

CONTRE-EXPERTISE DU DR REN ORANS

**Energy Imbalance Pricing
for Hydro-Québec TransÉnergie (HQT)**

Rebuttal Testimony of

Dr. Ren Orans

Energy and Environmental Economics, Inc. (E3)

101 Montgomery Street, Suite 1600

San Francisco California 94104

1 **1. Introduction and overview**

2 I am the Managing Partner of Energy and Environmental Economics, Inc. (E3)
3 located at 101 Montgomery Street, Suite 1600, San Francisco, California,
4 94104, USA. I have been retained by Hydro-Québec TransÉnergie (HQT) to
5 evaluate the evidence on imbalance pricing filed by William K. Marshall
6 ("WKM") on behalf of Brookfield Energy Marketing (BEMI) and Philip Raphals
7 ("PR") on behalf of RNCREQ and UC.

8 My evaluation draws on my qualifications and experience described below:

- 9 • With over 25 years of experience in the electric utility business, I have
10 worked extensively in transmission pricing, wholesale and retail rate
11 design, electricity market reform, integrated resource planning, and
12 transmission and distribution (T&D) planning. I have testified before state
13 and provincial regulators on transmission pricing, electricity market reform,
14 and asset valuation. Over the past ten years, my work has focused on
15 transmission pricing and planning for electric utilities in North America. I
16 received my Ph.D. in Civil Engineering from Stanford University and my
17 B.A. in Economics from University California, Berkeley. My curriculum
18 vitae, provided earlier, further details my qualifications and experience.
- 19 • I have testified in Québec and other Canadian provinces on transmission
20 rate design and related matters:

- 1 • On behalf of Hydro-Québec (HQ) before the Régie in (a) HQT's 2001
2 wholesale transmission tariff; (b) 2005 Open Access Transmission
3 Tariff (OATT) application; (c) 2008 regarding the implications of using
4 different costing rules applied to wind generators.
- 5 • On behalf of British Columbia Transmission Corporation (BCTC) before
6 the British Columbia Utilities Commission (BCUC) in BCTC's 2004 open
7 access transmission tariff (OATT) application and most recently in their
8 tariff modifications in response to FERC's Order 890 requirements.
- 9 • On behalf of Ontario Power Generation (OPG) in Hydro One Network's
10 2000 transmission rate application.
- 11 • On behalf of BC Hydro before the BCUC in BC Hydro's 2008
12 Residential Rate Application and its long term plan, 1996 and 1997
13 initial wholesale transmission service rate applications before the FERC
14 and the BCUC and 1995 participation in the BCUC's Electricity Market
15 Restructure Review.

16 My evaluation yields the following findings:

- 17 1. WKM's evidence fails to recognize that as a grid operator providing default
18 imbalance service,¹ HQT must procure from suppliers that can technically
19 and reliably offer this service. In the near term, Hydro-Québec Production
20 (HQP) is the only qualified supplier of that service in Québec. To ensure

¹ HQT does not require a grid user to buy its imbalance service. HQT's OATT permits a grid user to self-supply imbalance, subject to technical and reliability performance requirements. Hence, HQT's imbalance service is consumed by a user who chooses not to self-supply.

1 full cost recovery, HQT must exactly pass, on a dollar-for-dollar basis, its
2 procurement cost for the amount of imbalance service consumed by a grid
3 user. Failure to do so may cause a revenue shortfall, whose recovery will
4 likely violate the "cost-causation" and the "user pays" principles.

5 2. WKM's recommended pricing alternative is faulty because it is contrary to
6 HQT's main function of continuing to maintain reliable grid operations with
7 rate structures based on HQT's full cost of service. Specifically, adopting
8 this pricing alternative has the potential to increase the volume of
9 deviations that will complicate, or even jeopardize, HQT's reliable grid
10 operation.

11 3. PR's evidence proposes to remove the maximum and minimum prices and
12 to eliminate price differentiation by deviation band size. Adopting this
13 proposal may result in under-collection by HQT and weaken the incentive
14 for a grid user to minimize its use of the imbalance service.

15 4. HQT's imbalance pricing is directly driven by the procurement offer from
16 HQP, the only currently eligible supplier of the imbalance service. As
17 WKM's and PR's proposals differ from HQT's proposal, their adoption may
18 adversely impact HQT's cost recovery and reliable operation. Hence,
19 these alternative proposals should be rejected by the Régie in this
20 proceeding.

1 5. To the extent that the Régie prefers to allow alternative suppliers to offer
2 balancing energy services at either predefined prices or based on supplier
3 bids, Schedule 4 and Schedule 5 of Hydro-Québec Open Access
4 Transmission Tariff (OATT), already allows for self-provision of balancing
5 energy services. No modification of the tariff is needed for this to be
6 implemented. Similar to the process established in New Brunswick, HQT
7 could aid qualifying suppliers to provide ancillary services. Interested
8 suppliers could submit proposals to HQT for pre-qualification to supply
9 energy imbalances. These services could then be purchased directly by
10 eligible buyers from the pre-qualified suppliers, possibly aided by HQT's
11 OASIS for posting bids submitted by pre-qualified suppliers. Pre-qualified
12 suppliers and eligible buyers would then transact directly as provided for in
13 HQT's OATT.

14 **2. WKM's evidence**

15 ***2.1 WKM's criticism of HQT's proposal***

16 WKM's evidence (p.3), citing the Régie's Decision D-2009-015, concurs that
17 HQT should use "a reference price for energy imbalance that is based on the
18 hourly market prices in adjacent areas." WKM's evidence (p.3) also concurs

1 that the band definition² and settlement rule³ in HQT's proposal are consistent
2 with the FERC pro forma tariff. However, WKM's evidence (p.4) opposes
3 HQT's imbalance pricing formula, summarized by WKM as follows:

NY incremental price = NY Zone M less 0.16 \$/MWh less HQT hourly tariff (NY Inc)
NY decremental price = NY Zone M plus 4.50 \$/MWh (NY Dec)
NE Incremental price = ISO-NE (Ph2) less 6.00 \$/MWh less HQT hourly tariff (NE Inc)
NE decremental price = ISO-NE (Phase II) plus 8.00 \$/MWh (NE Dec)
Ontario Incremental price = HOEP (ON Inc)
Ontario decremental price = HOEP plus 4.00 or 5.00 \$Ca/MWh (off-peak or on-peak)
(ON Dec)

The incremental and decremental prices for each band prior to application of a +/- 10% adder for Band 2 and a +/-25% adder for Band 3 are proposed as follows:

Band 1 Incremental price = highest price of NY Inc, NE inc or ON Inc
Band 1 Decremental price = lowest price of NY Inc, NE inc or ON Inc
Band 2 Incremental price = highest price of NY Inc, NE inc, ON Inc or \$Ca100/MWh
Band 2 Decremental price = lowest price of NY Inc, NE inc, ON Inc or \$Ca 25/MWh
Band 3 Incremental price = highest price of NY Inc, NE inc, ON Inc or \$Ca100/MWh
Band 3 Decremental price = \$Ca 0/MWh

4 WKM argues that:

- 5 • HQT's proposed formula is not comparable with the FERC Orders because
6 it has more than one price (WKM, p.4).
- 7 • The formula is unduly discriminatory, with multiple incremental and
8 decremental prices by band (WKM, p.5)
- 9 • The formula contains minimum prices for negative deviations (e.g., actual
10 delivery - scheduled delivery < 0) and maximum prices for positive
11 deviations (e.g., actual delivery - scheduled delivery > 0). These minimum
12 and maximum prices are punitive, because they are beyond the adders in
13 the FERC pro forma tariff (WKM, p.5).

² Band 1: up to 1.5% (under 2 MW); Band 2: 1.5%-7.5% (2-10 MW); and Band 3: over 7.5%.

³ No adder to incremental cost for Band 1, a +/- 10% adder for Band 2, and +/-25% adder for Band 3.

1 **2.2 WKM's proposal**

2 After stating that "there can not be two prices in the same hour (one for
3 incremental cost and one for decremental cost)," WKM's proposal (p.7) is as
4 follows:

- If Hydro-Quebec is a net importer of energy in the hour of concern¹ it is acting as a purchaser so the markets from which it is purchasing determine its incremental cost. Unlike the Hydro-Quebec proposal the last 10 MW would not come from the lowest priced market. Rather, Hydro-Quebec would purchase as much lower priced energy as possible and the last 10 MW would come from the highest priced market from which it is importing plus delivery costs to get it to Quebec. Even if this import is for a wheel through to a different export market it is still the cost to Hydro-Quebec of the last 10 MW dispatched. Recall the FERC definition for incremental cost which is the "*actual average hourly cost of the last 10 MW dispatched for any purpose, e.g., to supply the Transmission Provider's Native Load Customers, correct imbalances, or make off-system sales.*" (Underlines added for emphasis). If a Transmission Customer is long and provides surplus energy Hydro-Quebec pays the same price as it did to purchase its last 10 MW. If the Transmission Customer is short then its pays the same price as the export market from which Hydro-Quebec obtained the energy and Hydro-Quebec is kept whole.
- If Hydro-Quebec is a net exporter of energy in the hour of concern then it is acting as a seller so the markets to which it is exporting determine its opportunity cost value. Again, unlike the Hydro-Quebec proposal the last 10 MW would not come from the highest priced market. Rather, Hydro-Quebec would sell as much energy as possible to the highest priced markets and the last 10 MW dispatched would be destined for the lowest priced market to which it is exporting. By using this lowest priced export market as a proxy we can determine the net back opportunity cost for energy in Quebec. If a Transmission Customer is short energy Hydro-Quebec supplies it at the same opportunity value that it is making for its last 10 MW of off system sales. If the Transmission Customer is long and supplies surplus energy to Hydro-Quebec it gets paid the same value that Hydro-Quebec would have received. Hydro-Quebec does not lose money and gets to keep its energy for use in another hour.

1 **3. Rebuttal to WKM's evidence**

2 ***3.1 HQT as an imbalance service provider***

3 Responding to WKM's criticism of HQT's proposal requires the contextual
4 background of HQT as a provider of imbalance energy service. Since HQT's
5 OATT, which has been approved by the Régie, permits a grid user to self-
6 supply imbalance energy, HQT is a "default" provider of imbalance energy
7 service to a user who chooses not to self-supply. In other words, any grid user
8 can procure its own imbalance energy service, so long as the chosen supplier
9 is verified to be capable of providing such service.

10 As Québec's grid operator, HQT provides the imbalance energy service to
11 facilitate open and comparable transmission service under its OATT. The
12 service is critical to HQT's reliability because absent this service, HQT will
13 have load-resource imbalance whose resolution may require transmission
14 service curtailment.

15 HQT does not own or control any generation resources. Nor does it control or
16 serve any loads. In order to provide the imbalance service, HQT must procure
17 from suppliers that can technically and reliably offer this service. At present,
18 HQP is the only demonstrated qualified supplier for this service. Since its
19 inception, HQT has been procuring the imbalance service from HQP.

1 HQT does not profit from its imbalance service. To ensure full cost recovery,
2 HQT must exactly pass, on a dollar-for-dollar basis, its procurement cost for
3 the amount of imbalance service consumed by a user. Failure to do so will
4 cause a revenue shortfall that must be recovered from (1) all HQT's customers
5 or (2) all users of the imbalance service. In either case, the recovery will
6 violate the "cost-causation" and the "user pays" principles. Moreover, failure
7 to do so places the transmission provider in the compromised position of
8 having a financial interest in energy markets.

9 To see this point, consider an example that assumes two imbalance service
10 users: A and B. Suppose user A's imbalance costs the grid operator \$20 and
11 user B's imbalance \$60 based on the price terms at which the grid operator
12 transacts with an imbalance service supplier. The principle of cost-causation
13 requires that \$20 be assigned to user A and \$60 to user B. The principle of
14 user-pays requires that user A pay \$20 and user B \$60.

15 Now suppose the actual payments are \$30 from user A and \$45 from user B.
16 These payments are based on the price terms in the OATT that differ from
17 those at which the grid operator transacts with an imbalance service supplier.
18 Hence, user A over-pays \$10 (= \$30 - \$20) and user B under-pays \$15 (= \$60
19 - \$45), violating the cost-causation and user-pays principles. Finally, there is
20 still a \$5 shortfall to be recovered. If this amount is to be collected from the
21 two users, the recovery exacerbates the over- and under-payments. If the

1 shortfall is to be collected from all grid users besides users A and B, it results
2 in cross-subsidy since the other users do not use the imbalance service.

3 The above example illustrates that when the imbalance costs are not fully
4 passed on to transmission customers, the transmission provider is
5 transformed from a neutral facilitator between the supplier and users of
6 imbalance energy to an entity having an energy position. Moreover, this
7 would jeopardize Hydro-Québec's functional separation between the
8 transmission provider (HQT) and the market participant (HQP) because HQT
9 would become involved in energy trading, buying electricity at a price different
10 from what it would sell it to its transmission customers.

11 **3.2 Are WKM's criticisms valid?**

12 WKM (p.4) argues that HQT's proposal of incremental and decremental prices
13 is unduly discriminatory. The argument overlooks the fact that HQT has no
14 profit incentive for price discrimination. HQT's pricing formula exactly mirrors
15 the imbalance procurement offer from HQP. This is necessary for HQT's full
16 cost recovery in accordance with each user's consumption of the service.

17 WKM (p.5) argues that HQT's formula should not have minimum and
18 maximum prices. WKM misinterprets the minimum and maximum prices,
19 referring to them as “excessive penalty charges” (p.5) and suggesting that

1 HQT could reap a “windfall gain” as a result (p.6). In fact, the minimum and
2 maximum prices are not penalties set by HQT, but instead are dictated by the
3 procurement offer from HQP. In passing these costs through to the imbalance
4 energy customer, HQT receives no financial benefit. Rather, this pass through
5 ensures HQT’s full cost recovery, thus preventing cross-subsidization of an
6 energy imbalance customer by other customers. Moreover, the minimum and
7 maximum prices help eliminate the arbitrage opportunity that a grid user may
8 exploit at the expense of HQT's reliable grid operation. This is because a user
9 with insufficient (surplus) injection relative to the scheduled amount would
10 have to pay (accept) a high (low) price when compared to the
11 contemporaneous market prices.

12 ***3.3 Is WKM's proposal reasonable?***

13 WKM's proposal is to set a single imbalance price: (1) if Québec is a net
14 importer, the price would be based on the highest priced market from which
15 Québec is importing; and (2) if Québec is a net exporter, the price would be
16 based on the lowest priced market to which Québec is exporting.

17 My evaluation of this proposal concludes that it should not be adopted by the
18 Régie in this proceeding. This conclusion is based on the following:

- 1 • WKM's recommendation has price terms different from those in the
2 imbalance offer from HQP, raising the likelihood of under-collection by
3 HQT.
- 4 • While a grid user may control its consumption of imbalance service, HQT
5 must procure the amount demanded by a grid user of the service. WKM's
6 proposed formula states that HQT may have to buy energy at a price
7 based on the highest priced market and sell at a price based on the lowest
8 priced market. A profit-making grid user has the incentive to make HQT
9 "buy high - sell low", as explained below.
- 10 • WKM's recommendation offers arbitrage opportunities to grid users that
11 can harm HQT's grid reliability. These arbitrage opportunities may be
12 contemporaneous or time-based. To see how contemporaneous arbitrage
13 opportunities are created by WKM's proposal, consider the following two
14 cases based on a hypothetical generator that has scheduled an export
15 transaction from Québec to New York, assumed to be not the highest or
16 lowest priced market of the three used in WKM's proposed formula:
- 17 ○ Case 1. If Québec is a net importer, the generator has the incentive
18 to over-inject to enjoy the imbalance price based on the highest
19 priced market. For example, suppose the generator has a contract
20 to export to New York, and the per MWH revenue from the export is
21 \$60/MWH. Further suppose that during this hour HQT is a net
22 importer of energy, and thus the incremental and decremental price
23 for imbalance energy is based on the highest price in neighboring

1 markets plus transportation, as per WKM's proposal. If this
2 imbalance price is higher, say \$70/MWH, the generator has the
3 incentive to over-inject to earn HQT's \$70/MWH price. Eliminating
4 the over-injection incentive requires a reduction in HQT's imbalance
5 price. This price reduction can be accomplished by basing HQT's
6 buy price on the lowest priced market, not the highest priced market
7 as in WKM's proposal.

- 8 ○ Case 2: If Québec is a net exporter, the generator has an incentive
9 to under-inject to take advantage of the imbalance price based on
10 the lowest priced market. To see this point, suppose, similar to the
11 example above, that the generator has a contract for export to New
12 York, the price is \$60/MWH, HQT is a net exporter, and the lowest
13 neighboring price plus transportation (and hence the balancing
14 energy price) is \$50/MWH. The generator has the incentive to
15 under-inject because each MWH under-injection yields a per MWH
16 profit of \$10/MWH (= \$60 - \$50). To eliminate the under-injection
17 incentive, HQT's imbalance price needs to be raised above
18 \$60/MWH. This can be accomplished by basing the sell price on
19 the highest priced market, not the lowest priced market as in WKM's
20 proposal.

- 21 • As mentioned above, WKM's proposal also creates time-based arbitrage
22 opportunities for generators with storage. To see this point, suppose that a
23 hydro generator has a contract for export to New York at a fixed price of

1 \$60/MWH. Further suppose that the price given by WKM's imbalance
2 energy pricing proposal is high at \$100/MWH, the result of a heat wave or
3 a major generation outage. The generator has an incentive to over-inject
4 during this high-price period in order to enjoy the higher revenues.
5 Relative to the export contract price of \$60/MWH, the gain from over-
6 injection is \$40/MWH (= \$100 - \$60). Now suppose prices later fall such
7 that the imbalance energy price given by WKM's proposal is \$40/MWH.
8 The generator can under-inject and pay an imbalance energy price of
9 \$40/MWH to meet the export delivery, yielding a \$20/MWH profit (= \$60 -
10 \$40). The total gain from the over- and under-injection is \$60 (= \$40 +
11 \$20), the inter-temporal difference between the initial high \$100/MWH price
12 and the subsequent low \$40/MWH price. Such inter-temporal price
13 differences give the hydro generator a strong incentive to "lean on the
14 system."

- 15 • It is not desirable that HQT become a market participant, by buying/selling
16 electricity to its transmission customers causing energy imbalances at a
17 price different from the price at which it transacts with HQP because this
18 would create a conflict with HQ's functional separation.

19 **4. Rebuttal to PR's evidence**

20 PR proposes that (a) the incremental (decremental) price should be the
21 highest (lowest) hourly price for each hour in Ontario, New York and New

1 England; and (b) the incremental and decremental prices should not have a
2 minimum or maximum and should not vary by deviation band. PR's evidence
3 argues that the resulting prices meet the objective of offering fair
4 compensation to the service provider.

5 My evaluation of this proposal concludes that it should not be adopted by the
6 Régie for the following reasons:

- 7 • To ensure full recovery of HQT's procurement cost for imbalance service,
8 imbalance pricing must mirror the offer from HQP. Thus, PR's proposed
9 modification may cause under-collection.
- 10 • PR's proposal does not discourage users from over- or under-scheduling.
11 To discourage grid users from over- or under-scheduling, HQT's proposed
12 formula uses Bands 2 and 3 to identify large deviations and set prices.
13 Incorporating the minimum and maximum prices, the formula widens the
14 spread between the incremental and decremental prices by band size to
15 discourage large deviations.

16 PR also argues that the NYISO Schedule 4 Imbalance Energy Service pricing
17 is not a valid reference point for HQT because Schedule 4 may never have
18 actually been applied to any customer transactions. This argument ignores
19 the difference in market structures between HQT and the NYISO:

- 20 • HQT is not a power pool and does not have real-time market prices.
21 Hence, HQT cannot price its imbalance service like the NYISO that allows

1 its participating customers to settle over- and under-injections at real-time
2 market prices.

- 3 • Schedule 4 in the NYISO's OATT applies to any customer who is not a
4 pool participant, exactly the type of customer of relevance to HQT.
5 Whether or not the tariff has actually been triggered by any customer
6 transactions does not negate the fact that it is the tariff of record for such
7 transactions. PR's argument that if there were more NYISO customers to
8 whom the tariff applied, it "would have had to be amended," is purely
9 speculative.

10 To be sure, renewable, non-dispatchable generators have less control over
11 their energy output profile. However, renewable, non-dispatchable generators
12 are exempted from Band 3 of HQT's proposal. Further, it is my understanding
13 that Hydro-Québec Distribution (HQD), under Native-Load Transmission
14 Service, provides balancing and firming services to all existing wind
15 generators that have signed contracts with HQD. Thus, the most significant
16 source of renewable, non-dispatchable generation in Québec is not subject to
17 the imbalance energy pricing, which is applicable only to Point-to-Point
18 Transmission Services.

1 **5. Conclusion**

2 As a grid operator that provides open and comparable transmission access,
3 HQT must provide imbalance service under its OATT approved by the Régie.
4 As HQT does not own resources or control loads, it must currently procure
5 imbalance from the only qualified supplier in the province, HQP. HQT's
6 imbalance proposal is driven by the procurement offer from HQP. As WKM's
7 or PR's proposals differ from HQT's proposal, their adoption may adversely
8 impact HQT's full cost recovery. Further, the WKM and PR proposals create
9 opportunities for arbitrage through deliberate over- or under-injection,
10 complicating or even jeopardizing HQT's continued reliable operation of the
11 transmission system. Hence, these alternative proposals should be rejected
12 by the Régie in this proceeding.

13 To the extent that the Régie prefers to allow alternative suppliers to offer
14 balancing energy services at either predefined prices or based on supplier
15 bids, the Régie could adopt HQT's proposal as a default supplier of balancing
16 energy and direct HQT to accept proposals from third parties to become pre-
17 qualified suppliers for energy imbalances. As I mentioned earlier, the existing
18 OATT already allows for self supply and this would be a first step to facilitate
19 the development of alternative suppliers in Québec.