

July 12, 2007

Via electronic mail

Stakeholder Engagement Unit
Independent Electricity System Operator

Re: OPG Submission on IESO Cost Benefit Analysis

Further to the IESO's request for feedback on the proposed Cost Benefit Analysis (CBA) methodology, below are comments from Ontario Power Generation Inc. (OPG).

OPG has retained Mr. Cliff Hamal, Principal at the consulting firm LECG, LLC to review the paper "Overview of Cost-Benefit Analysis and its Applications in Public Policy Decision," by Michael Trebilcock, Adonis Yatchew, and Andy Baziliauskas, June 2007, (the "CBA Overview Paper"), as well as review the draft Operating Reserve CBA (the "OR CBA"). Mr. Hamal's comments are attached as Appendix A to this document, and OPG supports the points contained in Mr. Hamal's review. Further, attached as Appendix B, are specific OPG remarks relating to the OR CBA.

OPG supports the use of a cost benefit methodology when assessing potential market rule changes. As a high-level principle, it is reasonable that a change to the market rules should only be undertaken if the benefits associated with that change clearly outweigh the resulting costs. However, as with any such principle, the difficulty lies in the details. The IESO, in consultation with stakeholders, must determine how best to translate the general discussion contained within the CBA Overview Paper into practices associated with specific market rule changes. OPG provides the following comments within that context.

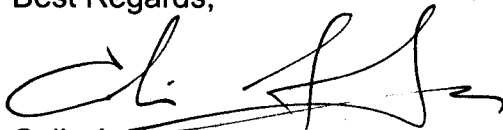
1. In developing procedures for CBA analyses, the IESO must be particularly careful in the approach to quantifying consumer and producer surpluses. The construction of appropriate demand and supply curves, and the inputs used in their construction, will be of particular importance. If there are errors in these items then the results

produced by the methodology will not be able to be relied upon. For example, in the OR CBA, producer surplus is "measured as profit". (p. 11.) Strictly speaking, this is incorrect, as producer surplus is measured relative to the difference between what producers actually receive when selling a product and the amount they would be willing to accept for the product. If the market supply curve corresponds to marginal costs, for example, then producer surplus would not be directly equal to profit as it ignores fixed costs. The OR CBA properly discusses the calculation of consumer surplus (p. 10), and the same degree of care should apply to the producer surplus calculation. See comments 1, 2, 3 and 5 in Mr. Hamal's submission.

2. Within the context of point 1 above is the topic of sensitivities relating to cost and benefit uncertainty. It is expected that there will be a number of occasions where it will be less than obvious whether a net benefit or a net cost will result from a proposed change, based on uncertainties and assumptions associated with either the calculation methodology or the forward looking estimate of either short or long-term benefits. Accordingly, the IESO must proceed with caution in such situations. See comment 3 in Mr. Hamal's submission.
3. No weighting of costs and benefits should be utilized by the IESO in its CBAs. As referenced in the CBA Overview Paper (Section 1.7, p12), it is possible to weight the changes in welfare experienced by individuals or groups of individuals differently, thereby altering the results of the CBA. In OPG's view, this is at odds with the central premise of the cost benefit methodology, since it can result in a rule change being adopted that, in the absence of weighting, yields a net cost. This is not an appropriate component of the CBA methodology. See comment 1 in Mr. Hamal's submission.

OPG would be pleased to discuss these comments further. Please direct any questions in this matter to the undersigned.

Best Regards,



Colin Anderson

cc: Brian Bell, OPG

Appendix A

**Cost-Benefit Analysis
In the Evaluation of
Market Rule Changes**

Comments on MR-00332-R00

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Cliff W. Hamal

**LECG, LLC
July 12, 2007**

Prepared On Behalf of Ontario Power Generation, Inc.

The IESO is advocating the use of cost-benefit analysis (CBA) as part of its evaluation of future market rule amendments. I have been asked by Ontario Power Generation, Inc. (OPG) to provide comments on Market Rule Amendment Proposal MR-00332-R00, "Reducing Synchronized OR Requirement Due to Regional Reserve Sharing Program Changes," version 2.0 dated June 14, 2007 (hereafter, the 10S Initiative). This proceeding focuses on the proposal to reduce synchronized operating reserves requirements, but also includes a request for comments regarding the use of CBA. My comments are directed at the general use of CBA for market rule evaluations.¹

The IESO is proposing the adoption of CBA for "any future market rule amendments that are expected to have a material impact on market outcomes and market efficiency,"² and is using the 10S Initiative to put forth its methodology. The IESO also sponsored a companion document, "Overview of Cost-Benefit Analysis and its Applications in Public Policy Decision," by Michael Trebilcock, Adonis Yatchew, and Andy Baziliauskas, June 2007, (hereafter the CBA Overview Paper) to provide further background on its use.

¹ I am a Principal at the consulting firm LECG, LLC. I am an economist that specializes in issues pertaining to the electric power industry, and I have worked on issues associated with electricity markets in Ontario for nearly ten years.

² "DRAFT Cost Benefit Analysis: Operating Reserve Initiative 2- Reducing the 10-minute synchronized OR requirement," provided with the June 14, 2007 10S Initiative, p. 1.

In making any change to the market, it is reasonable to ask that there be benefits that outweigh the costs associated with making the changes. Such costs and benefits may be difficult to quantify, but it is reasonable to require some demonstration that there will be net benefits before proceeding. The adoption of a review process that includes CBA will provide a structured approach for evaluating implications, and will allow a more formal debate when differences of opinion exist. As in any analysis, there is the potential for differences of opinion at all levels. The use of CBA will not eliminate controversy, of course, but it may be helpful in focusing any debate on the merits of a rule change.

My comments focus on steps the IESO can take now to improve the CBA review process. The IESO has not prescribed a detailed approach for the CBA or the presentation of results. The CBA supporting the 10S Initiative is a helpful example demonstrating its use, but is too narrow to provide a comprehensive demonstration of the use of the CBA in all instances. The IESO should use the current proceeding to provide general guidance on the use of CBA for market rule evaluation. In doing so, it should balance the need to provide the market guidance on how such analyses should be conducted, but also recognize that there may be a wide range of circumstances where it may be employed, and therefore it is appropriate that a certain level of flexibility should be maintained. The following recommendations reflect this balance.

1. CBA Success Criterion: Benefits Confidently Exceed Costs.

The IESO should explicitly define the success criteria to be used in the CBA framework. The Kaldor-Hicks criterion should be adopted, with some explanation and further amplification as discussed below. The adoption of the Kaldor-Hicks criterion

would require that a market rule change be “approved if the winners from the change could *hypothetically* compensate the losers and still be better off. More accurately, the change is approved if the gains to ‘winners’ exceed the losses to ‘losers’, such that the changes creates benefits that are sufficiently large to offset the losses.” (CBA Overview Paper, p. 4.) In short, the test would require the demonstration of net benefits.

This criterion is widely used in cost-benefit analyses and an endorsement of this approach would advance the application of CBA by the IESO. Without a firmly-established criterion, there could be extensive debate about the potential adoption of a rule change even when there is agreement about the costs and benefits. Under the pareto optimum criterion discussed in the CBA Overview Paper, for example, almost no rule change would be allowed, because the criterion is failed whenever it can be shown that the change imposes some net cost to any market participant.

One alternative discussed in the CBA Overview Paper is to add weights to the costs and benefits associated with specific market participants, under the assumption that a cost or benefit to some groups are more valuable than others. This is in conflict with the Kaldor-Hicks criterion, and therefore would be precluded under its use. Weighting effects to certain market participants can lead to the adoption of options that reduce efficiency. Indeed, the weighting of results is only material *when* it changes the outcome of the analysis. The weighting approach would endorse market rule changes which

results in net-costs to the market, or block changes that would otherwise provide net-benefits.³

The basis for weighting the effects on different groups outlined in the CBA Overview Paper comes from a desire to reflect social considerations, such as wealth distribution. (p.12.) Such weighting would be a significant and explicit step to changing the objectives in market design from general improvements targeted at efficiency to other social changes. Clearly, the adoption of CBA for market rule evaluation should not be used to promote social objectives inconsistent with the *Electricity Act*, and establishing an unweighted CBA criterion is consistent with the IESO's specific objectives therein.

Accepting the potential for weighting in the criterion also introduces maddening complexity to any market rule change. The problems only begin with the determination of which groups are to be favored at the cost to others. Secondary effects, and the response of various group members are also important. One might be concerned about the ability of various groups to pay the cost of rule changes. This might lead to weighting effects to consumers over industrial firms, but then one might next consider whether individual industrial firms serve the needs of low-income individuals. The weighting might also consider the ownership of corporate entities, because there may be a desire to weight the effects to some owners over others. As one slides down this slippery slope, the objectives can move far from improving market efficiency. For example, a proposed market rule that simply results in a disfavored group making arbitrary payments to a

³ If the unweighted benefits exceed the costs, and the changes also pass a weighted CBA analysis, it just means that the weighting had no effect on the outcome.

favoured group would pass the weighted CBA test. This is not market design, but tax policy, and should not be adopted.

2. All Benefits and Costs Should Be Included.

The IESO should make it clear that there is no limit on what benefits and costs need be considered. This does not mean that explicit analysis of every cost is required, and there may quickly come a point of diminishing returns in evaluating all of the potential effects of a change. It does represent an explicit statement that there is no *a priori* reason to limit the consideration of any factor. Support for a rule change should be based on a reasonable analysis of anticipated effects, and there should not be a limit on what issues might be raised. If a party raises concern about a cost or benefit that had not previously been identified, that effect should be evaluated on its own merits, not against some pre-determined screen of what can be considered.

As described in the CBA Overview Paper, benefits and costs are determined by calculating changes in consumer and producer surpluses. (p. 6-7.) I note that in the analysis supporting the 10S Initiative, page 11, there is the statement “Producers’ surplus is measured as profit”, which is technically incorrect. For example, producers may not have any profit, yet still face a change in producer surplus as a result of a market rule change. I assume that the reference to producers’ profits was not meant as a deviation from standard practices in evaluating producer surplus, but it highlights the need for care in implementing the CBA approach and developing formal practices.

Some interpret the Kaldor-Hicks criterion to call for only the consideration of economic costs and benefits that directly affect the financial condition of participants

(that is, those that directly receive benefits or are forced to incur costs). This narrow definition can exclude effects that should be considered. An obvious example is environmental effects, which some might argue do not result in a direct cost to any participant. Environmental effects are traditionally an important consideration in market rule changes, and the IESO should make it clear that they will be considered in CBAs. It is also possible that there may be effects on non-market participants (such as potential new entrants) that might be considered, and again, in a narrow interpretation of the Kaldor-Hicks criterion it might be argued that such effects should not be considered. The IESO can address this issue by stating that all costs and benefits may be considered. This provides the opportunity for consideration, but defers judgment about any particular calculation until it is presented.

3. Net Benefits Should Have A High Likelihood.

The Kaldor-Hicks criterion does not address explicitly uncertainties in cost and benefit estimates. The IESO should affirmatively state that it will require a high likelihood of net benefits to pass the criterion. Any estimate of benefits and costs will have uncertainties, and there is no need to set an arbitrary standard on the level of certainty required for any change. It is important, however, that there be net benefits. For example, a market change that promises vague and highly uncertain benefits, but does so at virtually no cost (and therefore with no potential for net costs), should be adopted. Similarly, in situations where both costs and benefits are highly uncertain, but there is a logical case that benefits will always exceed costs, the test will be passed.

When there is the potential for net costs, prudence calls for more careful consideration. This might occur in situations where the change requires significant up-front costs and benefits are only expected to occur over the long term. The application of CBA in civil transportation projects (e.g., roads and bridges) has run into this problem. Assumptions about use and benefits of some projects have proven to be overly-optimistic, and expensive projects have proven to not have been worthwhile. The IESO should be wary of such possibilities, and be particularly cautious where such possibilities arise.

This means that not all CBAs demand the same degree of rigor. Extra care is required where the range of uncertainty includes the possibility of net costs. Merely demonstrating the expectation of savings is not enough; rule changes should not be adopted unless there is no more than a small likelihood of net costs.

4. Discounting of Future Effects Demands Flexibility.

Different approaches to discounting may be appropriate for different market rule changes. Discounting reflects the time value of money, but also the uncertainty of the costs and benefits, and the likely duration of the effect of specific changes made to the market. Some changes are temporary by design, and others may be superseded by anticipated rule changes in the future. The IESO should not endorse a single approach to all situations.

In some cases, there are similar costs and benefits in each year such that discounting has little effect on the demonstration of net benefits, but in others – such as when significant near-term costs are anticipated to yield long-term benefits – discounting

may be critical. Discounting issues should not be explored in the abstract, but in the context of a specific rule change. Discounting issues include not only the discount rate, but the time period of the analysis (i.e., number of years into the future) and the potential for end effects.⁴

This is another situation where the IESO should preserve some flexibility relative to a strict application of the Kaldor-Hicks criterion. Under Kaldor-Hicks, a rule change would be approved if winners could (theoretically) adequately compensate losers. By focusing near-term compensation on individual participant groups, one could propose that different discount rates apply. Some market participants might finance incremental borrowing at credit card rates, while others might have access to long-term, tax-free financing. In this situation, a rule change with the financial implications of a loan from the tax-free borrowers to the credit card borrowers would be approved, even if it had net costs when evaluated at a constant interest rate. The IESO should not commit now to adopting such an approach.

5. CBA Filings Should Be Complete.

The IESO has called for comments on the content of a CBA. The comments above reflect the view that considerable flexibility should be allowed. Any such analyses should be complete, however, to allow for detailed review and replication of the results.

In adopting CBA, the IESO is taking a positive step toward open and objective analysis. Such openness can easily be thwarted if analyses are not made public. All supporting documentation and data sources should be identified and produced.

⁴ End effects refer to a summation of future costs and benefits beyond the last year of an analysis.

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Obviously, exceptions may be made for propriety software or licensed computer products and to comply with the confidentiality provisions of the market rules. The objective should be to allow a full debate on the merits of a rule change and the integrity of supporting analyses, and to minimize the time wasted attempting to match results of some other party.

Appendix B

OPG Comments on Cost Benefit Analysis for OR Initiative #2

- July 12, 2007 -

Background

The IESO has provided its first example of a cost benefit analysis (CBA) with the intent to use CBAs for future market changes that have a material impact on market outcomes and efficiency. This initial CBA deals with Operating Reserve Initiative #2 which will allow a 100 MW reduction in the 10-minute synchronized operating reserve (10S) requirement as part of NPCC's Regional Reserve Sharing (RRS) program. The CBA concludes that the initiative should be implemented due to estimated efficiency gains ranging from 0.5 to 1 M\$ annually. These gains result from displacing 10S from Ontario generators with zero cost 10S available over the interties through RRS.

This response provides comments on three areas of the CBA: 10S cost assumptions, Reliability Impact, Dynamic Efficiency Impact as well as concluding comments.

10S Cost Assumptions

The efficiency gain in the CBA is based on an estimated reduction of 0.91 M\$ in reduced producer cost. This was determined from IESO analysis over a 6 month period in which the average binding requirement for 10S was found to be 44 MW and the difference in cost of supplying 10S versus 10N was approximately \$2.36/MW. The \$2.36/MW was derived from the average of the differences in 10S and 10N shadow prices, while limiting any shadow prices greater than \$2000, to a value of \$2000, and then dividing the result by two to approximate cost from the clearing prices. Clearly this method of estimating savings in producer cost, although quite logical, is at best, an estimate.

Within the next few months the IESO will be introducing a further operating reserve related rule amendment to allow dispatchable loads to provide 10S operating reserve. The latest Market Surveillance Panel Report indicates that the IESO market has about 700 MW of dispatchable load which is more than enough to meet the 10S requirement of about 240 MW.

From page 131 of Dec 22, 2006 Market Surveillance Panel Report:

"Currently there are 9 large industrial consumers that are registered as dispatchable loads for a total of roughly 709 MW of consumption. These loads also offer operating reserve."

With this imminent change in the providers of 10S, it would be incorrect to base the expected efficiency gains on historical 10S shadow prices as these only reflect

generator costs. It is likely that the difference in cost between 10S and 10N from dispatchable loads will be lower thus reducing the economic efficiency gains of this initiative. The savings of 490 k\$ in Scenario 2 included in the CBA is therefore an upper bound on the savings and the actual savings could be much lower. The IESO should revise the estimated cost savings to include the impact of loads providing 10S.

Reliability Impact

The CBA reports that there is little or no impact on reliability and estimates this impact at \$28 per year. Although the reliability impact may in fact be quite small, the CBA lacks sufficient detail for stakeholders to accept this result.

The \$28 is derived simply by multiplying the probability of an Adverse Reliability Event by the expected cost of the event:

$$\$28 = (1/1,080 - 1/1,114) \times 100 \text{ MWh} \times \$10,000 / \text{MWh}, \text{ or,}$$

$$\$28 = 0.0000283 \times 1 \text{ M\$}$$

The 1,080 and 1,114 values are from an NPCC document provided to the Technical Panel as IESOTP 201-5b. This document reports on results from a simulation using New England as a representative system. The report suggests that that the proposed change to operating reserve would increase the risk of an "Adverse Reliability Event" from once in 1,114 years to once in 1,080 years.

The critical factor in quantifying the reliability impact is the probability value of 0.0000283 from $(1/1,080 - 1/1,114)$. Insufficient information is provided to be confident that these values are accurate and applicable in the Ontario context. Questions around this value include:

- What level of uncertainty is present in the analysis?
- Has the IESO thoroughly assessed whether the probability of one event in 1,080 years using the New England system applies equally in the Ontario context?
- Does New England have transmission restrictions on the intertie over which Regional Reserve Sharing is provided like Ontario's Queenston Flow West limit which can suddenly restrict imports from New York? Of interest is the fact that on June 12, 2007 Regional Reserve Sharing was unavailable to the IESO markets due to restrictions at Queenston Flow West.

The cost of an adverse event would be at least the 1 M\$ cited in the CBA but could be much greater. The NPCC paper does not define what an adverse reliability event is. If we assume it is some loss of load, how many MWs were lost, for how long and after what control actions were taken which may have also reduced load? The CBA simply assumes the shared quantity (100 MW) would be lost for one hour. If the adverse event resulted in failure by the IESO to recover from a reportable contingency, the IESO would be required by NPCC to carry additional operating reserve as a penalty until, in

subsequent months, it has demonstrated successful recoveries. This could cost customers several million dollars through higher OR and energy prices.

The \$28 result is counter-intuitive when compared with other realities.

- If the increased exposure to adverse reliability events is truly only \$28 per year then why is NPCC only introducing such a small reduction in operating reserve requirements?
- If local synchronized reserve is worth so little then why does NPCC impose increased synchronized reserve requirements after failure to recover Area Control Error (ACE) from a reportable contingency?

Although IESO may feel confident and may be correct in stating that the impact on reliability is acceptable, with the information provided, OPG does not share this confidence.

Impact on Dynamic Efficiency

Some hydroelectric generators operate in condense mode (i.e. as synchronized condensers) in order to provide 10-minute synchronized reserve. At some stations, condense mode requires multiple compressors to provide forced air to displace the water out of the area around the turbine. Reduced revenues from 10S may result in some suppliers retiring redundant compressors. The CBA agreed with this view on page 12 in the second last paragraph.

The last paragraph on page 12 of the CBA states that the money spent to maintain 10S resources would be diverted to other activities such as producing energy. This logic is flawed as the suppliers would no longer receive the revenue associated with supplying 10S so they would not have this money to reinvest in other activities. They will simply take steps to cut costs which will likely result in a gradual reduction in the amount of 10s capacity within the province as mentioned in the previous paragraph.

The 100 MW of 10S provided through Regional Reserve Sharing is not available all of the time. The IESO has reported in IESOTP 198-3c that during 2006, RRS was unavailable about 8% of the time, and this was while only counting on 50 MW of reduction. With the increase to 100 MW in May of 2007 it is likely that RRS will be unavailable more often. When RRS is unavailable the market must schedule the full 10S requirement of at least 236 MW from dispatchable resources within Ontario.

Decisions regarding retiring or maintaining equipment related to the provision of 10S are complex and would not be made over short time horizons. Once retired, the equipment would not likely be restored based on short periods of higher 10S prices. Thus it is possible that the reductions in 10S revenue could result in some long-term withdrawal of 10S supply and during periods in which RRS is unavailable the market will likely experience higher 10S prices without inducing a return of retired 10S capability. The CBA makes no allowance for this possibility.

In the fourth paragraph (2nd paragraph on page 13) the CBA refers to the role of OPA in stating that *“they are tasked with providing the incentives (through contract) to invest when the market itself does not provide these incentives. As long as the OPA performs this role, and as long as the bigger distortions in the market design exist, it is likely that changes such as the 10S initiative will not impact the level of investments in the province; prospective investors will always turn to the OPA for a contract.”*

This view is in contrast to the perspective presented in the Dec 12, 2006 Market Surveillance Panel Report in section 2 on “Realizing Efficiencies in the Hybrid Market”. The report makes numerous references to the importance of price signal for long-term investment.

Page 145, Paragraph 3:

“In the long-term, efficient price signals guide the decisions of the diverse set of suppliers and buyers toward efficient technology choices and timely and efficient capacity investment decisions.”

Page 148, Paragraph 2:

“Second, even though long-term investment will be guided through central planning in the near term, price signals from an efficient wholesale market can and should play an important role in guiding this planning process. Efficient real-time pricing can provide the OPA and the OEB with a measure of the expected value of new investment that reflects the economic reality of the province’s overall supply and demand situation.”

The IESO should not take the view that any negative impact on long-term investment due to the proposed change to 10S can be ignored as it will be managed by the OPA. This could lead to reduced efficiency through the retirement of existing 10S capability which depends on market revenues while additional costs are paid through contract to procure new 10S capability. If this view were to persist it would only reinforce the need for an ongoing central procurement role and continue to undermine the relevance of market signals.

Conclusion

Many of the comments above are quite specific with regard to the details of the draft OR CBA. OPG understands that adoption of a general CBA methodology represents an adjustment to the IESO’s decision making process as compared to past practice, and expects that refinements to that process will be necessary going forward. It is within that context that OPG submits its view that the OR CBA is not illustrative of the degree of rigour that market participants will require in such documents in the future. Appropriate quantification of all costs and benefits (including necessary details regarding assumptions), complete with a consideration of risks and sensitivities, are absolute requirements of any CBA.

As described in detail above, the draft OR CBA does not present a compelling case given:

- The calculation of efficiency gains lacks rigour, and as such, there is little confidence in the quantum of the projected benefit;
- The information provided on the reliability impact is insufficient to be confident that the reliability impact is indeed negligible; and
- The CBA makes no allowance for the likely detrimental impact on dynamic efficiency which although difficult to quantify would further reduce the benefits.

Prepared by:

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