ONTARIO POWER GENERATION

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January 17, 2013

Via Email, RESS and Overnight Courier

Ms. Kristen Walli
Board Secretary
Ontario Energy Board
PO Box 2319
2300 Yonge Street, Suite 2700
Toronto, ON M4P 1E4

Dear Ms. Walli and All Intervenors in EB-2012-0002:

RE: EB-2012-0002 – OPG Confidentiality Request for Ex. L-1-7 SEC-05

As you know, OPG submitted letters on January 14 and 15, 2013 in respect of a request for confidential treatment for parts of its interrogatory response to L-1-7 SEC-05. The letter of January 15th included a copy of OPG's earlier email of January 15 to the OEB and all intervenors in respect of L-1-7 SEC-05.

Subsequent to delivering the above-referenced correspondence, OPG revisited part of its request for confidential treatment of L-1-7 SEC-05. The result is that OPG is now withdrawing its request for confidential treatment for parts of the subject interrogatory response which relate to various parameters used in the calculation of the referenced values of the Bruce Lease embedded derivative contained in the response. OPG's request for confidential treatment of other aspects of Ex. L-1-7 SEC-05 and of Ex. L-2-2 AMPCO-07 as set out in our letter of January 14, 2013 still stands. That is, with respect to Ex. L-1-7 SEC-05 specifically, OPG continues to consider as confidential certain information related to its contractual relationship with Bruce Power L.P. as indicated in the subject interrogatory response, as now amended, at page 2, lines 6-8 and as redacted in Attachment 1 to the response.

Annexed to this letter is a revised non-confidential response to L-1-7 SEC-05, including all attachments. As a confidential response (i.e. fully unredacted version) has already been filed with the OEB, it is not enclosed herein.

Yours truly,

Carlton D. Mathias

Att.
cc: Charles Keizer – Torys LLP
Garry Hendel – OPG
EB-2012-2002 Intervenors (with attachments)

SEC Interrogatory #05

Ref: H2/1/2, p. 4

Issue Number: 1
Issue: Is the nature or type of amounts recorded in the deferral and variance accounts appropriate?

Interrogatory

Please provide the full calculation of the derivatives for each of 2011 and 2012, including all assumptions used (such as discount rates, or future annual average HOEP) and the sources of those assumptions, and file the report or reports of E&Y referred to. Please include a full, live version of the valuation model referred to. Please provide a copy of any reports or presentations to the Applicant's senior management or Board dealing with the calculation and/or impact of these derivatives, or dealing with any alternatives to derivative accounting considered.

Response

Exhibit L-1-1 Staff-10 c), Attachment 1 provides the assumptions used and the resulting valuations of the derivative liability at year-end 2011 and at Q2 2012 as well as the valuation of the increase in the derivative liability resulting from the extension of the accounting service life of the Bruce B units for an additional five years to 2019.

In addition to the information provided in L-1-1 Staff-10 c), Attachment 1 to this response is a memorandum to OPG's Chief Financial Officer discussing the Bruce Lease Supplemental Rent Claim for 2009. Appendix B to this memorandum is a paper titled Valuation of Bruce Power's Embedded Put Option dated February 11, 2010 (Attachment 1, pp. 9-15) ("Technical Document"). The Technical Document provides the underlying mathematical model used to compute the embedded derivative and assumptions used to derive the expected annual Average HOEP by removing a risk premium from OPG's proprietary forward price curve, together with an explanation as to the basis/sources of the assumptions. The derivation of the $118M fair value of the Bruce Lease derivative recorded in OPG's 2009 audited consolidated financial statements using the model described in the Technical Document is illustrated in Appendix A to Attachment 1 (page 8).

Attachment 2 to this response supplements the Technical Document (the "Supplement"). It provides the specific parameter values such as forward price data for HOEP used in the model to calculate the values provided in L-1-1 Staff-10 c). The Supplement includes the specific formulae and coding underlying the calculation and was prepared by OPG in responding to this question in order to allow the calculations to be fully understood.

In addition to the assumptions addressed by the above Technical Document and Supplement, and as discussed in L-1-1 Staff-10 c), the other assumptions provided in Attachment 1 to that interrogatory are the discount rate, which is used to determine the

present value of the liability, and an estimated value for the Consumer Price Index ("CPI"), which is used to estimate the projected amount of the supplemental rent rebate for each future year. The source and rationale for the discount rate used is discussed in L-1-7 SEC-09. The estimated CPI values are based on publicly available information.

In the non-confidential version of this response, OPG has redacted certain information in the body of the memorandum related to its contractual relationship with Bruce Power L.P., as the disclosure of such information may affect OPG's commercial interests.

OPG also notes a typographical error contained in the memorandum. At page 5 of Attachment 1 there is a reference to "four units of Bruce A" in the last paragraph. The reference should be to "four units of Bruce B". As noted in sections 2 and 5 of the memorandum at pages 2 and 4 of the Attachment, respectively, and in L-1-1 Staff-8 b), the partial rent rebate provision in the Bruce Lease agreement does not apply to Bruce A units as long as they are subject to the Bruce Power Refurbishment Implementation Agreement between Bruce Power and the Ontario Power Authority.

For clarity, OPG's pre-filed evidence at Ex. H2-1-2, p. 4, lines 21-25 does not contain a reference to "report or reports of [Ernst & Young LLP] E&Y." As noted in that evidence, "… E&Y … reviewed the significant inputs used in the model, the model itself and the resulting valuation as part of the audit of OPG's financial statements …" As noted above, the requested information from the 2011 E&Y audit report to OPG's Board of Directors and/or committees thereof is provided as part of Attachment 3 as described in the following paragraph. E&Y's independent auditors' report on OPG's 2011 consolidated financial statements provided as part of OPG's year-end 2011 external financial report is found at page 61 of Ex. A3-1-1, Attachment 1.

Attachment 3 provides the requested information from reports by OPG's Senior Management and E&Y to OPG's Board of Directors and/or committees thereof that relate to the calculation and/or impact of the derivative and accounting for the derivative. Specifically, Attachment 3 includes the following:

Attachment	Document	Requested Information
3A	Year End Report 2009 for the Audit/Risk Committee and Board of Directors Meeting – March 2010	• Year End Results – Key Disclosures • Accounting and Tax Matters • Accounting and Tax Matters for Disclosure – Fourth Quarter 2009
3B	Ernst & Young 2009 Financial Statement Audit Results Report	• E&Y Communication to the Audit/Risk Committee of the Board of Directors • Areas of emphasis, critical policies, and judgments and estimates
3C	2010 First Quarter Report for the Audit/Risk Committee and Board of Directors Meetings – May 2010	• Accounting and Tax Matters and Other Project Updates • First Quarter Results – Key Disclosures and Recommendation • Accounting and Tax Matters for Discussion – First Quarter 2010
3D	Ernst & Young 2010 First Quarter Review Report for 31 March 2010	• E&Y Communication to the Audit/Risk Committee of the Board of Directors • Areas of focus and changes in accounting policies, judgments & estimates
3E	Ernst & Young 2010 Second Quarter Review Report for 30 June 2010	• E&Y Communication to the Audit and Finance Committee of the Board of Directors • Areas of focus and changes in accounting policies, judgments & estimates
3F	Ernst & Young 2010 Third Quarter Review Report for 30 September 2010	• E&Y Communication to the Audit and Finance Committee of the Board of Directors • Areas of focus and changes in accounting policies, judgments & estimates
3G	Ernst & Young 2010 Audit Results Report	• E&Y Communication to the Audit and Finance Committee of the Board of Directors • 2010 Audit Results – Critical policies, estimates and areas of audit emphasis
3H	Ernst & Young 2011 Audit Results Report	• E&Y Communication to the Audit and Finance Committee of the Board of Directors • Critical policies, estimates and areas of audit emphasis

OPG declines to provide a live version of its proprietary valuation model. As discussed in the OEB's Decision with Reasons in EB-2007-0905 (pp.111-112), the purpose of the Bruce Lease Net Revenues Variance Account is to ensure that OPG recovers its costs associated

The issue before the OEB is whether in making entries to the Bruce Lease Net Revenues Variance Account, OPG has appropriately calculated the costs and revenues associated with the Bruce Lease according to CGAAP. One element of this calculation is the reduction in supplemental rent associated with years when annual average HOEP is below $30/MWh, which must be valued as a derivative under CGAAP.

In response to this and other interrogatories, OPG has detailed the specifics of and all inputs to the calculations valuing the derivative and also has provided the documentation supporting this calculation and material from its auditors confirming both the calculations and that they are in accordance with CGAAP. This information will allow the parties and the OEB to understand and validate the calculations that OPG has performed.

Variations to these calculations as a result of the manipulation of a live model by SEC or any other intervenor are not relevant to this proceeding because they could only produce results that are different from OPG's actual costs of the Bruce Lease, which are the amounts recognized in OPG's financial statements and reviewed and accepted by its auditors as appropriate. Moreover, any changes to the input of the model would themselves need to be fully understood and validated.

As explained in L-1-1 Staff-07, no alternatives to derivative accounting were considered because derivative accounting as applied by OPG is required in accordance with CGAAP and USGAAP.

ONTARIO POWER GENERATION

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Donn Hanbidge
Chief Financial Officer

February 25, 2010

Robin Heard
VP Finance and Chief Controller

Bruce Lease Supplemental Rent Claim for 2009

Background

In May 2001, OPG entered into a Lease Agreement with Bruce Power for the Bruce Nuclear Power Development site, which included the Bruce-A and Bruce-B generating stations. The lease requires Bruce Power to pay OPG both a Base Rent and a Supplemental Rent tied to the operational Bruce-A and Bruce-B generating units. The initial calculation for Supplemental Rent involved a rate per megawatt hour (MWh) of production and included a compensation factor for the ultimate disposal of used fuel.

In January 2002 the Supplemental Rental clause of the Lease was amended to provide for a fixed annual Supplemental Rent per unit, adjusted annually by a Consumer Price Index (CPI) quotient. The amended clauses additionally provided that the Supplemental Rent rate would be significantly reduced if the annual arithmetic average hourly price of electricity in the Ontario market (i.e. HOEP) was below $30.00 per MWh.

Subsequent amendments to the lease in 2003 and 2005 have modified the conditions of Supplemental Rent payments but have retained the concept of reduced rental payments below the HOEP threshold of $30.00 per MWh. The amendment to the Lease in 2005 made the HOEP reduction applicable only to the Bruce B operating units; the Bruce-A units are not eligible for the HOEP as long as the agreement between Bruce Power and the Province of Ontario for the refurbishment of the Bruce-A units is in effect.

The 2009 HOEP closed out at $29.58/MWh. As a result, and in accordance with Schedule 3.1 Section 3.1.3.4 of the lease agreement, OPG received the annual Supplemental Rent Certificate from Bruce Power on January 19, 2010, claiming a return of Supplemental Rent overpayments for the Bruce generating facilities. The value of the claim is $72,826,903.80 including GST (approximately $69 million excluding GST). [redacted]

Actions Taken

Upon receipt of the transmittal a number of activities were completed to validate and substantiate the claim, including:

1. Notification of appropriate stakeholders of the receipt of claim.
2. Review of contract documents in order to confirm the validity of the claim.
3. Independent calculation of the value of the claim using terms and conditions of the contract and amendments.
4. Consultation with corporate stakeholders in order to obtain consensus of conclusions.
5. Accounting entries and financial reporting for 2009 rent rebate.
6. Quantification of future exposure for OPG from subsection 3.1.3.4 of Schedule 3.1 and appropriate accounting entries.

1. Notification of Stakeholders

Upon receipt of the claim the following individuals were notified:

Dietmar Reiner, Senior Vice President - IM&CS.

Steve Reeves, Controller - IM&CS

Law Division representatives were also notified as the transmission had been addressed to David Brennan, Senior Vice President – Law and General Counsel.

2. Review of Contract Documents

Terry Dereski of the Bruce Lease Management Office provided copies of the relevant sections of the Bruce Lease Agreement and amendments #1 - 3 that deal with Supplemental Rent. The original provisions of the Lease with respect to rent payments have gone through some modification in the amendments to the Agreement.

The amendment to the contract calls for Supplemental Rent to be paid in the amount of $25,500,000 per operating unit per year (as set in 2002) adjusted by CPI factors thereafter. Providing that the average arithmetic cost of power (HOEP) exceeds $30.00 per MWh, the full Supplemental Rent per operating unit at the Bruce A and B units will be payable is monthly installments by Bruce Power to OPG.

In the event that the average HOEP falls below $30.00 per MWh the annual Supplemental Rent is reduced to $12,000,000 per year per unit for each operational Bruce B unit. Supplemental Rent for operational Bruce A units remain unchanged as long as the Bruce Power Refurbishment Implementation Agreement ("Implementation Agreement") between Bruce Power and the Province remains in effect. This provision was introduced in the 3rd amendment to the lease subsequent to the execution of the BPRIA.

During the course of the year Bruce Power pays to OPG monthly the full Supplemental Rent, and then issues to OPG a Supplemental Rent Certificate in the month of January of the following year summarizing the rent payments for the 12 preceding months. At this point, Bruce Power assesses the HOEP for the preceding year and makes a claim for reimbursement of Supplemental Rent overpayments if the HOEP value is less than $30.00 per MWh

3. Independent Calculation of Claim Values

To validate the value of the claim, an independent calculation was performed by OPG. This calculation included the following steps:

1. Verification of the arithmetic average cost of power per MWh was conducted by consulting the HOEP values published by the IESO. Based on the monthly values reported the annual average for 2009 is $29.58 per MWh. A subsequent discussion on the terms of reference and the definitions of which average should apply concluded that the $29.58 average calculated by the IESO is the appropriate value for this calculation.
2. Validation of the CPI values used by Bruce Power. Published CPI values were obtained from the Bank of Canada and were compared to the values used. While some minor differences were found these differences were not material to the calculations.
3. A spreadsheet was created to calculate the total Supplemental Rental payments per the Lease Agreements in the event that the average rate is greater than $30.00 per MWh. The total value of payments was then reconciled to monthly payments received by Bruce Power in 2009.

4. Rental payments were then calculated using the rates assuming an average rate per MWh lower than $30.00. The difference between these two methods was calculated and found to be consistent with the Bruce Power claim value.

[redacted]

4. Consultation with Corporate Stakeholders

During the investigation process a consultation process was implemented by Mario Cornacchia to ensure that stakeholders were informed of the existence and progress of the claim and to elicit opinions and other input relative to the validity and payment of the claim.

Individuals included in the consultation process included:

Dietmar Reiner	Senior VP, IM&CS
Mario Cornacchia	Commercial Services, IM&CS
Terry Dereski	Commercial Services, IM&CS
Dennis Dodo	Nuclear Finance
Randy Leavitt	VP Nuclear Finance
Steve Reeves	Nuclear Finance
Dickson Harkness	Law Division
David Brennan	Law Division
Paul Burke	Planning – Energy Markets
Joanne Barradas	Financial Services
Robin Heard	VP Finance and Chief Controller

Through this process it was concluded that the claim submitted by Bruce Power was valid in terms of the contractual obligations set out in the Lease Agreements and that the value had been correctly calculated.

It was also recommended that OPG's shareholder would be consulted prior to final approval and payment of the claim.

5. Accounting Treatment and Financial Disclosure

The accounting treatment and disclosure issues have been broken down into the following discussion areas:

5.1 Regulatory Treatment

5.2 Accounting Treatment of Embedded Derivative

5.3 Bruce B Units

5.4 Bruce A units 3-4

5.5 Valuation Model

5.6 Bruce Lease Net Revenue Variance Account

5.7 HB3862 disclosure

5.8 Tax Impact

5.9 Future Period Impact

The payment will be made pending consultation with OPG's shareholder.

The journal entry recorded reflected a reduction to lease revenue of $69 million. The reduction in revenue reflected Bruce's claim for the lower Supplemental Rent payments for 4 units at the Bruce B nuclear generating station. This reduction of $69 million was determined by subtracting the amount collected (excluding GST) for the Bruce B units minus $48 million ($12 million per unit for four Bruce B units).

This calculation excludes Bruce A. This is because the Supplemental Rent for the Bruce A units remains unchanged unless the Implementation Agreement was terminated. Currently, there is no indication that the Implementation Agreement will be terminated; thus there was no claim on the Bruce A units for 2009.

5.1 Regulatory Treatment

Although the Bruce generating stations are not prescribed facilities, the income and expenses related to the Bruce generating stations are included in the determination of OPG's regulated prices. Specifically, forecasted Bruce lease revenues were applied against OPG's revenue requirement. In the OEB's 2009 decision, the OEB authorized a Bruce Lease Net Revenue Variance account. Under the Bruce Lease Net Revenue Variance account, OPG is required capture in a variance account the difference between actual and forecast revenues and costs related to the nuclear generating stations on lease to Bruce Power. Accordingly, OPG has recorded an offsetting regulatory asset of $69 million for the 2009 reduction in Supplemental Rent.

5.2 Accounting treatment of embedded derivative

In accordance with CICA HB Section 3855, Financial Instruments – Measurement and Recognition, this adjustment to the Supplemental Rent would be considered an embedded derivative that needs to be bifurcated from the lease agreement. Embedded derivatives are measured and recognized at fair value in the statement of income, which is in addition to the current claim by Bruce Power already recognized for 2009.

This embedded derivative is similar to a series of put options written by OPG requiring OPG to "pay" Bruce Power an amount that is equal to the normal Supplemental Lease payment minus $12 million with a strike price linked to a HOEP price (arithmetic average) of $30/MWh for that year, which is exercisable by Bruce Power every year for the duration of the lease.

The value of this embedded derivative is determined based on a number of factors including forward price curves for future years (excluding the impact of any risk premium included in the forward prices), the volatility of the HOEP price, forecasted consumer price index, and a discount rate. Further details of the pricing models and inputs will be discussed later in this memo. The following discusses which of the options are included in the valuation model.

5.3 Bruce B Units

Supplemental lease payments are only applicable in years where the units are operating at any time during the year. Consistent with OPG's assumption for depreciation purposes, Bruce B units have an average useful life of 2014. To be consistent with this assumption, OPG has concluded that the valuation would only be applicable to the four units up to 2014. This is because, if the units are not operating, OPG would not collect Supplemental Rent from Bruce Power for those units and the embedded derivative would have no value.

In addition, based on the current forecast, the forward price beyond 2014 is estimated to be $45/MWh or higher, hence options value beyond 2014 will likely have a value of close to zero. In the future, if the useful life of the Bruce B generating station for accounting purposes is extended, the options related to years beyond 2014 will need to be evaluated.

5.4 Bruce A Units 3 and 4

For Bruce A Units 3 and 4, the $30/MWh trigger is only effective if the Implementation Agreement related to the Bruce A refurbishment is terminated. Currently, however, there is no indication that the Implementation Agreement will be terminated. If the Implementation Agreement were to be terminated in the future, the Bruce A option would be valued the same way as the Bruce B options as discussed above.

5.5 Valuation Model

A write-up of the valuation model is included in Appendix A and Appendix B. The model was prepared by Energy Markets and reviewed by the Corporate Portfolio Risk Management group in Finance. The basic steps to estimate the fair value of the options are as follows:

1) The valuation model estimates the probability of the strike price being met in each year;

2) The probability for the year is then multiplied by the maximum exposure for each year;

3) The result of the probability-adjusted value is discounted at OPG's credit adjusted rate;

4) The sum of all present values is the present value for the series of the options.

As of December 31, 2009, the sum of all present values for four units of Bruce A up to year 2014 is estimated to be $118 million. The fair values of the embedded derivatives are recorded in long-term accounts payable and as a reduction to revenue (Regulated – Nuclear Generation segment).

OPG uses market-based variables as input into the valuation to the extent those variables are available. The fair value of the derivative is calculated based on a number of inputs and the key inputs are listed as follows:

To calculate the probability of the strike price being met: Forward curve for electricity for Ontario[1], estimation of risk premium included in the forward curve value (to remove risk premium), and calibration of volatility.

To calculate the maximum exposure: Supplemental Rent and the Expected Consumer Price Index

To calculate present value: OPG's credit adjusted rate (In accordance with EIC 173, *Credit Risk and the Fair Value of Financial Assets and Financial Liabilities*, OPG is required to include its credit risk for the valuation of a financial liability).

To determine which options to include: Number of Units that operate during the year and Useful life of the stations.

5.6 Bruce Lease Net Revenue Variance Account

As discussed in the above, OPG is required to capture in a variance account the difference between actual and forecast revenues and costs related to the nuclear generating stations on lease to Bruce Power. Accordingly, OPG has recorded a regulatory asset of $118 million in the Bruce Lease Net Revenue Variance account.

5.7 HB3862 Disclosure

The estimation of risk premium requires the use of an assumption of implied profitability probability of 80%. This assumption is not a significant input and is not based on observable market information. Hence, the instruments are classified as level 3 for fair value disclosure purposes. In accordance with HB3862, OPG is required to present a sensitivity analysis for instruments that are classified at level 3.

The sensitivity analysis was performed by varying key assumptions to a reasonably possible degree. OPG varied the profitability probability range from 70% - 90% and volatility sigma from 0.012 to 0.018. These ranges are determined based on professional judgment of what is reasonably possible given the knowledge of the market and variability in the surrounding environment. By varying these variables, OPG disclosed sensitivity of an increase of $45 million or a decrease of $44 million, respectively.

5.8 Tax Impact

As a result of the OEB's prescribed method for calculating the income tax related to Bruce, which differs from OPG's income tax method, OPG recorded $5 million of income tax recovery in 2009 related to the $69 million. The income tax recovery related to the fair value of the embedded derivative is approximately $6 million

1. Given the illiquidity in the Ontario market for electricity forward contracts and electricity related options, forward price curves and volatilities are estimated based on limited actual transactions, bid/ask spreads posted from time to time, and inferred prices from other liquid hubs.

5.9 Prior Period Impact

Upon review of the material there is no prior period impact caused by this issue. Both parties have been applying the contract in strict accordance with its terms, and 2009 is the first year the HOEP value has dropped below $30 per MWh.

6.0 Ongoing Accounting, Reporting, and Internal Control Processes

Concurrent with the activities listed in this document Nuclear Finance has undertaken a study to improve the level of control and management reporting for the Bruce Lease Management Office. Recommendations of the study performed include the following:

1. Recommended accountabilities should be validated and accepted by identified OPG business units, including Finance, Corporate Real Estate, Law Division, Business Services & Information Technology, Risk Services, Regulatory Affairs & Corporate Strategy, and Nuclear business units with specific accountabilities.
2. Specific requirements for regular reporting should be outlined for financial results, strategic decisions, and emerging issues in order to ensure the relationship is well managed and obligations are discharged in a timely and effective manner.

[redacted]

4. Governance should be created or updated to reflect accepted accountabilities and reporting requirements. In addition, guidelines should be developed to assist OPG business units who interface with Bruce Power or receive requests outside the existing agreements. These guidelines should address materiality provisions and limits requiring formal agreement or amendment.
5. With a firm understanding of the accountabilities of OPG business units, reporting requirements and the strategic goals of the BLMO, resource levels should be reviewed for adequacy. If transactional responsibilities are to be retained by the BLMO, additional resources may be required to adequately fulfill oversight responsibilities.
6. With regard to organizational placement of the BLMO, three organizations should be considered:
    (i) Nuclear Commercial Relations,
    (ii) Corporate Affairs, and
    (iii) Corporate Business Development.

Dedicated financial support within the appropriate Controllership is also recommended.

Organizational alignment with a non-operational group will enhance BLMO capabilities to coordinate and drive the discharge of OPG obligations and service new requests. In addition, periodic reports to OPG Senior Management (and the OEB) could be appropriately integrated with other corporate initiatives.

Randy Leavitt
VP Nuclear Finance

Appendix A

Year Ended December 31, 2009
Bruce Emedded Derivative Estimate

	Input fields
Assumptions:	
Supplemental Rent for 2009	117,358,596
Reduced Supplemental Rent	12,000,000
Number of Units	4
Total Reduced Supplemental Rent	48,000,000
CPI - 2010	1.50%
CPI - 2011 to 2014	2.00%
CPI - 2015 to 2018	2.50%
Probability 2010 - 2014	50%
Probability 2015 - 2018	0%
Discount Rate	4.12%

Summary of Results:

Maximum refund (undiscounted)	736,703,307
Maximum value of derivative (PV)	599,494,478
Expected value of derivative (undiscounted)	132,000,605
Expected value of derivative (PV)	**117,973,985**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Full Supplemental Rent	119,118,975	121,501,354	123,931,382	126,410,009	128,938,209	132,161,665	135,465,706	138,852,349	142,323,658	1,168,703,307
Reduced Supplemental Rent	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	432,000,000
Maximum refund	71,118,975	73,501,354	75,931,382	78,410,009	80,938,209	84,161,665	87,465,706	90,852,349	94,323,658	736,703,307
Probability	41.66%	41.72%	36.71%	27.51%	27.51%	0.00%	0.00%	0.00%	0.00%	
Maximum Fair Value of Derivative (100% probability)	68,302,783	67,795,546	67,263,588	66,708,803	66,132,988	66,043,758	65,918,631	65,759,642	65,568,738	599,494,478
Total expected adjustment	29,630,350	30,663,908	27,877,529	21,566,718	22,262,100	-	-	-	-	132,000,605
PV of expected adjustments	**28,457,038**	**28,283,511**	**24,695,227**	**18,348,294**	**18,189,916**	**-**	**-**	**-**	**-**	**117,973,985**

Valuation of Bruce Power's Embedded Put Option

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February 11th, 2010

1 Introduction

Bruce Power negotiated an embedded put option in their long-term lease contract for the Bruce A and Bruce B nuclear stations with Ontario Power Generation (OPG). Whenever the arithmetic average of the Hourly Ontario Electricity Price (HOEP) over a calendar year falls below 30$, they can exercise a provision in their contract with OPG that entitles them to a rebate on part of the rent for that year. For the calendar year 2009 this rebate is about 72.8 M$. This option is in place for the duration of the lease until the end of the year 2018.

The embedded put option constitutes an obligation for OPG that needs to be valued in the companies financial statements. The question to be answered is:

> "What is the fair value of the options for 2010–2018, as of December 31st, 2009?"

We shall answer this question by constructing a model from which the probability that the option is exercised for a given year can be derived. Multiplying these probabilities by the maximum exposure for each year and summing the discounted values gives the Present Value (PV) that is needed for the company's financial statements. This value needs to be updated during the course of the year for the quarterly financial statements.

2 Analysis

This contingent claim has elements of the following option types:

1. **Binary Put.** Such a contract pays a pre-determined, fixed amount, if the value of the underlying asset falls below a certain level,
2. **Asian Option.** Such a contract is written on the arithmetic average of the value of the underlying asset over a specific time period,
3. **Forward Starting Option.** An option where part of the components that determine the value of the option are already known when the contract is entered into.

The underlying asset on which the option is written, is the Hourly Ontario Electricity Price (HOEP). For notational brevity and to adhere to standard financial notation, we will denote this as a spot-price $S(t)$, where the time t is measured in hours. The average price over the hours $t = 1, \ldots, T$, where T is 8760 (or 8784 for a leap year), is given by

$$\bar{S} = \frac{1}{T} \sum_{t=1}^{T} S(t). \tag{1}$$

The option that Bruce Power holds is an annual recurring, binary put on $\bar{S}$, with a strike of $K = 30\$$ and notionals in the order of 72.8M\$.

2.1 Model

Rather then to propose a model for the spot-price process and its evolution, we have chosen to directly model the annual, arithmetic average of the spot price. The reasons for this are given in greater detail in Section 7.1, but boil down to the generally acknowledged difficulty of accurately modeling hourly electricity prices, certainly over longer periods of time, and the calibration of the model parameters.

The traded instruments for electricity in the Ontario market are limited to forward contracts only; options on electricity do not exist. The fact that one can synthesize the annual average over the spot price by purchasing a 7×24 forward contract over the same period, for a volume of 1 MW, forms the basis of our model. The power that we receive over that period, by paying a forward price of F per MW over a period of T hours, has a total market value of $\sum_{t=1}^{T} S(t)$. So, for a payment of $F \times T$, we receive $\sum_{t=1}^{T} S(t)$, and this establishes a connection between the forward price and the arithmetic average of the spot price over a calendar year. We formally relate the two through the following model:

$$\bar{S} \cong F e^{-\lambda - \frac{1}{2}\sigma^2 + \sigma Z}, \tag{2}$$

where the symbol $\cong$ denotes equality in distribution, F is the latest observed forward price, $\lambda > 0$ represents a discount factor, σ is a standard deviation, and Z is a standard normal variate, so that $\bar{S}$ follows a lognormal distribution. The expected value of $\bar{S}$ is given by:

$$\mathsf{E}\,\bar{S} = F e^{-\lambda}. \tag{3}$$

This incorporates the well-documented fact that the forward price in electricity markets is not an unbiased estimator of the expected (average) spot price, and incorporates a risk premium. Moreover, when the distribution of spot prices exhibits positive skewness and there is a risk of price spikes, the forward contract trades at a risk premium over the expected spot. Section 7.2 discusses this in more detail. Examining Table 1, we can see that the prices in Ontario are positively skewed and experience large price spikes, so that the assumption of a positive risk premium is plausible.

As there is no options market, from which one can derive implied volatilities, we are limited to the historical forward-price series to quantify the uncertainty around the annual average. For the standard deviation σ of the logarithmic of the annual average for the next calendar year (2010), we assume that this is the same as the standard deviation that the logarithm of the forward price would experience over a period of a calendar year. With the usual assumption that there are 250 trading days in a year, this implies that

$$\sigma = \sqrt{250}\, \sigma_F, \tag{4}$$

where σ_F is the standard deviation of the daily log-returns of the forward. For all the subsequent calendar years (2011 and beyond), we use $2 \times 250 = 500$ trading days, as the electricity price process is mean-reverting and thus the volatility will stabilize for longer periods of time, which we assume occurs after two years.

2.2 Exercise Probability

Under model (2) for the distribution of the annual average spot price, we can determine the probability that the option will be exercised for a particular year as the expected value of a \$1 binary put option B, with strike $K = 30\$$:

$$\mathsf{E}\, B = \mathsf{E}\ \mathbf{1}(\bar{S} < K) = \mathsf{Prob}\,(\bar{S} < K) = \mathsf{Prob}\,(F\, e^{-\lambda - \frac{1}{2}\sigma^2 + \sigma Z} < K) = \Phi\left(\frac{\ln(K/F) + \lambda + \frac{1}{2}\sigma^2}{\sigma}\right), \tag{5}$$

where Φ is the cumulative density function (cdf) of the standard normal distribution.

2.3 Risk Premium

The risk premium in the forward is estimated by means of the following trading strategy: at the start of the calendar year, we sell a forward at price F. During the calendar year we have to deliver the commodity at the spot price, so that the profit or loss at the end of the year is given by:

$$\text{P\&L} = F \times T - \sum_{t=1}^{T} S(t).$$

The probability of not loosing money on this trade is given by

$$\mathsf{Prob}\,(\text{P\&L} \geq 0) = \mathsf{Prob}\,(\bar{S} \leq F) = \cdots = \Phi\left(\frac{\lambda}{\sigma} + \frac{1}{2}\sigma\right).$$

If we insist that we need a minimum probability p, so that we do not loose money on the trade, we can determine the discount factor as:

$$\lambda = \Phi^{-1}(p)\sigma - \frac{1}{2}\sigma^2. \tag{6}$$

This gives the (relative) risk premium, embedded in the forward price, as:

$$\frac{F - \mathsf{E}\,\bar{S}}{F} = 1 - e^{-\lambda} \tag{7}$$

Note that p is a reflection of the risk-aversion of the trader and the market liquidity. In a market that is not very liquid, there would not be many trade opportunities to off-set a trade that lost money, and hence p would be relatively high. The more liquid a market is, the more possibilities there are to recover any losses, and consequently, the lower p would be. Note that, by (6), the risk premium λ also incorporates the volatility of the traded asset.

3 Data and Model Inputs

This Section describes the data that was used to calibrate the volatility of the forward price series, and the assumption that was made for the required probability of a trade being profitable.

3.1 Daily Volatility of the Forward

The data for the analysis was provided by the Market Risk group of Energy Markets. This comprised the historical, daily forward prices for Cal-2008, Cal-2009, and Cal-2010, as recorded on business days, over the preceding calendar years, 2007, 2008, and 2009, respectively. A volatility estimate for each time series was estimated as the standard deviation of the equally weighted, log returns. This resulted in the following estimates:

	Cal-2008	Cal-2009	Cal-2010
$\hat{\sigma}_F$	0.014528	0.016571	0.015395

.

We note that these estimated volatilities are very similar, and support the simplifying assumption that we can treat all forward price series as having the same daily volatility. Hence, we will take the rounded average of these three volatilities as the final daily, volatility estimate of the forward price: $\sigma_F = 0.015$.

3.2 Required probability of a trade being profitable

It was judged that $p = 0.9$, would be too high, as it would probably price any potential transactions out of the market, and that $p = 0.7$ would be too low in a very thin and volatile market to have a reasonable profit expectation. In the end, we made a judgment call, and have chosen $p = 0.8$, as a reasonable value.

4 Sanity Check

To see what the effects of the key parameters (σ and p) of the model are, we have varied these parameters over a reasonable range and computed what the corresponding risk-premium for a Cal-2010 forward would be. The results are displayed in Table 2 and Table 3. Where the former gives the risk premium, relative to the forward price, as per (7), and the latter the risk premium, relative to the spot price.

The parameter choice of $\sigma = 0.015$ and $p = 0.8$ results in a risk premium, relative to spot price, of 18.7%. This value is comparable to the results from the market studies that OPG commissioned before market opening.

4.1 Internal Validation

Prior to market opening in Ontario on May 1st, 2002, OPG conducted several studies on how to construct forward curves and what risk premiums to charge. The findings [2, p. 18] were that there was a 20% premium based on forwards over historical spots. Electricity industry consultant, C. Pirrong, reached similar conclusions. A 15% premium was recommended to and approved by the Risk Oversight Committee (ROC).

5 Risk-Neutral Probabilities

We can now apply the model to give an estimate for the risk-neutral probabilities that the put option will be exercised. Combining the last quoted forward prices in 2009, for the 7×24 contracts for the calendar years 2010–2014, with the parameter estimates, previously derived, gives

	2010	2011	2012	2013	2014
FWP	\$38.50	\$42.68	\$44.58	\$48.61	\$48.61
$\mathsf{E}\,\bar{S}$	\$32.44	\$34.04	\$35.56	\$38.78	\$38.78
Prob.	41.7%	41.7%	36.7%	27.5%	27.5%

6 Quarterly Valuation

At the start of the period of the exposure, the probability that the option will be exercised is given by (5). For the probability during the period, when time has passed, we need to account for the fact that some portion of the average is already known, and that this reduces the uncertainty

around the probability of exercise and this has an effect on the option value. At time t_1, the prices $S_1, S_2, \ldots, S_{t_1}$ are known, and the average can be decomposed into a known and unknown part:

$$\bar{S} \times T = \sum_{t=1}^{T} S(t) = \sum_{t=1}^{t_1} S(t) + \sum_{t=t_1+1}^{T} S(t).$$

We can relate the forward price F_1, of a 7×24 over the period $t_1 + 1, \ldots, T$, to the sum of the spot prices over that period in exactly the same manner as we have done for the entire calendar year. This allows us to generalize equation (2) to

$$\bar{S} \cong \frac{t_1}{T}\bar{S}_1 + \frac{T - t_1}{T} F_1 e^{-\lambda_1 - \frac{1}{2}\sigma_1^2 + \sigma_1 Z},$$

where $\bar{S}_1$ is the average over the time period $t = 1, \ldots, t_1$, which is known at t_1. The other variables are the latest observed forward price F_1, the discount factor $\lambda_1 > 0$, and the standard deviation σ_1, all for the remainder of the year; the period $t = t_1 + 1, \ldots, T$. These can all be computed in a fashion similar to the parameters for the distribution of the annual average.

By the same mechanism as before, we can determine the probability that the option will be exercised, given the information up to t_1, as an expectation:

$$\mathsf{E}\, B_1 = \Phi\left(\frac{\ln\left(\frac{KT - t_1\bar{S}_1}{(T-t_1)F}\right) + \lambda_1 + \frac{1}{2}\sigma_1^2}{\sigma_1}\right).$$

As the option is typically revalued for the quarterly reports, the formula simplifies to:

$$\mathsf{E}\, B_i = \Phi\left(\frac{1}{\sigma_i}\ln\left(\frac{4K - i\bar{S}_i}{(4-i)F_i}\right) + \frac{\lambda_i}{\sigma_i} + \frac{1}{2}\sigma_i\right), \quad i = 0, 1, 2, 3,$$

where $\mathsf{E}\, B_i$ is the probability of exercise, when i quarters have passed, and F_i and σ_i are the forward price and implied volatility for a 7×24 forward contract over the remaining quarters. Note that for $i = 0$, at the start of the calendar year, this formula reduces to (5). Also note that, although we have taken a quarterly valuation as typical, this is easily adapted to a monthly frequency.

7 Discussion and Motivation

This Section provides a more in-depth discussion and motivation behind the modeling choices that have been made.

7.1 Spot Price Modeling

When the underlying asset follows a well-defined stochastic process, such as a Geometric Brownian Motion (GBM), an Ornstein-Uhlenbeck (OU) mean-reverting process, or any one- or multi-factor model, one can use standard approaches to value Asian-type options. For a GBM one can use moment-matching techniques to derive a proxy distribution, and for any of the more general models one can use Monte-Carlo techniques. Unfortunately, the hourly spot-price for electricity does not follow a simple stochastic process. In fact, it is general acknowledged that electricity is one of the most difficult asset classes to model. The main reasons are that electricity is a non-storable commodity, and that supply and demand must be managed and balanced in real time. The first means that standard arbitrage arguments to price derivatives that rely on buy-and-hold strategies and replication arguments do not apply. The second implies that the spot electricity price can exhibit large price spikes, as temporary surges in demand are satisfied by flexible but potentially, very expensive generation.

The result is that the hourly electricity price is determined by a host of fundamental factors, reflecting load patterns that translate into strong diurnal, weekly and seasonal price patterns, and cause strong mean-reversing in the electricity prices. Any realistic stochastic model for the spot price of electricity must also incorporate price spikes that reflect the inelasticity of demand. Weron [6, Ch. 4] gives an overview of various modeling approaches for the spot price. Another feature that has only started to occur in the last few years in the Ontario market are negative prices, due to low demand and a surplus of generation, which leads inflexible base-load generation, such as nuclear to offer at negative prices in order to avoid having to shut-down. This phenomenon has been observed much earlier in more mature markets, that have a sizeable amount of renewable generation in their generation mix, see Sewalt and de Jong [5]. The feature of negative prices is of particular importance in our setting, as these prices are a major contributing factor to the average HOEP for 2009 being as low as $29.517. With this in mind, it is important to note that in almost all of the spot-price models in the literature, it is tacitly assumed that negative prices cannot occur. Finally, even if an appropriate model can be formulated, one still has to calibrate a large number of parameters, which is challenging in a stationary market, let alone in a market such as Ontario where the generation mix is changing.

For all of the above reasons we have chosen not to use the approach of modeling the evolution of the spot price through some stylized stochastic process. This ruled out a straightforward Monte Carlo simulation approach.

7.2 Risk Premium

If we were dealing with a normal financial asset, the forward price would be equal to the discounted, expected value of its stochastic counterpart. However, this is not the case for electricity forwards. It is well documented in the literature that the forward price in electricity markets is not an unbiased estimator of the spot price, and incorporates a risk premium. Bessembinder and Lemmon [1] study the PJM market and find that the risk premium, defined as the difference between the forward and expected spot price over the period that the forward covers, increases when the spot power-price distribution exhibits positive skewness. Longstaff and Wang [4] also find significant forward premia in electricity forward prices. They also find that forward premia are positively correlated with skewness of the spot price distribution. Diko et al. [3], using data from the three major and most liquid continental European energy markets: the Dutch, German, and French electricity markets, also show significant risk premia in the forward price.

References

[1] Hendrik Bessembinder and Michael L. Lemmon. Equilibrium pricing and optimal hedging in electricity forward markets. *The Journal of Finance*, 57(3):1347–1382, June 2002.

[2] OPG Corporate. Forward price curve process: Forward price analysis, commercial operations, October 26th, 2000. OPG Confidential.

[3] Pavel Diko, Steve Lawford, and Valerie Limpens. Risk premia in electricity forward prices. *Studies in Nonlinear Dynamics & Econometrics*, 10(3):Article 7, 24 pp., September 2006.

[4] Francis A. Longstaff and Ashley W. Wang. Electricity forward prices: A high-frequency empirical analysis. *The Journal of Finance*, 59(4):1877–1900, August 2004.

[5] Michael Sewalt and Cyriel de Jong. Negative prices in electricity markets. *Commodities Now*, pages 74–77, June 2003.

[6] Rafał Weron. *Modeling and Forecasting Electricity Loads and Prices: A Statistical Approach*. John Wiley, Chichester, England, 2006.

	2003	2004	2005	2006	2007	2008	2009
Mean	54.045	49.950	68.492	46.383	47.806	48.830	29.517
SDev	35.929	21.892	40.739	23.984	24.658	29.762	30.864
Skewness	2.979	1.819	2.871	5.450	1.563	2.591	30.214
Kurtosis	22.323	11.804	20.540	106.719	12.803	25.394	1654.762
Min	11.540	5.250	8.600	-3.100	-0.400	-34.000	-52.080
Max	548.520	340.450	639.970	699.650	436.530	563.620	1891.140

Table 1. HOEP statistics

$\sigma \backslash p$	0.70	0.75	**0.80**	0.85	0.90
0.010	6.8%	9.0%	11.4%	14.0%	17.3%
0.012	7.8%	10.4%	13.2%	16.4%	20.2%
0.014	8.8%	11.7%	14.9%	18.5%	22.8%
0.015	9.2%	12.4%	**15.8%**	19.6%	24.1%
0.016	9.6%	12.9%	16.5%	20.6%	25.3%
0.018	10.3%	14.1%	18.0%	22.5%	27.7%
0.020	10.9%	15.1%	19.4%	24.3%	29.9%

Table 2. Risk Premium embedded in a Cal-2010 Forward (relative to the Forward price)

$\sigma \backslash p$	0.70	0.75	**0.80**	0.85	0.90
0.010	7.3%	9.9%	12.8%	16.3%	20.9%
0.012	8.5%	11.6%	15.2%	19.6%	25.3%
0.014	9.6%	13.3%	17.6%	22.7%	29.6%
0.015	10.1%	14.1%	**18.7%**	24.3%	31.8%
0.016	10.6%	14.9%	19.8%	25.9%	33.9%
0.018	11.5%	16.4%	22.0%	29.0%	38.3%
0.020	12.3%	17.7%	24.1%	32.0%	42.7%

Table 3. Risk Premium embedded in a Cal-2010 Forward (relative to the spot price)

Bruce Embedded Derivative — Technical Disclosure.

The references in this document are to Equations and Sections in the Technical Document. Words in **boldface** indicate corresponding variable names and constants in the mathematical model, described in the Technical Document.

The exercise probability **EB** of the binary option is calculated as per Eqn (5), with the discount factor **lambda** determined as per Eqn (6). Combining these two equations, this can be coded in Excel, as follows:

EB = NORMSDIST(NORMSINV(**p**)+LN(**K**/**F**)/**sigma**).

As described in Section 3.2, the value for **p** is taken as p=0.8, and is fixed throughout and used equally for all valuations. The strike price **K** is $30, as per the lease agreement. The forward price **F** is the price for a 7x24 forward contract over the relevant calendar year, as seen on the valuation date. The aggregate volatility **sigma** is computed as the square root of the number of trading days **NTD** (that are left to the expiry of the option), multiplied by the historical daily volatility. The aggregate of volatility is capped at 500 trading days, as explained towards the end of Section 2.1.

The discount factor **lambda** is calculated as per Eqn (6). This can be coded in Excel as follows:

lambda = NORMSINV(**p**)***sigma** – ½***sigma**^2.

The discount factor determines the risk premium that is embedded in the forward price and is calculated as per Eqn (7). This can be coded in Excel as follows:

Risk Premium (in %)= 100*(1-EXP(-**lambda**)).

The expected annual average HOEP can then be computed by stripping out the risk premium from the forward price, as per Eqn (3). This can be coded in Excel as follows:

Exp HOEP = **F***EXP(-**lambda**).

The parameter values that were used in the valuations that were provided are given in the following tables.

Valuation Date					**Bruce Embedded Derivative Valuation**				
Sat 31-Dec-2011					Parameter Values				
		Forward Price	Nr Trading Days	Daily Volatility				Strike Price	Prob of Exercise
		F	**NTD**		**sigma**	**lambda**		**K**	**EB**
2012	$	27.606	250.0	0.013792	0.218075	0.159758	$	30.00	88.93%
2013	$	29.290	500.0	0.013792	0.308405	0.212003	$	30.00	82.10%
2014	$	31.814	500.0	0.013792	0.308405	0.212003	$	30.00	74.26%

Valuation Date					**Bruce Embedded Derivative Valuation**				
Fri 29-Jun-2012					Parameter Values				
		Forward Price	Nr Trading Days	Daily Volatility				Strike Price	Prob of Exercise
		F	**NTD**		**sigma**	**lambda**		**K**	**EB**
2012	$	22.203	126.4	0.011659	0.131061	0.101715	$	30.00	99.91%
2013	$	22.028	376.4	0.010945	0.212336	0.156163	$	30.00	98.92%
2014	$	24.219	500.0	0.010945	0.244740	0.176029	$	30.00	95.69%

Valuation Date					**Bruce Embedded Derivative Valuation**				
Fri 29-Jun-2012					Parameter Values	**Life Extension**			
		Forward Price	Nr Trading Days	Daily Volatility				Strike Price	Prob of Exercise
		F	**NTD**		**sigma**	**lambda**		**K**	**EB**
2015	$	27.216	500.0	0.010945	0.244740	0.176029	$	30.00	89.24%
2016	$	29.542	500.0	0.010945	0.244740	0.176029	$	30.00	81.71%
2017	$	30.660	500.0	0.010945	0.244740	0.176029	$	30.00	77.42%
2018	$	32.120	500.0	0.010945	0.244740	0.176029	$	30.00	71.32%
2019	$	34.287	500.0	0.010945	0.244740	0.176029	$	30.00	61.64%

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Year End Results – Key Disclosures

MD&A

- Reduction in Bruce lease revenue due to low average HOEP and offset by corresponding increase in regulatory variance account (page 7)

Accounting and Tax Matters

Bruce Supplemental Agreement

- Conditional obligation based on HOEP accounted for as an embedded derivative.

3. Bruce Supplemental Rent Adjustment and Embedded Derivatives

According to the existing lease agreement with Bruce Power, the annual Supplemental Rent for each Bruce B unit is $25.5 million from January 1, 2002, escalated by the Consumer Price Index. However, if the annual arithmetic average of the Hourly Ontario Electricity Price ("HOEP") for a calendar year is less than $30/MWh, the Supplemental Rent for that calendar year is reduced to $12 million for each Bruce B unit.

For the first time since the inception of the lease agreement, in 2009, the HOEP fell below the $30/MWh threshold. As a result, there is a refund owing to Bruce Power of $69 million, which is the difference between the Supplemental Rent paid and the reduced Supplemental Rent of $12 million per unit. OPG has accrued a payable of $69 million and reduced the Bruce lease revenue for 2009. The reduction to the Bruce lease revenue was offset by a corresponding increase in the Bruce Lease Net Revenue variance regulatory asset. The establishment of a variance account to capture differences between actual and forecasted results associated with the nuclear generating stations on lease to Bruce Power was authorized by the OEB.

Furthermore, the impact of this Supplemental Rent adjustment clause in future periods is accounted for as a put option written by OPG, which requires OPG to pay Bruce Power an amount that is equal to the annual Supplemental Lease payment minus $12 million per unit with a strike price linked to an HOEP of $30/MWh. This feature meets the definition of a derivative that must be accounted for separately, since HOEP is not closely related to the lease contract. Derivatives, including embedded derivatives, are recognized at fair value with changes in fair value recorded through net income. Prior to 2009, OPG valued this embedded derivate at zero as the HOEP remained significantly higher than $30/MWh. OPG has re-valued this derivative at the end of 2009 and recorded a payable of $118 million. The derivative was recorded against Bruce lease revenue. The decrease in Bruce lease revenue was also offset by the Bruce Lease Net Revenue variance regulatory asset.

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The Audit / Risk Committee of the Board of Directors
Ontario Power Generation Inc.

24 February 2010

Dear Members of the Audit / Risk Committee:

We are pleased to present the results of our audit of the financial statements of Ontario Power Generation Inc. ("OPG") This report also includes the status of our final procedures, which we anticipate will be completed on or about 4 March 2010.

The audit is designed to express an opinion on the 2009 consolidated financial statements as of 31 December 2009. In accordance with professional standards, we obtained a sufficient understanding of internal control to plan the audit and to determine the nature, timing and extent of tests to be performed. However, we were not engaged to and we did not perform an audit of internal control over financial reporting.

At Ernst & Young, we continually evaluate the quality of our professionals' work, with a focus on our goal to deliver remarkable client service. We strive to provide you with audit services of the highest quality that will meet or exceed your expectations, and we encourage you to participate in the Assessment of Service Quality (ASQ) process to provide your input on our performance. The ASQ process is a critical tool in enabling us to continually monitor and improve the quality of our audit services to OPG.

This report is intended solely for the information and use of the Audit Committee, Board of Directors and management. It is not intended to be, and should not be, used by anyone other than these specified parties.

We look forward to meeting with you to discuss the contents of this report and answer any questions you may have about the results of our audit.

Sincerely,

Ernst & Young LLP

Chartered Accountants
Licensed Public Accountants

2009 audit results (cont'd)

Areas of emphasis, critical policies, and judgments and estimates

Area	Ernst & Young comments on quality of accounting policy and application / Area of emphasis	Significant judgments and estimates
Investments and financial instruments **Description** The Company values certain investment and financial instruments (available for sale, trading and other assets and liabilities that the Company may elect to carry at fair value) at fair value, measured in accordance with CICA 3855 **GAAP basis** CICA Section 3855, *Financial Instruments – Recognition and Measurement*	*Bruce Lease Embedded Derivative* Included in the Bruce Lease Agreement is a provision that allows for reduced supplemental rent payments if the annual HOEP arithmetic average cost of power falls below $30/MWh. This clause was actually triggered in 2009, resulting in a claim amount of $72.8 million, comprised of $69.3 million of reduced rent and $3.5 million of GST to be refunded. In accordance with CICA 3855, the adjustment to the Supplemental Rent is considered an embedded derivative that needs to be bifurcated from the lease agreement and fair valued. We have reviewed the valuation model developed by OPG's Energy Markets group, and concur with the fair value amount recorded of $118 million. The amount recorded has been offset against the Bruce revenue variance account, thus there is no impact on net income.	*Bruce Lease Embedded Derivative* The value of the embedded derivative is determined based on a number of factors including forward price curves for future years, the volatility of the HOEP price, forecasted consumer price index, and a discount rate.

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Accounting and Tax Matters and Other Project Updates

Bruce Supplemental Agreement and Embedded Derivative

- Conditional obligation based on HOEP accounted for as an embedded derivative. Derivative value increased by $95 million to $213 million as at March 31, 2010
- Income impact offset by Bruce Lease Net Revenues Variance Account

First Quarter Results – Key Disclosures and Recommendation

MD&A

- Reduction in Bruce lease revenue by change in fair value of embedded derivative due to lower average HOEP forward prices, and offset by corresponding increase in regulatory variance account (page 6)

1. Bruce Supplemental Rent Adjustment and Embedded Derivative

According to the existing lease agreement with Bruce Power, the annual Supplemental Rent for each Bruce B unit is $25.5 million from January 1, 2002, escalated by the Consumer Price Index. However, if the annual arithmetic average of the Hourly Ontario Electricity Price ("HOEP") for a calendar year is less than $30/MWh, the Supplemental Rent for that calendar year is reduced to $12 million for each Bruce B unit. The impact of this Supplemental Rent adjustment clause in future periods is accounted for as an embedded derivative. Derivatives, including embedded derivatives, are recognized at fair value with changes in fair value recorded through net income.

As at December 31, 2009, OPG reported a payable related to the embedded derivative of $118 million. As at March 31, 2010, OPG revalued this embedded derivative and reported a payable of $213 million. The increase in the payable of $95 million was primarily due to reductions to expected future electricity prices compared to the forecast of future prices at the end of 2009. The decrease in the expected forecast of future prices was primarily due to a reduction to short-term and long-term gas prices expressed in U.S. dollars, the strengthening of the Canadian dollar compared to the U.S. dollar, and changed bidding behaviour of other market participants.

The change in fair value of the derivative was recorded as a reduction to Bruce lease revenue. The decrease in Bruce lease revenue was fully offset by the Bruce Lease Net Revenues Variance regulatory asset. As such, there is no net income impact.

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The Audit /Risk Committee of the Board of Directors
Ontario Power Generation Inc.

10 May 2010

Dear Members of the Audit / Risk Committee:

We are pleased to present the status of our review of Ontario Power Generation Inc.'s 2010 first quarter financial statements.

This Report to the Audit / Risk Committee summarizes the scope of our review and the status of our final procedures, which will be completed prior to the Company's filing of its interim financial statements. The document also contains the Audit Committee communications required by our professional standards, as well as significant current accounting developments and issues that could or will affect Ontario Power Generation Inc.

Our review is performed in accordance with standards established by the Canadian Institute of Chartered Accountants. A review of interim financial information consists principally of applying analytical review procedures and making inquiries of persons responsible for financial and accounting matters. It is substantially less in scope than an audit conducted in accordance with generally accepted auditing standards. The objective of a review of interim financial information is to provide the auditor with a basis for communicating whether the auditor is aware of any material modifications that should be made to the interim financial information for it to conform with generally accepted accounting principles.

This report is intended solely for the information and use of the Audit / Risk Committee, Board of Directors and management in their review of the interim financial statements, and is not intended to be and should not be used by anyone other than these specified parties. We disclaim any responsibility to any third party who may rely on it. Further, this report is a by-product of our review of the 2010 first quarter financial statements and indicates matters identified during the course of our review. Our review did not necessarily identify all matters that may be of interest to the Audit / Risk Committee in fulfilling its responsibilities.

We appreciate this opportunity to meet with you.

Sincerely,

Ernst & Young LLP

Chartered Accountants
Licensed Public Accountants

Areas of focus and changes in accounting policies, judgments & estimates

Area of focus	Change in policy, judgments and estimates	Findings and Observations
Bruce Lease Embedded Derivative	Included in the Bruce Lease Agreement is a provision that allows for reduced supplemental rent payments if the annual HOEP arithmetic average cost of power falls below $30/ MWh In accordance with CICA 3855, *Financial Instruments. Recognition and Measurement*, the conditional reduction to the supplemental rent is considered an embedded derivative that needs to be bifurcated from the lease agreement.	The value of the embedded derivative is determined based on a number of factors including forward price curves for future years, the volatility of the HOEP price, forecasted consumer price index, and a discount rate. As at 31 March 2010, the value of the embedded derivative recorded is $213 million. The amount recorded has been offset against the Bruce revenue variance account, thus there is no impact on net income. EY has reviewed the valuation model developed by OPG's Energy Markets group and we believe the fair value amount recorded at 31 March 2010 is plausible.

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The Audit and Finance Committee of the Board of Directors
Ontario Power Generation Inc.

6 August 2010

Dear Members of the Audit and Finance Committee:

We are pleased to present the status of our review of Ontario Power Generation Inc.'s 2010 second quarter financial statements.

This Report to the Audit and Finance Committee summarizes the scope of our review and the status of our final procedures, which will be completed prior to the Company's filing of its interim financial statements. The document also contains the Audit Committee communications required by our professional standards, as well as significant current accounting developments and issues that could or will affect Ontario Power Generation Inc.

Our review is performed in accordance with standards established by the Canadian Institute of Chartered Accountants. A review of interim financial information consists principally of applying analytical review procedures and making inquiries of persons responsible for financial and accounting matters. It is substantially less in scope than an audit conducted in accordance with generally accepted auditing standards. The objective of a review of interim financial information is to provide the auditor with a basis for communicating whether the auditor is aware of any material modifications that should be made to the interim financial information for it to conform with generally accepted accounting principles.

This report is intended solely for the information and use of the Audit and Finance Committee, Board of Directors and management in their review of the interim financial statements, and is not intended to be and should not be used by anyone other than these specified parties. We disclaim any responsibility to any third party who may rely on it. Further, this report is a by-product of our review of the 2010 second quarter financial statements and indicates matters identified during the course of our review. Our review did not necessarily identify all matters that may be of interest to the Audit and Finance Committee in fulfilling its responsibilities.

We appreciate this opportunity to meet with you.

Sincerely,

Ernst & Young LLP

Chartered Accountants
Licensed Public Accountants

Areas of focus and changes in accounting policies, judgments & estimates (cont'd)

Area of Focus	Changes in policy, judgments and estimates	Findings and Observations
Bruce Lease Embedded Derivative	Included in the Bruce Lease Agreement is a provision that allows for reduced supplemental rent payments if the annual HOEP arithmetic average cost of power falls below $30/ MWh. In accordance with CICA 3855, *Financial Instruments, Recognition and Measurement*, the conditional reduction to the supplemental rent is considered an embedded derivative that needs to be bifurcated from the lease agreement.	The value of the embedded derivative is determined based on a number of factors including forward price curves for future years, the volatility of the HOEP price, forecasted consumer price index, and a discount rate. As at 30 June 2010, the value of the embedded derivative recorded is $156 million as compared to $213 million recorded at 31 March 2010 ($118 million, December 2009). The amount recorded has been offset against the Bruce revenue variance account, thus there is no impact on net income. EY has reviewed the valuation model developed by OPG's Energy Markets group and we believe the fair value amount recorded at 30 June 2010 is plausible.

ERNST & YOUNG

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The Audit and Finance Committee of the Board of Directors
Ontario Power Generation Inc.

8 November 2010

Dear Members of the Audit and Finance Committee:

We are pleased to present the status of our review of Ontario Power Generation Inc.'s 2010 third quarter financial statements.

This Report to the Audit and Finance Committee summarizes the scope of our review and the status of our final procedures, which will be completed prior to the Company's filing of its interim financial statements. The document also contains the Audit Committee communications required by our professional standards, as well as significant current accounting developments and issues that could or will affect Ontario Power Generation Inc.

Our review is performed in accordance with standards established by the Canadian Institute of Chartered Accountants. A review of interim financial information consists principally of applying analytical review procedures and making inquiries of persons responsible for financial and accounting matters. It is substantially less in scope than an audit conducted in accordance with generally accepted auditing standards. The objective of a review of interim financial information is to provide the auditor with a basis for communicating whether the auditor is aware of any material modifications that should be made to the interim financial information for it to conform with generally accepted accounting principles.

This report is intended solely for the information and use of the Audit and Finance Committee, Board of Directors and management in their review of the interim financial statements, and is not intended to be and should not be used by anyone other than these specified parties. We disclaim any responsibility to any third party who may rely on it. Further, this report is a by-product of our review of the 2010 third quarter financial statements and indicates matters identified during the course of our review. Our review did not necessarily identify all matters that may be of interest to the Audit and Finance Committee in fulfilling its responsibilities.

We appreciate this opportunity to meet with you.

Sincerely,

Ernst + Young LLP

Chartered Accountants
Licensed Public Accountants

Areas of focus and changes in accounting policies, judgments & estimates (cont'd)

Area of Focus	Changes in policy, judgments and estimates	Findings and Observations
Bruce Lease Embedded Derivative	Included in the Bruce Lease Agreement is a provision that allows for reduced supplemental rent payments if the annual HOEP arithmetic average cost of power falls below $30/ MWh. In accordance with CICA 3855, *Financial Instruments, Recognition and Measurement*, the conditional reduction to the supplemental rent is considered an embedded derivative that needs to be bifurcated from the lease agreement.	The value of the embedded derivative is determined based on a number of factors including forward price curves for future years, the volatility of the HOEP price, forecasted consumer price index and a discount rate. As at 30 September 2010, the value of the embedded derivative recorded is $165 million as compared to $156 million recorded at 30 June 2010 ($213 million, 31 March 2010 and $118 million, December 2009). The amount recorded has been offset against the Bruce Lease Net Revenues Variance Account, thus there is no impact on net income. EY has reviewed the valuation model developed by OPG's Energy Markets group and we believe the fair value amount recorded at 30 September 2010 is plausible.

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The Audit and Finance Committee of the Board of Directors
Ontario Power Generation Inc.

22 February 2011

Dear Members of the Audit and Finance Committee,

We are pleased to present the results of our audit of the consolidated financial statements of Ontario Power Generation Inc. This report also includes the status of our audit, which we anticipate will be completed on or about 4 March 2011.

Our audit was designed to express an opinion on the 2010 consolidated financial statements. We continue to receive the full support and assistance of Ontario Power Generation Inc.'s personnel in conducting our audit. Open and candid dialogue with you, as an Audit and Finance Committee member, is a critical step in the audit process, and in the overall corporate governance process and we appreciate this opportunity to share the insights from our audit with you.

At Ernst & Young, we continually evaluate the quality of our professionals' work in order to deliver remarkable client service. We strive to provide you with audit services of the highest quality that will meet or exceed your expectations, and we encourage you to participate in our Assessment of Service Quality (ASQ) process to provide your input on our performance. The ASQ process is a critical tool that enables us to monitor and improve the quality of our audit services to Ontario Power Generation Inc.

This report is intended solely for the information and use of the Audit and Finance Committee, Board of Directors and management. It is not intended to be, and should not be, used by anyone other than these specified parties.

We look forward to meeting with you to discuss the contents of this report and answer any questions you may have about these or any other audit-related matters.

Sincerely,

Ernst & Young LLP

Chartered Accountants
Licensed Public Accountants

2010 audit results

Critical policies, estimates and areas of audit emphasis

Area of emphasis / critical accounting policy	Ernst & Young comments on quality and application of accounting policy, significant estimates, financial statement disclosures and related matters
Bruce Lease Embedded Derivative Accounting policy: The Company values certain investments and financial instruments (available for sale, trading and other assets and liabilities that the Company may elect to carry at fair value) at fair value, measured in accordance with CICA 3855. For financial instruments which do not have quoted market prices directly available, fair values are estimated using forward price curves developed from observable market prices or rates which may include the use of valuation techniques or models, based wherever possible on assumptions supported by observable market prices or rates prevailing at the balance sheet date. Critical policy? Yes.	Included in the Bruce Lease Agreement is a provision that allows for reduced supplemental rent payments if the annual HOEP arithmetic average cost of power falls below $30/MWh. This clause was first triggered in 2009. In accordance with CICA 3855, the adjustment to the supplemental rent is considered an embedded derivative that needs to be bifurcated from the lease agreement and fair valued. The value of the embedded derivative is determined based on a number of factors including forward price curves for future years, the volatility of the HOEP price, forecasted consumer price index, and a discount rate. As at 31 December 2010, the value of the embedded derivative recorded is $163 million. We have reviewed the valuation model developed by OPG's Energy Markets group, and concur with the fair value amount recorded of $163 million. The amount recorded has been offset against the Bruce net revenue variance account, thus there is no impact on net income

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The Audit and Finance Committee of the Board of Directors
Ontario Power Generation Inc.

21 February 2012

Dear Members of the Audit and Finance Committee,

We are pleased to present the results of our audit of the financial statements of Ontario Power Generation Inc. This report also includes the status of our audit, which we anticipate will be completed on or about March 2, 2012.

Our audit was designed to express an opinion on the 2011 consolidated financial statements. We continue to receive the full support and assistance of Ontario Power Generation Inc.'s personnel in conducting our audit. Open and candid dialogue with you, as an audit committee member, is a critical step in the audit process, and in the overall corporate governance process and we appreciate this opportunity to share the insights from our audit with you.

This report is intended solely for the information and use of the Audit Committee, Board of Directors and management. It is not intended to be, and should not be, used by anyone other than these specified parties.

We look forward to meeting with you to discuss the contents of this report and answer any questions you may have about these or any other audit-related matters.

Very truly yours,

Ernst & Young LLP

Chartered Accountants
Licensed Public Accountants

Critical policies, estimates and areas of audit emphasis

Area of emphasis; risk considerations	Critical policy (1)	Ernst & Young comments on quality of accounting policy and application
Financial instruments – Bruce lease embedded derivative		
The Company values certain investments and financial instruments (available for sale, trading and other assets and liabilities that the Company may elect to carry at fair value) at fair value, measured in accordance with CICA 3855. For financial instruments which do not have quoted market prices directly available, fair values are estimated using forward price curves developed from observable market prices or rates which may include the use of valuation techniques or models, based wherever possible on assumptions supported by observable market prices or rates prevailing at the balance sheet date.	✓	Included in the Bruce Lease Agreement is a provision that allows for reduced supplemental rent payments if the annual HOEP arithmetic average cost of power falls below $30/MWh. This clause was first triggered in 2009. In accordance with CICA 3855, the adjustment to the supplemental rent is considered an embedded derivative that needs to be bifurcated from the lease agreement and fair valued. The value of the embedded derivative is determined based on a number of factors including forward price curves for future years, the volatility of the HOEP price, forecasted consumer price index, and a discount rate. As at 31 December 2011, the value of the embedded derivative liability recorded is $186 million. We have reviewed the valuation model developed by OPG's Energy Markets group, and concur with the fair value amount recognized. The amount recorded has been offset against the Bruce Lease Net Revenues variance regulatory account, thus there is no impact on net income.

(1) Represents critical accounting policies included in Note 3 to the Company's financial statements