution Loss Reduction Plan.

EB-2005-0381
Filed: July 11, 2006

Table 6.1
HYDRO OTTAWA LIMITED
DISTRIBUTION LOSS REDUCTION PROGRAM
SCHEDULE



7.0 Conclusions

Hydro Ottawa has already done a significant amount of work to ensure that distribution losses are as low as technically possible. This is clearly reflected in the current approved loss factor of 1.0344, which represents a three-year average. In addition to the programs described in this strategy, which are expected to achieve a reduction in distribution losses of 13,000,000 kWh per year, Hydro Ottawa will continue to include distribution loss reduction as an objective in ongoing Asset Management work, so that new opportunities can be incorporated into all future capital programs.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.16

JT 3.16

To explain the role of distribution loss reduction when procuring equipment, if that does not involve a valuation of the benefit of the loss reductions from different kinds of equipment; to indicate whether hydro ottawa would be willing to value distribution loss reductions in its tendering process going forward.

RESPONSE:

Please see part (c) of the UPDATED response to interrogatory ED-3, which clarifies Hydro Ottawa's practice of evaluating loss impacts from station transformers during the tendering process. For ease of reference, UPDATED ED-3 has been appended to this undertaking response as Attachment JT 3.16(A).

UPDATED INTERROGATORY RESPONSE - ED-3

3

EXHIBIT REFERENCE:

Exhibit 8 ,Tab 9, Schedule 1, UPDATED, May 5, 2020

SUBJECT AREA: Loss Factor

Preamble:

Hydro Ottawa's Conservation and Demand Management Annual Reports for 2006 and 2007 describe a project relating to Distribution Loss Reduction.

Question:

a) What are the most important steps that Hydro Ottawa has taken in the past 20 years to reduce distribution system energy losses?

b) Where does Hydro Ottawa believe the greatest opportunities are to make additional reductions in distribution losses in the next 20 years?

c) Does Hydro Ottawa quantify and consider the potential value of distribution loss reductions for different options when procuring equipment (e.g. transformers) and deciding on the details of demand-driven capital projects (e.g. the type and sizing of conductors)? If yes, please explain how and provide documentation detailing the methodology used.

d) If Hydro Ottawa is considering the value to its customers of distribution loss reductions for planning purposes, how does it calculate the dollar value ($) of said loss reductions (kWh)? Is the value calculated based only on the HOEP or on all-in cost of electricity (e.g. including the GA)?

e) Please list and describe the operational measures that Hydro Ottawa takes to cost-effectively reduce distribution losses.

f) Please provide a table listing the technically available measures to cost-effectively reduce distribution losses and describe for each the respective responsibilities of Hydro Ottawa, the IESO, and Hydro One.

RESPONSE:

a) Over the last 20 years, the steps Hydro Ottawa has taken to reduce distribution losses include the following:

- Voltage conversion;
- Upgrading conductors;
- Load balancing; and
- Ensuring transformer purchase specifications balance fault current and losses.

b) Hydro Ottawa believes the greatest opportunities to make additional reductions in distribution losses include the same steps taken over the previous 20 years:

- Voltage conversion;
- Upgrading conductors;
- Load balancing; and
- Ensuring transformer purchase specifications balance fault current and losses.

c) ~~Hydro Ottawa designs and procures equipment based on distribution system needs, right-sizing the equipment to balance technical requirements (e.g. system loading and voltage drop) and cost. Hydro Ottawa does not quantify distribution loss reductions when procuring equipment, but does consider them. This includes comparing vendor~~

~~substation power transformer losses during evaluation and requiring that Hydro Ottawa transformers meet or exceed Canadian Standards Association ("CSA") 802.94 (Maximum Losses for All Transformers).~~

Hydro Ottawa's distribution transformer specifications require that procured equipment must meet the energy efficiency standards under Canadian Standards Association C802.11. Substation power transformers are procured through a competitive request for proposals process. The present value of the transformer losses are added to the transformer base price for evaluation purposes. For capital projects, the types and sizes of conductors are standardized to be appropriate for the various conditions under which they are installed.

Hydro Ottawa designs and procures equipment owned by the utility for demand-driven projects based on right-sizing for customer technical requirements (e.g. loading). Hydro Ottawa does not specify customer-owned equipment which is governed by the Electrical Safety Authority; however, Hydro Ottawa does charge customers for all unmetered transformer losses, per section 2.5.5.5 of the utility's Conditions of Service (Transformer Loss Charge).

d) If Hydro Ottawa is considering the value to its customers of distribution loss reductions for planning purposes, the utility would calculate the dollar savings based on kWh basis using the cost of electricity, including Global Adjustment. Hydro Ottawa acknowledges that the most significant savings are achieved in the long-term with isolated short-term savings as well.

e) Please see part (a) above.

f) Please see part (a) above.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.17

JT 3.17

To provide calculations and to take another crack at calculating on average the difference between the avoided cost, directly related, and minimum system PLCC with the actual proposed.

RESPONSE:

The undertaking requests that Hydro Ottawa provide a table comparing the proposed monthly fixed service charge for 2021 for Commercial and Industrial customer classes to the Minimum System Service Charge with PLCC Adjustment, as calculated by the OEB Cost Allocation Model. Table A provides that comparison.

Table A – Comparison of Minimum System with PLCC Adjustment Fixed Charge to Proposed Monthly Service Charge (2021)

Charge Basis	GS <50 kW	GS 50 - 1,499 kW	GS 1,500 - 4,999 kW	Large Use
Minimum System with PLCC Adjustment (A)	$23.46	$78.54	$386.06	$492.27
Proposed Fixed Monthly Service Charge (B)	$21.23	$200.00	$4,193.93	$15,231.32
(B) as a Percentage of (A)	90%	255%	1,086%	3,094%

As indicated during the Technical Conference, Hydro Ottawa is following OEB policy regarding the proposed fixed charges. In addition, as the residential distribution charge is fully fixed, the proposed fixed residential distribution charge is 171% of the Minimum System with PLCC Adjustment, as calculated by the OEB Cost Allocation Model.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.18

JT 3.18

To provide an explanation of how the numbers were set historically with respect to each of the Commercial and Industrial rate classes.

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.19

JT 3.19

[Not Described]

RESPONSE:

As per page 134 of the Technical Conference transcript dated July 17, 2020, Hydro Ottawa interprets this undertaking to be the question posed on lines 11-15: "I just mean applying -- or whether or not you applied it or not, but that the current allocation methodology which sets the minimum system with PLCC adjustment as the maximum, can you undertake to let us know when that was rolled out?"

Preamble: The undertaking is to confirm which year Hydro Ottawa first used the OEB Cost Allocation model in setting its rates.

Response: The OEB Cost Allocation model was first used by Hydro Ottawa in support of its 2008 Electricity Distribution Rate Application (EB-2008-0188).

TECHNICAL CONFERENCE UNDERTAKING - JT 3.20

JT 3.20

To extend the table back to prior to the existing cost-allocation methodology.

RESPONSE:

The OEB Cost Allocation Model was first used by Hydro Ottawa in support of its 2008 Rate Application.[1]

Hydro Ottawa has provided the utility's approved fixed and variable distribution rates in the tables below to include 2007 through 2010.

[1] Hydro Ottawa Limited, 2008 *Electricity Distribution Rate Application*, EB-2007-0713 (September 19, 2007).

Table A – Hydro Ottawa's Approved Fixed Distribution Charges (2007-2012)

	2007	2008	2009	2010	2011	2012
Residential	$9.24	$9.54	$10.18	$8.52	$8.54	$9.32
GS<50 kW	$10.30	$15.67	$16.38	$14.73	$14.76	$16.11
GS 50 to 1,499 kW	$249.13	$248.53	$251.99	$250.76	$251.21	$251.21
GS 1,500 to 4,999 kW	$3,979.63	$3,979.03	$4,026.51	$4,032.07	$4,039.33	$4,039.33
Large Use	$14,448.42	$14,447.82	$14,618.83	$14,643.46	$14,669.82	$14,669.82
USL	$4.28	$3.97	$4.02	$4.03	$4.04	$4.26
Standby Power	$95.41	$106.38	$107.64	$107.83	$108.02	$117.90
Sentinel Lighting	$1.68	$1.87	$1.89	$1.89	$1.89	$2.52
Street Lighting	$0.32	$0.48	$0.49	$0.49	$0.49	$0.54

Table B – Hydro Ottawa's Approved Variable Distribution Rates (2007-2012)

	2007	2008	2009	2010	2011	2012
Residential	$0.0183	$0.0205	$0.0207	$0.0207	$0.0207	$0.0226
GS<50 kW	$0.0180	$0.0183	$0.0185	$0.0185	$0.0185	$0.0202
GS 50 to 1,499 kW	$2.5463	$2.9918	$3.0271	$3.0325	$3.0380	$3.4376
GS 1,500 to 4,999 kW	$2.3357	$2.8573	$2.8910	$2.8962	$2.9014	$3.3601
Large Use	$2.5918	$2.7352	$2.7675	$2.7725	$2.7775	$3.1907
USL	$0.0191	$0.0198	$0.0200	$0.0200	$0.0200	$0.0211
Standby Power GS 50 to 1,499 kW	$1.2732	$1.4196	$1.4364	$1.4390	$1.4416	$1.5734
Standby Power GS 1,500 to 4,999 kW	$1.1679	$1.3022	$1.3176	$1.3200	$1.3224	$1.4433
Standby Power Large Use	$1.2960	$1.4451	$1.4622	$1.4648	$1.4674	$1.6016
Sentinel Lighting	$6.3974	$7.1332	$7.2174	$7.2304	$7.2434	$9.6661
Street Lighting	$2.4671	$3.4037	$3.4439	$3.4501	$3.4563	$3.8523

1 **Table C (As per IRR SEC-69 Table A) – Hydro Ottawa's Approved Fixed Distribution Charges (2011-2020)**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Residential	$8.54	$9.32	$9.42	$9.55	$9.67	$12.96	$16.60	$20.51	$24.29	$27.79
GS<50 kW	$14.76	$16.11	$16.28	$16.51	$16.72	$17.23	$17.89	$18.60	$19.07	$19.32
GS 50 to 1,499 kW	$251.21	$251.21	$253.92	$257.47	$260.82	$200.00	$200.00	$200.00	$200.00	$200.00
GS 1,500 to 4,999 kW	$4,039.33	$4,039.33	$4,082.95	$4,140.11	$4,193.93	$4,193.93	$4,193.93	$4,193.93	$4,193.93	$4,193.93
Large Use	$14,669.82	$14,669.82	$14,828.25	$15,035.85	$15,231.32	$15,231.32	$15,231.32	$15,231.32	$15,231.32	$15,231.32
USL	$4.04	$4.26	$4.31	$4.37	$4.43	$4.42	$4.60	$4.83	$5.00	$5.09
Standby Power	$108.02	$117.90	$119.17	$120.84	$122.41	$126.36	$132.38	$138.53	$142.75	$145.13
Sentinel Lighting	$1.89	$2.52	$2.55	$2.59	$2.62	$2.98	$3.04	$3.25	$3.28	$3.17
Street Lighting	$0.49	$0.54	$0.55	$0.56	$0.57	$0.75	$0.80	$0.85	$0.89	$0.91

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Table D (As per IRR SEC-69 Table B) – Hydro Ottawa's Approved Variable Distribution Charges (2011-2020)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Residential	$0.0207	$0.0226	$0.0228	$0.0231	$0.0234	$0.0193	$0.0151	$0.0105	$0.0054	$0.0000
GS<50 kW	$0.0185	$0.0202	$0.0204	$0.0207	$0.0210	$0.0216	$0.0227	$0.0238	$0.0246	$0.0250
GS 50 to 1,499 kW	$3.0380	$3.4376	$3.4747	$3.5233	$3.5691	$4.0706	$4.3245	$4.5851	$4.7680	$4.8760
GS 1,500 to 4,999 kW	$2.9014	$3.3601	$3.3964	$3.4439	$3.4887	$3.6541	$3.9181	$4.1834	$4.3608	$4.4562
Large Use	$2.7775	$3.1907	$3.2252	$3.2704	$3.3129	$3.4742	$3.7199	$3.9710	$4.1440	$4.2422
USL	$0.0200	$0.0211	$0.0213	$0.0216	$0.0219	$0.0219	$0.0226	$0.0235	$0.0240	$0.0242
Standby Power GS 50 to 1,499 kW	$1.4416	$1.5734	$1.5904	$1.6127	$1.6337	$1.6865	$1.7669	$1.8489	$1.9052	$1.9370
Standby Power GS 1,500 to 4,999 kW	$1.3224	$1.4433	$1.4589	$1.4793	$1.4985	$1.5469	$1.6206	$1.6958	$1.7474	$1.7766
Standby Power Large Use	$1.4674	$1.6016	$1.6189	$1.6416	$1.6629	$1.7166	$1.7984	$1.8819	$1.9392	$1.9716
Sentinel Lighting	$7.2434	$9.6661	$9.7705	$9.9073	$10.0361	$11.3998	$12.2794	$13.8285	$14.6566	$14.8502
Street Lighting	$3.4563	$3.8523	$3.8939	$3.9484	$3.9997	$5.3171	$5.6501	$5.9758	$6.2053	$6.3414

TECHNICAL CONFERENCE UNDERTAKING - JT 3.21

JT 3.21

To provide the calculation for the floor and the ceiling.

RESPONSE:

This undertaking requests an update to Table B in part (I) of the response to interrogatory ED-5. This update was requested to illustrate the impact of basing fixed monthly service charges, for the 2021-2025 period, on the OEB-defined cost categories of Avoidable Cost, Directly Related Cost, and Minimum System Cost with PLCC Adjustment.

Table A below recreates Table B from part (I) of interrogatory response ED-5 with the requested additional lines to provide the context of applying the cost categories to all customer classes.

In reviewing the Technical Conference transcript dated July 17, 2020, Hydro Ottawa observed that the discussion which preceded the establishment of this undertaking requested the removal of the Residential class from the reproduction of the table in question (see page 142, lines 17-23). However, this aspect of the request was ultimately not captured as part of the scope of the undertaking. Nevertheless, Table B from the response to interrogatory ED-5 has also been recreated so as to illustrate the impacts of employing the OEB-defined cost categories on commercial and industrial rate classes only, while noting that Hydro Ottawa does not believe rate classes should be excluded from such a modeling exercise. Please see Table B below.

It should also be noted that, in two instances (Street Light and Sentinel), the Minimum System Cost option resulted in those customer classes being assigned more “fixed” cost than their total revenue requirements. The values in the table for these two customer classes have been capped at 100% of the revenue requirement allocated to those classes.

Table A – Fixed Charges by Customer Class ($'000s), Including Residential

	Residential	GS <50	GS 50 to 1,499 kW	GS 1,500 to 4,999 kW	Large Use	Street Light	Sentinel	Unmetered Scattered Load	Standby	TOTAL
2018 A	$74,847	$5,536	$7,706	$3,386	$2,278	$607	$2	$199	$3	**$94,564**
2019 A	$90,538	$5,749	$7,654	$3,396	$2,011	$647	$2	$203	$3	**$110,203**
2020 F	$104,308	$5,787	$8,179	$3,825	$2,011	$606	$2	$224	$4	**$124,946**
2021 F	$116,124	$6,280	$7,488	$3,422	$2,011	$716	$3	$223	$6	**$136,273**
2021 -2025 F	$649,213	$35,458	$40,292	$17,812	$10,371	$4,148	$18	$1,307	$32	**$758,651**
Fixed % of Total Cost	*100%*	*25%*	*16%*	*29%*	*26%*	*65%*	*51%*	*40%*	*28%*	***66%***
Avoidable 2021 - 2025 F	$89,458	$10,786	$5,343	$300	$20	$350	$9	$10	$24	**$106,300**
Fixed % of Total Cost	*14%*	*7%*	*2%*	*0%*	*0%*	*5%*	*24%*	*0%*	*21%*	***9%***
Directly Related 2021 - 2025 F	$162,472	$18,499	$9,024	$512	$59	$848	$17	$30	$36	**$191,497**
Fixed % of Total Cost	*25%*	*13%*	*4%*	*1%*	*0%*	*13%*	*49%*	*1%*	*31%*	***17%***
Minimum System 2021 - 2025 F	$379,973	$40,362	$15,785	$1,639	$334	$6,585	$35	$2,188	$24	**$446,925**
Fixed % of Total Cost	*59%*	*28%*	*6%*	*3%*	*1%*	*100%*	*100%*	*67%*	*21%*	***39%***

Table B – Fixed Charges by Customer Class ($'000s), Excluding Residential

	GS <50	GS 50 to 1,499 kW	GS 1,500 to 4,999 kW	Large Use	Street Light	Sentinel	Unmetered Scattered Load	Standby	TOTAL
2018 A	$5,536	$7,706	$3,386	$2,278	$607	$2	$199	$3	**$19,717**
2019 A	$5,749	$7,654	$3,396	$2,011	$647	$2	$203	$3	**$19,665**
2020 F	$5,787	$8,179	$3,825	$2,011	$606	$2	$224	$4	**$20,638**
2021 F	$6,280	$7,488	$3,422	$2,011	$716	$3	$223	$6	**$20,149**
2021 -2025 F	$35,458	$40,292	$17,812	$10,371	$4,148	$18	$1,307	$32	**$109,438**
Fixed % of Total Cost	*25%*	*16%*	*29%*	*26%*	*65%*	*51%*	*40%*	*28%*	***22%***
Avoidable 2021 - 2025 F	$10,786	$5,343	$300	$20	$350	$9	$10	$24	**$16,842**
Fixed % of Total Cost	*7%*	*2%*	*0%*	*0%*	*5%*	*24%*	*0%*	*21%*	***3%***
Directly Related 2021 - 2025 F	$18,499	$9,024	$512	$59	$848	$17	$30	$36	**$29,025**
Fixed % of Total Cost	*13%*	*4%*	*1%*	*0%*	*13%*	*49%*	*1%*	*31%*	***6%***
Minimum System 2021 - 2025 F	$40,362	$15,785	$1,639	$334	$6,585	$35	$2,188	$24	**$66,952**
Fixed % of Total Cost	*28%*	*6%*	*3%*	*1%*	*100%*	*100%*	*67%*	*21%*	***13%***

TECHNICAL CONFERENCE UNDERTAKING - JT 3.22

JT 3.22

To respond to VECC's written questions.

RESPONSE:

Written responses to the questions received by Hydro Ottawa from the Vulnerable Energy Consumers Coalition ("VECC") follow below.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.22 - QUESTION 1

JT 3.22 - WRITTEN QUESTION #1

REFERENCE: 3-VECC-59 (b) & (c) and Attachment VECC-59(B)

PREAMBLE:

VECC 59 b) requested detail on the “HeatIntensity” variable used in the Residential model. The attached excel spread sheet identified a number of independent variables that were factored into the determination of the HeatIntensity variable for each historic/forecast year including:

- Housing Square Footage
- Heating Equipment Market Shares
- Heating Equipment Efficiencies

The following questions follow-up on the request for the sources of the data used and the modifications to reflect Ontario trends.

QUESTIONS:

a) Please confirm that the Heating Equipment Market Shares are based on data from Natural Resources Canada and clarify whether or not the data is specific to the Ottawa area.

b) Please clarify what the variable “BSE Index Heat” (per Attachment VECC-59(B), StructuralVars Tab, Column M) represents and what the source is.

c) It appears that, apart from the Heating Equipment Market Share data, the EIA (i.e., the US Energy Information Administration) is the source for the balance of the data used to construct the HeatIntensity variable. Please confirm whether or not this is the case and, if not, for which inputs were other sources used and what those sources were.

d) Please confirm that 2015 was the year used for purposes of calibrating the residential model to Hydro Ottawa's residential electricity use.

e) Please explain why using a more recent year to calibrate the model would not have improved the accuracy of the forecast (i.e., using a year closer to the forecast period would mean there were less years for the EIA data to diverge from HOL's data).

f) Please confirm whether the preceding responses would also apply to the CoolIntensity variable used in the Residential model.

g) Please confirm whether the preceding responses would also apply to instances where the HeatIntensity and CoolIntensity variables were used in load forecast models for other customer classes.

RESPONSE:

a) The historical heating equipment shares for most heating end-uses are based on Natural Resources Canada ("NRCan") data for the province of Ontario and are not specific to Ottawa. Ground-source heat humps, secondary heating, and furnace fan shares are based on U.S. Energy Information Administration ("EIA") data, as the NRCan data did not contain those end-uses. The forecasted heating shares are based on the historical growth rates from NRCan and/or forecasted growth rates in heating shares from the EIA for the Middle Atlantic region.

b) The BSE Index Heat variable (and BSE Index Cool) stands for "Building Shell Efficiency" and measures the overall thermal shell efficiency of a home with respect to heating or cooling. The source is EIA's *Annual Energy Outlook*, Table 21: Residential Sector Equipment Stock and Efficiency.

c) The data used to construct the HeatingIntensity variable is derived from the EIA, with the exception of the market share data which comes from NRCan.

d) 2015 is the base year used to calibrate inputs.

e) The EIA data is based on a 2015 base year; this is why the calibration uses a 2015 base year. The base year calibration adjusts up or down the starting intensities so that total intensity equals historical average use for 2015. The percent change in intensity over time (which would impact the model estimation and forecast) would be the same if a different base year were chosen.

f) The Cool Intensity is derived in a manner similar to that which is described in the preceding responses.

g) The non-residential customer class models do not use the heating and cooling intensity inputs from Attachment VECC-59(B). The non-residential customer class models use commercial heating and cooling intensities found in Attachment VECC-64(B). These intensities are derived in a similar manner, using shares and efficiency inputs, and calibrated to a base year. Data from NRCan was not used, as the building type and end-use definitions were not compatible with EIA definitions.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.22 - QUESTION 2

JT 3.22 - WRITTEN QUESTION #2

REFERENCE: 3-VECC-69 a) & d) and Attachment VECC-69(A)

Exhibit 3, Attachment C, Table 4

QUESTION:

a) Please confirm that the CDM savings set out in Table 4 of Attachment C and the values provided in response to VECC-69 a) are all "annualized" CDM savings values. If not, please explain what they represent.

b) Please confirm that, apart from the application of a ½ year adjustment to the first year of a CDM program's saving, the values set out in VECC 69 a) are consistent with those used in the load forecast. If not, please explain.

c) The response to VECC-69 d) only provided the requested breakdown for the total CDM savings in each year. Please also provide the breakdown by customer class as requested in the original question.

d) Please confirm that the values provided in response to VECC-69 d) are also "annualized" CDM savings values. If not confirmed, please explain what they represent.

e) Please confirm that, apart from the application of a ½ year adjustment to the first year of a CDM program's saving, the values set out in VECC 69 d) are consistent with those used in the load forecast. If not, please explain.

f) With reference to Attachment VECC-69(A) {rows 51-78}, please confirm that neither the historical CDM values nor the forecast CDM values used included any adjustments for loss of persistence.

g) It is understood that the IESO has prepared reports setting the loss of persisting savings for LDC's CDM programs. Does Hydro Ottawa have such reports for its historic CDM program savings results and, if yes, why weren't the results incorporated into the load forecast?

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.22 - QUESTION 3

JT 3.22 - WRITTEN QUESTION #3

REFERENCE: 3-OEB-134 and Attachment OEB 134(A)
3-OEB-136 a)
3-VECC-69, Attachment VECC-69(A)

QUESTION:

a) With respect to Attachment OEB 134(A), Persisting Savings by Year&Prog Tab, starting at row 36 there is a determination of the savings implemented between the end of 2017 and early 2019 totalling 59,981 MWh. VECC-69 shows savings from 2018 CDM programs of 52,987 MWh. Why are the values different and what is the source of the 2018 savings values used in VECC-69?

b) Similarly, with respect to Attachment OEB 134(A), Persisting Savings by Year&Prog Tab, starting at row 61 there is a determination of the savings implemented between February 15, 2019 and December 2, 2019 totalling 46,758 MWh. VECC-69 shows savings from 2019 CDM programs of 42,991 MWh. Why are the values difference and what is the source of the 2019 savings values used in VECC-69?

c) With respect to Attachment OEB 134(A), Persisting Savings by Year&Prog Tab, starting at row 36/column G, there are estimates of the persisting savings in 2020 and subsequent years from CDM programs implemented between the end of 2017 and early 2019. Why do the savings for 2020 assume no loss of persistence and the savings for 2021-2025 assume that 2020 is the first year for each program?

d) Similarly, with respect to Attachment OEB 134(A), Persisting Savings by Year&Prog Tab, starting at row 61/column G, there are estimates of the persisting savings in 2020 and subsequent years from CDM programs implemented between February 15, 2019 and December 2, 2019. Again, why do the savings for 2020 assume no loss of persistence and the savings for 2021-2025 assume that 2020 is the first year for each program?

e) With respect to Attachment OEB 134(A), New By Class Tab, starting at row 79 is purportedly set out the basis for Table 6 in Exhibit 3 of the Application. However, the values differ from those in Table 6 – most significantly in the case of the GS<50 class.
   i) Are the differences for the GS<50 class due to the issue discussed in OEB-136 a)?
   ii) Which values are correct, those in Table 6 of the Application or those in Attachment OEB 134(A)?

f) With respect to the derivation of Table 6 as set out in Attachment OEB 134(A), New By Class Tab, the Residential values are derived in the Residential Tab (row 263/columns P-T) of the same Attachment. Please confirm that the Residential values in Table 6 include the ½ adjustment for a CDM programs first year and that this would be the case for the other customer classes as well.

g) Please confirm that Table 6 sets out the CDM savings as used in the load forecast.

h) With respect to Attachment OEB 134(A), Residential Tab {Rows 2-3}, please confirm that these are the annualized savings used in the calculations for Table 6 and that these values do not include any loss in persistence of savings.

i) With respect to Attachment OEB 134(A), Residential Tab {Rows 2-3}, please confirm that the 2020 Residential value of 11,137,407 kWh includes (per the "New by Rate Class" Tab) Affordability Trust Savings from 2018 and 2019. If confirmed, please explain why these savings aren't already captured in the historical data used to estimate the Residential load forecast model.

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.22 - QUESTION 4

JT 3.22 - WRITTEN QUESTION #4

REFERENCE: 3-VECC-72

PREAMBLE:

The response states that the LRAMVA threshold values for the test years are set out in Tables 6 and 7 from the Updated Exhibit 3

QUESTIONS:

a) Please confirm that the Board's LRAM model uses actual annualized CDM savings (with no ½ year adjustment for the first year) in it calculations.

b) Please confirm that Tables 6 and 7 include a ½ year adjustment for the first year a CDM program is implemented.

c) Please provide the equivalent of Tables 6 and 7 but without the ½ year adjustment.

d) The forecast CDM savings from programs implemented in 2020-2025 include the results from Hydro Ottawa's rate-based programs and savings from the Affordability Trust. Will the actual savings from these two areas be verified by a third party?
   - If yes, by who?
   - If no, why is it appropriate for the related savings to be included in the LRAMVA threshold and in future LRAM calculations?

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.22 - QUESTION 5

JT 3.22 - WRITTEN QUESTION #5

REFERENCE: 7-OEB-154

PREAMBLE:
The response states that Hydro Ottawa's proposal to set the primary/secondary split for conductors at the same values as used for: i) poles, towers and fixtures for overhead and ii) conduit for underground is in line with the approach previously approved in Toronto Hydro's 2020-2024 Rate Application.

QUESTION:

a) It is acknowledged that in the referenced Application Toronto Hydro used the same split for overhead conductor as it did for poles, towers and fixtures and the same split for underground conductor as it did for conduit. However, can Hydro Ottawa provide a reference to the Toronto Hydro Application that indicates this approach was based on the assumption that the two were the same as opposed to analysis that supported the two being the same?

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

TECHNICAL CONFERENCE UNDERTAKING - 3.22 - QUESTION 6

JT 3.22 - WRITTEN QUESTION #6

REFERENCE: 7-OEB-155 a)

7-VECC-99 a)

QUESTION:

a) Both information requests asked for the derivation of the Billing & Collecting weighting factors. The response provided does not set out the actual derivation of the weighting factors used. Please provide the derivation of the actual weighting factors by setting out each of the 23 vendor services provided, outlining what customer classes each supports, the weights applicable to each class for each of the services and the derivation of the overall weights based on the relative forecasts costs for each service.

RESPONSE:

a) In responding to interrogatory OEB-155, Hydro Ottawa intentionally grouped the 23 vendors into nine distinct patterns of customer impact (please see Table A, copied below for reference). Table A is a binary table – a value of "1" indicates a proportionate impact on that customer class weighted by number of connections. This was done to protect vendor competitive information; Hydro Ottawa is not proposing to expand on that level of detail.

Table B below is likewise sourced from the utility's response to interrogatory OEB-155. It further groups vendors into three groups of similar customer impact – again, to protect sensitive third-party competitive information. Weighting factors are based on the number of connections by customer class, averaged over the costs of the members of each vendor group. Without revealing specific cost detail, Table B expands on the response to interrogatory OEB-155 (and is therefore labelled as "UPDATED") so as to specify the proportion of Billing and Collecting cost allocated by each of the three vendor groups.

Table A – Allocation Factors (As per IRR OEB-155)

Vendor Pattern	Residential	GS<50	GS 50 - 1,499	GS 1,500 - 4,999	Large Use	Street Light	Standby	USL	Sentinel
1	1	1	1	1	1	1	1	1	
2	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1		
4	1	1	1	1	1		1		
5		1	1	1	1				
6			1	1	1	1	1		
7			1	1	1		1		
8	1	1	1						
9	1	1							

Table B – UPDATED – Weighting Factors for Vendor Groups (As per IRR OEB-155)

Vendor Group	Proportion of Cost	Residential	GS<50	GS 50 - 1,499	GS 1,500 - 4,999	Large Use	Street Light	Standby	USL	Sentinel
1	53%	1.0	1.1	4.1	10.3	10.3	10.9	11.1	1.3	0.1
2	40%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3	7%	1.0	1.1	9.2	24.1	23.4	0.7	23.3	0.0	0.0

TECHNICAL CONFERENCE UNDERTAKING - JT 3.23

JT 3.23

To look at the different models and inform whether they were looked at and if so why rejected relative to the approach taken.

RESPONSE:

The General Service 50 to 1,000 kW Interval and the General Service 50 to 1,000 kW Non-Interval class sales (kWh) were aggregated and modeled together. Model inputs such as the heating and cooling variable would be the same if modelled separately. Aggregating the sales resulted in improved model statistics.

The customer forecasts for the General Service 50 to 1,000 kW Interval and General Service 50 to 1,000 kW Non-Interval classes are based on separate models. Historically, the customer counts in these classes have been moving in opposite directions, with interval customers increasing and non-interval decreasing. Accordingly, there is no reason to aggregate and model them as one class.

While preparing the forecast, a forecast model was not run aggregating the classes together. However, as the historical data showed that the General Service 50 to 1,000 kW Interval class had a stronger correlation with the Residential customer forecast growth, while the General Service 50 to 1,000 kW Non-Interval class did not, the forecast model used a simple trend for the General Service 50 to 1,000 kW Non-Interval class.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.24

JT 3.24

Not Described

RESPONSE:

Hydro Ottawa interprets the scope of this undertaking as aligning with page 153, lines 2-10 of the Technical Conference transcript dated July 17, 2020, as follows:

In relation to the pre CDM forecast. This part of the exhibit on the Itron is talking about the forecast before you do any CDM adjustments, you know, you do this.

So the forecast before you do the CDM adjustments, the forecast were developed using the models just happened to come out as a constant number, or whether you just for purposes of the forecast assumed the sales were the same at historic levels.

Regression models are used to develop the load forecasts for the large user and street lighting classes. The large user model specification is found on page 41 of UPDATED Attachment 3-1-1(C): Hydro Ottawa Long-Term Electric Energy and Demand Forecast (produced by Itron), titled “Large User Sales Model”. The street lighting model specification is found on page 43 of UPDATED Attachment 3-1-1(C): Hydro Ottawa Long-Term Electric Energy and Demand Forecast (produced by Itron) and is entitled “Street Lighting Sales Model”.

The large user model does not contain a trend variable or any economic variable which would allow the forecast to increase or decrease over time. Large user sales are a function of cooling degree days and selected binary variables, one of which is a binary shift variable starting in May 2016. Because the cooling degrees do not change in the forecast period, the model output is essentially the average monthly sales since May 2016. This is the reason for the statement on page 23 of UPDATED Attachment 3-1-1(C): Hydro Ottawa Long-Term Electric Energy and Demand Forecast (produced by Itron).

The street lighting model is similar, in that it contains 12 monthly binaries and a binary shift variable starting in January 2019. The resulting forecast is consistent with the 2019 monthly values.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.25

JT 3.25

To advise whether the assumption that the values in that updated table 3 are based on covid is correct or not, and to provide the revised forecast.

RESPONSE:

For clarity, Hydro Ottawa confirms that the scope of this undertaking aligns with the discussion captured in the Technical Conference transcript dated July 17, 2020, stretching from line 21 on page 157 to line 22 on page 160.

The values in Table 3 of UPDATED Attachment 3-1-1(C): Hydro Ottawa Long-Term Electric Energy and Demand Forecast (produced by Itron) did not reflect the economic impacts caused by COVID-19.

The forecast for the purpose of this undertaking response was constructed with the economic inputs using the updated historical values through Q4 2019. Starting in Q1 2020, the values were used from the prior forecast. This is being referred to as a “Hybrid Scenario”.

Table A below provides the results of this Hybrid Scenario for the sales forecast by MWh for 2021-2025, with the inclusion of 2020 for comparison purposes.

Table A – Hybrid Scenario – 2021-2025 Energy Sales Forecast by Customer Class (MWh)[1]

	2020	2021	2022	2023	2024	2025
Residential	2,241,744	2,239,154	2,259,758	2,285,156	2,318,916	2,338,890
General Service < 50 kW	699,158	689,681	688,100	685,602	684,698	682,009
General Service 50 to 1,000 kW Non Interval	1,117,378	1,066,119	1,027,257	988,603	952,154	911,246
General Service 50 to 1,000 kW Interval	1,305,989	1,333,329	1,374,680	1,416,461	1,461,500	1,500,815
General Service 1,000 to 1,499 kW	384,231	383,713	385,005	382,286	388,554	389,590
General Service 1,500 to 4,999 kW	693,258	673,985	673,129	673,094	674,683	673,636
Large Use	588,827	574,291	572,889	572,034	572,834	570,390
Unmetered Scattered Load	14,105	13,601	13,131	12,663	12,194	11,727
Sentinel Lighting	47	47	47	47	47	47
Street Lighting	24,063	22,108	21,224	20,413	19,602	18,855
TOTAL MWh SALES	**7,068,800**	**6,996,028**	**7,015,219**	**7,036,359**	**7,085,183**	**7,097,204**

Table B provides the demand forecast by kW using the Hybrid Scenario for 2021-2025, with the inclusion of 2020 for comparison purposes.

Table B – Hybrid Scenario – 2021-2025 Demand Sales Forecast by Customer Class (kW)

	2020	2021	2022	2023	2024	2025
General Service 50 to 1,000 kW Non Interval	2,867,612	2,755,439	2,670,393	2,585,802	2,506,039	2,416,518
General Service 50 to 1,000 kW Interval	3,085,230	3,139,081	3,220,523	3,302,817	3,391,525	3,468,960
General Service 1,000 to 1,499 kW	850,347	849,297	851,916	854,517	859,117	861,217
General Service 1,500 to 4,999 kW	1,536,140	1,500,764	1,499,196	1,499,131	1,502,047	1,500,123
Large Use	1,075,011	1,052,899	1,050,767	1,049,467	1,050,683	1,046,964
Standby Power	7,440	7,440	7,440	7,440	7,440	7,440
Sentinel Lighting	132	132	132	132	132	132
Street Lighting	67,032	61,588	58,863	56,618	54,373	52,530
TOTAL KW DEMAND SALES	**9,488,944**	**9,366,640**	**9,359,230**	**9,355,924**	**9,371,356**	**9,353,884**

[1] This forecast does not include the Dry Core Transformer Charge.

Tables C and D below provide the average number of customers and connections using the Hybrid Scenario that are forecasted for the 2021-2025 period, with the inclusion of 2020 for comparison purposes.

Table C – Hybrid Scenario – 2021-2025 Average Number of Customers by Class

	2020	2021	2022	2023	2024	2025
Residential	313,150	316,342	319,368	322,284	325,136	327,980
General Service < 50 kW	25,198	25,387	25,549	25,698	25,841	25,981
General Service 50 to 1,000 kW Non Interval	2,069	2,004	1,930	1,856	1,781	1,707
General Service 50 to 1,000 kW Interval	1,005	1,043	1,082	1,120	1,158	1,196
General Service 1,000 to 1,499 kW	73	73	73	73	73	73
General Service 1,500 to 4,999 kW	68	68	68	68	68	68
Large Use	11	11	11	11	11	11
Standby Power	3	3	3	3	3	3
TOTAL CUSTOMERS	**341,577**	**344,931**	**348,085**	**351,113**	**354,071**	**357,020**

Table D – Hybrid Scenario – 2021-2025 Average Number of Connections by Customer Class

	2020	2021	2022	2023	2024	2025
Unmetered Scattered Load	3,321	3,321	3,321	3,321	3,321	3,321
Sentinel Lighting	55	55	55	55	55	55
Street Lighting	61,886	62,806	63,725	64,645	65,564	66,484
TOTAL CONNECTIONS	**65,262**	**66,182**	**67,101**	**68,021**	**68,940**	**69,860**

TECHNICAL CONFERENCE UNDERTAKING - JT 3.26

JT 3.26

Not Described

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.

TECHNICAL CONFERENCE UNDERTAKING - JT 3.27

JT 3.27

Not Described

RESPONSE:

Hydro Ottawa interprets the scope of this undertaking as aligning with the discussion on page 168, lines 12-20 of the Technical Conference transcript dated July 17, 2020, as follows:

Can we scroll down to VECC 104D, part D of this response dealing with the reconnect at the meter for a new account?

Now, as I understand it, this charge would be applied to a new customer that is setting up an account at a premise where the meter had previously been disconnected for non-payment, or for periods in which there is no confirmed account holder that would accept responsibility for the account. Is that correct?

Hydro Ottawa introduced the Disconnect/Reconnect at Meter – New Account service charge as part of its 2016-2020 rate application.[1] As explained in that application, the Disconnect/Reconnect at Meter – New Account (Regular and After Hours) charge was originally proposed in response to the OEB's customer service rules regarding the opening and closing of customer accounts, as prescribed in OEB consultation EB-2007-0722. Hydro Ottawa's business practices were augmented to disconnect services in situations where the financially responsible account holder is unknown or does not confirm account responsibility within the prescribed 15-calendar day period (as per sections 2.8.1 and 2.8.2 of the *Distribution System Code)*.

Hydro Ottawa established this charge to motivate customers to identify themselves as the responsible account holder, in order to avoid the inconvenience of disconnection and associated

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[1] Hydro Ottawa Limited, *2016-2020 Custom Incentive Rate-Setting Distribution Rate Application*, EB-2015-0004 (April 29, 2015). The specific exhibit within this application in which the proposed Disconnect/Reconnect at Meter service charge is explained is Exhibit H-7-1.

business costs. The existence of this charge also contributed to an increase in executed Landlord Reversion Agreements. These Agreements allow Hydro Ottawa to place the account in the Landlord's name during vacant periods, which provides both the Landlord and new customer a more seamless and positive service experience.

In situations in which customers do not self-identify and this results in a service disconnection, Hydro Ottawa applies the reconnection charge to the customer requesting reconnection.

There is a charge for the reconnection of service during regular business hours and a separate charge for the reconnection of service after regular business hours. These service charges are reflected under the Customer Administration category.

The respective service charge amounts are the same as those associated with reconnection for non-payment of account (at the meter).

TECHNICAL CONFERENCE UNDERTAKING - JT 3.28

JT 3.28

To take the load forecast in the response to sec JT 3.8 and apply whatever scale factor is felt to be appropriate to come up with a forward-looking growth factor.

RESPONSE:

As determined in undertaking JT 3.8, the customer count from the load forecast for 2021-2025 renders a compound annual growth rate ("CAGR") of 0.86%.

As discussed in UPDATED Exhibit 1-1-10: Alignment with the Renewed Regulatory Framework, Hydro Ottawa believes that a growth factor of 0.40% is appropriate. In which case, if using the forward-looking customer count forecast rather than historical analysis, Hydro Ottawa would apply a scaling factor of 0.47, as follows:

"G" Factor = customer growth rate * scaling factor
= 0.86% * 0.47
= 0.40%

TECHNICAL CONFERENCE UNDERTAKING - JT 3.29

JT 3.29

Not Marked

RESPONSE:

N/A

TECHNICAL CONFERENCE UNDERTAKING - JT 3.30

JT 3.30

Not Described

RESPONSE:

A response to this undertaking will be provided in full as soon as possible.