

# Hydro-Québec Distribution

## 2004 Distribution Tariff Application Demande R-3541-2004

Before the  
Régie de l'énergie du Québec

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On behalf of the  
Fédération Canadienne de l'Entreprise Indépendante  
(FCEI)  
and the  
Association des Stations de Ski du Québec (ASSQ)

Project 041338

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## Section II Operational Issues

### *The Operational Issues*

The heritage amount of 166,4 TWh of delivered energy (the legislated amount of 165 TWh adjusted for lower losses than originally anticipated) can be viewed as a reservoir of energy that HQD can draw down as desired.<sup>1</sup> Because forecast sales exceed this level, HQD plans to buy post-heritage energy. In 2005, some of this will come from short-term, open market purchases. The issues discussed here will still apply to some extent in future years, as well. In any event, the basic question—regardless of the fact that HQD has already signed some contracts—is what planning approach is most logical from the standpoint of cost and risk management.

From a planning standpoint first, and then from an operating standpoint, HQD will face the question every hour whether to supply that hour's load totally from the heritage "reservoir" or to purchase some post-heritage power and leave a bit more energy in the "reservoir". This is similar—with one important difference—to the decision whether to generate hydropower with water stored behind a dam or to save that water and buy power (or generate it from thermal resources) so as to save the water for generation at a later time. The difference between the heritage "reservoir" and a real one is that any "unused" water remaining on December 31 can be used the next year, whereas any heritage supply that HQD has not used simply expires at the end of the calendar year.

It is not at all clear how HQD plans to operate in this area. To evaluate the importance of this issue, we can review a couple of alternate strategies and the resulting cost.

For a base case, we start with a simple notional strategy wherein HQD fully uses the heritage supply every hour until it is exhausted and then relies totally on post-heritage supply.<sup>2</sup> For 2005, the post-heritage supply is equal to about 1,3% of the energy required to serve heritage customers. 1,3% of the year is about 5 days. Allowing for the heavier-than-average usage in December, with this strategy HQD would see the heritage "reservoir" run dry sometime around December 25<sup>th</sup> or 26<sup>th</sup>. At that point, it would start buying energy on the open market. What would this cost?

To estimate the cost of this base case, we shall use the Ontario market prices<sup>3</sup> as a measure of the cost of relying on open market prices under different purchasing strategies.

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<sup>1</sup> With limitations defined by the annual duration curve.

<sup>2</sup> The heritage energy is constrained within a defined annual duration curve. Therefore, the actual "use Heritage first" strategy would be to use the maximum heritage amount available each hour and supplement it with post-heritage energy.

<sup>3</sup> Ontario prices are used to demonstrate the opportunities available due to volatility of short-term prices. Prices from other markets could and should be used for the actual analysis. For this discussion, the Ontario prices are used because they are not complicated by locational differentials and other market features.

1 In the last week of 2003, the average price in the Ontario market was 28\$/MWh.<sup>4</sup> At this  
2 price, the total forecast post-heritage energy cost would have been 58\$ million. Of  
3 course, the power need not actually come from Ontario. This is a way of estimating the  
4 cost of market purchases. To the extent that constraints apply, the next iteration would  
5 be to consider how close HQD could come to this strategy.

6  
7 Another simple strategy would be for HQD to acquire the post-heritage energy uniformly  
8 over all hours of the year. Such an approach, at the average Ontario price of 54\$/MWh<sup>5</sup>  
9 (for 2003), would have resulted in post-heritage procurement costs of 111,4\$ million.

10  
11 Between these two simple strategies lie a myriad of alternatives. Among these are  
12 strategies that try to anticipate the times of low cost and plan to use less heritage energy  
13 at those times, saving it for periods of high market prices. The objectives of HQD and the  
14 mechanisms to be put in place by HQD to achieve those objectives are simply not well  
15 documented.

16  
17 HQD is obliged to undertake competitive procurement of future supply requirements. HQD  
18 recently obtained approval to undertake purchases on a short-term basis. It now has  
19 before it the tools to purchase energy on terms from one hour to many years into the  
20 future.

21  
22 The ability to undertake short-term transactions provides additional opportunities for HQD  
23 to procure energy.

#### 24 25 26 ***Potential for Short-Term Purchases***

27 The Québec system has 18 interconnections with 5 neighbouring jurisdictions, with import  
28 capability in excess of 9,500 MW. Three of the interconnected jurisdictions maintain open  
29 access real time energy markets.<sup>6</sup>

30  
31 Not only are these markets potential sources of low-cost supply to HQD, they also provide  
32 benchmarks as to prices that HQD should be willing to pay for generation in Québec. HQD  
33 would not always have to import energy to procure market-priced energy. HQD should be  
34 able to obtain the benefits of low prices in neighboring jurisdictions by having knowledge  
35 of, for example, HQP's opportunities for short-term sales.

36  
37 The volatility of market prices in neighbouring jurisdictions can also be observed and  
38 incorporated in assessing the relative attractiveness of fixed price contracts to short-term  
39 market purchases.

40  
41 Québec entities are active in both import and export of electricity. In the first eight months  
42 of 2004, exports from Québec were 6.3 TWh; imports were 3.3 TWh.

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<sup>4</sup> Transmission charges would have to be incurred to deliver this energy to HQD. For simplicity, we assume the transmission price is the same in all cases.

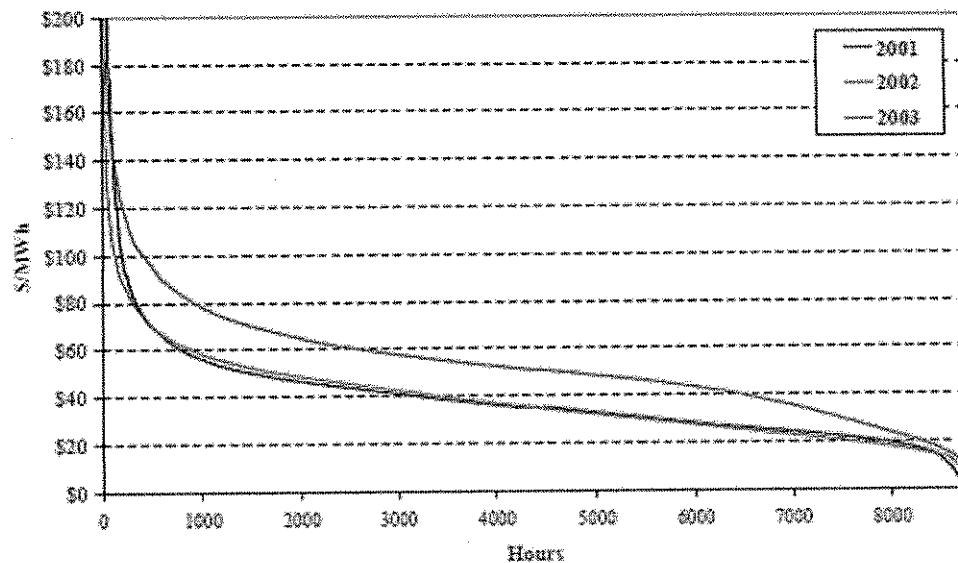
<sup>5</sup> Price data from [http://www.theimo.com/imoweb/pubs/marketReports/download/HOEPMonthlyAverages\\_20041102.csv](http://www.theimo.com/imoweb/pubs/marketReports/download/HOEPMonthlyAverages_20041102.csv).

<sup>6</sup> Ontario IMO, New York ISO and New England ISO.

1  
2 HQD could utilize imports and exports as one tool to manage price risk to end-use  
3 customers. For example, HQD could import energy during off-peak hours and thereby  
4 preserve heritage entitlements.

5  
6 The figure below provides the price duration curve for the New York ISO (NYISO). It is  
7 apparent there were a significant number of hours when relatively inexpensive energy has  
8 been available in the New York market. Although often more expensive than the heritage  
9 supply, such open market purchases might be inexpensive relative to the proposed post-  
10 heritage contracts. The significant variation between 2001/2002 and 2003 highlights the  
11 potential risks associated with reliance on market purchases that must be balanced against  
12 the potential benefits. Of course, transmission capability is required to move energy from  
13 New York to Québec. It is not just the price of the transmission that is relevant,  
14 availability is also uncertain.

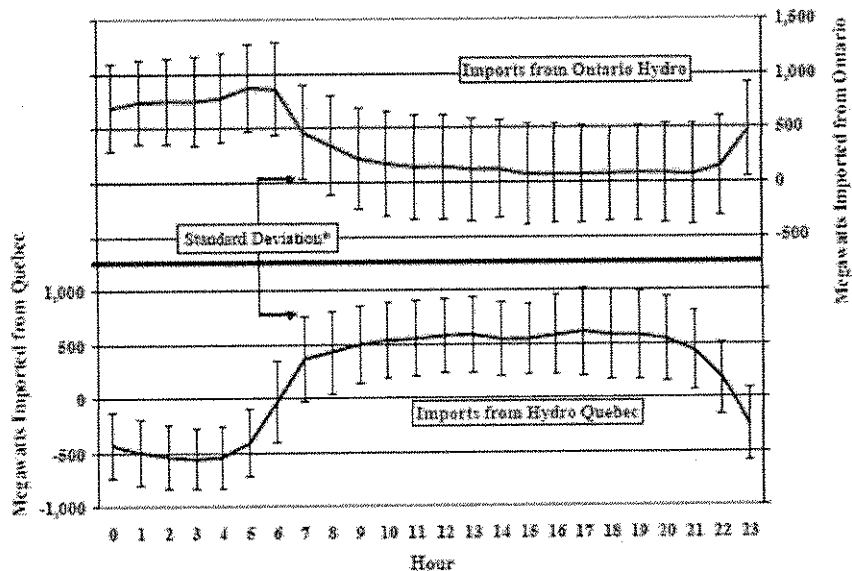
15  
**Figure 2: Price Duration Curve – All Hours**  
**Average Real-Time Price 2001- 2003**



16  
17 Source: "2003 State Of The Market Report New York ISO", Potomac Economics, Ltd. May 2004 p. 3  
18 available at  
19 [http://www.nyiso.com/topics/articles/news\\_releases/2004/patton\\_report/2003\\_state\\_of\\_the\\_](http://www.nyiso.com/topics/articles/news_releases/2004/patton_report/2003_state_of_the_market_report)  
20 [market\\_report.](http://www.nyiso.com/topics/articles/news_releases/2004/patton_report/2003_state_of_the_market_report)

21  
22 Imports from neighbouring jurisdictions are not unusual. The bottom portion of the figure  
23 below shows the average daily imports and exports between Québec and New York for  
24 2003. On average, Québec imported 500 MW of power in the early morning hours.  
25 Presumably, this reflects HQP importing energy so that it can maintain reservoir levels and  
26 export larger volumes in the higher priced peak hours.

Figure 43: Average Net Imports from Canada by Hour of Day Weekdays 2003

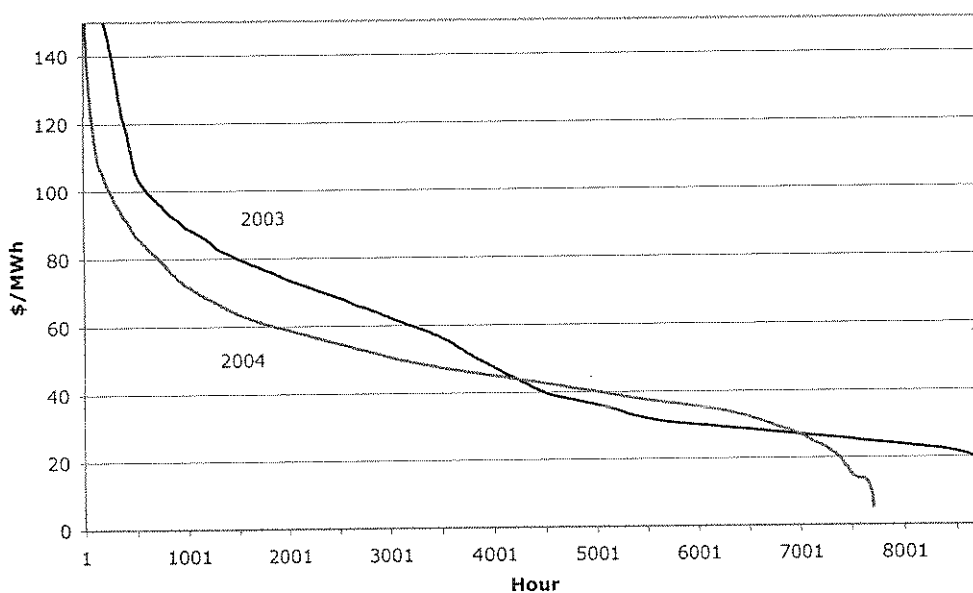


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Source: "2003 State Of The Market Report New York ISO", Potomac Economics, Ltd. May 2004 p. 70.

Data from Ontario suggests that relatively inexpensive off-peak energy may be available. As indicated in the price duration plots for 2003 and 2004 (year-to-date), there were many hours with energy available for less than \$40/MWh.

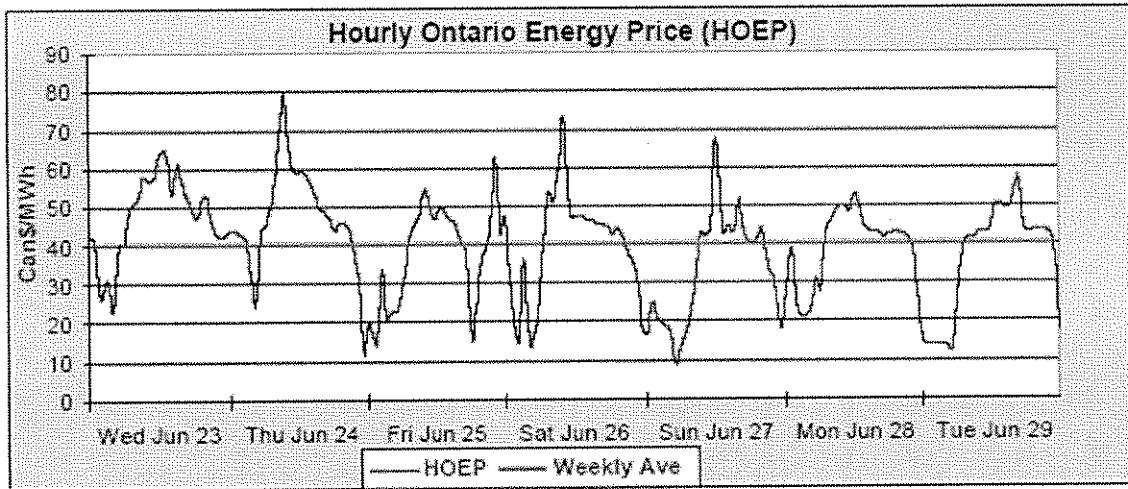
Ontario Price Duration - 2003 and 2004 ytd



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Source: Compiled from data available at [http://www.theimo.com/imoweb/pubs/marketReports/download/HOEP\\_20041119.csv](http://www.theimo.com/imoweb/pubs/marketReports/download/HOEP_20041119.csv).

1 Low-cost energy may be available but availability may be short-term. For example, the  
2 graph below suggests that even within the same week, low-cost energy may not be  
3 available on a predictable basis.



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Source: <http://www.theimo.com/imoweb/pubs/marketReports/weekly/20040629.pdf>.

To facilitate imports, HQD would have to contract with TransÉnergie for transmission import and export capability. At the present time, it would appear that the competition for this capability would be between HQP, MEHQ, HQD and potentially others. Additionally, one may ask, though, whether HQP is importing as a strategy to manage the heritage obligations to HQD. The roles and responsibilities of HQP and HQD may overlap somewhat and there may be the potential for conflicts between the two.

***Cost Minimization versus Risk Minimization***

Ideally, customers would like HQD to achieve the lowest possible cost of the post-heritage supply. In practice, absolute cost minimization is not possible because both the prices and the amounts needed are uncertain. HQD forecasts that it will require about 2,000 GWh of post-heritage supply to meet its regulated price obligations. It forecasts that this energy will cost 8,06¢/kWh (equally, 80,6¢/MWh) or a total of 166.3\$ million. The amount of purchases is based on normal weather conditions. The potential variation in the volume of post-heritage purchases has an estimated standard deviation of 1 900 GWh due to climatic variations, further compounding the uncertainty surrounding procurement of post-heritage energy.

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***What Risk Is Being Managed***

Insight into electric supply risk management can be gleaned from gas markets, which have matured over nearly two decades. Over this period, the natural gas market evolved from a structure based on long-term fixed price contracts to shorter-term contracts. Part of this evolution was the outcome of confidence in the developing market and recognition that to "beat the market" entailed a lot of risk. Parties became unwilling to make commitments that could turn out to be not "wrong", but to differ from the market.

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1  
2 With the market, not contracts, taking responsibility for security of supply, the perceived  
3 risk became one more of price than availability. Risk became defined as an assessment as  
4 to the degree to which commitments turn out to differ from the market.

5  
6 The risk faced by HQD, and ultimately consumers, has a number of dimensions. Firstly, it  
7 should be recognized that in the short-term it is price risk and not supply risk that is at  
8 issue. Although outside the scope of the current proceeding, it appears that HQD at the  
9 very least does not have sole responsibility for long-term security of supply in Quebec.

10  
11 The balance between cost minimization and risk minimization is a complex one.  
12 Contracting for 100% of possible energy purchases may provide for predictable and stable  
13 prices by eliminating exposure to volatile real time energy prices with their occasional high  
14 price periods. However, such a purchasing strategy forecloses the opportunity to benefit  
15 from low-cost, short-term purchases.

16  
17 The long-term contracts that have been entered into by HQD involve a significant risk  
18 relative to market pricing. This is more a product of their duration than the level of price  
19 within the contracts. If market prices decline, the "over the market" payments under  
20 these contracts could be significant.

21  
22 In making procurement decisions, HQD will be assessing cost and risk, trying to balance  
23 the two. Given that HQD is managing a portfolio of energy procurement options largely on  
24 behalf of customers, the preferences of customers should be recognized in developing the  
25 approach to portfolio management.

26  
27 In committing to contracts on behalf of customers, HQD should consider the tradeoffs  
28 customers would choose to make with respect to incurring risk to potentially obtain lower  
29 costs. There may also be a maximum risk tolerance that customers would be comfortable  
30 with.

31  
32 The use of imports and exports would only be one part of the procurement strategy for  
33 HQD. Market purchases may provide low-cost energy—but real time markets are volatile  
34 and uncertain, relying on market purchases brings with it potential risks along with the  
35 potential rewards. Long-term fixed price contracts provide potentially more stable pricing  
36 than real time markets but they also entail risk—risk that the price was too high.

### 37 38 39 ***Measuring Outcomes***

40 Outcomes of HQD's purchasing strategy can be measured in both absolute and relative  
41 terms. For example, actual energy costs for post-heritage energy may turn out to be  
42 70\$/MWh in 2005. Is that good or bad? With no terms of reference, it is difficult to say.  
43 Someone in the energy procurement business may have a ready view, but many others  
44 would need more information. What if the actual energy costs were 70\$/MWh but the  
45 average market price was 100\$/MWh. The result would appear to have been a good one.  
46 But, all of the purchases were made in January and by December the market price was

1 50\$/MWh. The additional information provides a new reference and the outcome appears  
2 less attractive.

3  
4 When it comes time to review the costs being claimed through the post-heritage energy  
5 deferral account, customers will have to evaluate HQD's procurement results. To make a  
6 responsible determination as to prudence, it will be necessary to look not just at the price  
7 outcomes, but to fairly examine the choices that were made, at the time they were made,  
8 with the information that was available.

9  
10 To make an appropriate determination, it will be necessary to understand what the  
11 objectives were, what risks were being taken as well as the basis for quantifying and  
12 managing the risk.

13  
14 Ideally, the strategy ultimately employed by HQD will employ a balance between risk and  
15 reward that will permit the maximum value to be captured from the heritage. All the while,  
16 there should be an overriding recognition that there should be a maximum risk threshold  
17 that HQD should operate within.

18  
19 In the longer term, it may be appropriate to structure the procurement strategies and the  
20 post-heritage deferral account in a manner that provides incentives for HQD to minimize  
21 procurement costs by managing a defined level of risk within an energy portfolio. A  
22 particular challenge will be to develop a deferral mechanism that confirms risk limits were  
23 complied with, impose meaningful penalties for risk infractions yet recognize that  
24 occasionally prudent strategies will have less than optimal outcomes.

25  
26  
27 ***Recommendation***

28 HQD has many alternative means to procure post-heritage energy. The choice of how to  
29 contract and the price to be paid involves a tradeoff of price versus risk.

30  
31 To appropriately evaluate the choices made by HQD in procuring post-heritage energy,  
32 customers will have to understand how this tradeoff has been assessed. Customers will  
33 require access to market data to assess the choices made by HQD and to establish that  
34 prices were appropriate at the time of the transactions, given the information available at  
35 that time. This process will be more efficient if HQD includes such information within  
36 future applications related to the post-heritage deferral account.

37

## Section III Cost Allocation

### *HQD Proposal*

While legislation defines how the cost of heritage energy is to be split amongst customer groups, it has yet to be determined how the cost of post-heritage energy is to be allocated.

HQD has allocated the post-heritage energy by two assumptions. The first is that each class is deemed to have the same proportion of heritage supply and post-heritage supply. For example, in the 2005 cost allocation study (HQD-12, Document 4, Page 15), Tariff D/DM is allocated 32,44% of both the heritage supply and the post-heritage supply. The second is that the post-heritage supply cost per kilowatt-hour for each class is the same ratio to the average cost as for the heritage supply:

Table 1

#### Allocation of Supply Cost

	<u>Heritage ¢/kWh</u>	<u>Ratio to Average</u>	<u>Post-Heritage ¢/kWh</u>	<u>Ratio to Average</u>
D & DM	3,20¢	1,16	9,33¢	1,16
G	2,88	1,04	8,40	1,04
M	2,67	0,96	7,77	0,96
Sentinel	2,61	0,94	7,61	0,94
L	2,61	0,89	7,16	0,89
Contrats speciaux	2,43	0,88	7,07	0,88
Average	2,77¢	1,00	8,06¢	1,00

The first assumption—the same share of heritage and post-heritage energy for each class is consistent with standard regulatory procedure and with sound economics. The higher cost of “new” supply versus “old” supply in this case is no different than has occurred in many other cases. This aspect will not be discussed further.

### *Analysis*

The second assumption used by HQD—that the ratios of post-heritage supply costs among classes is the same as for heritage supply—is not as certain. We can identify a number of different ways of allocating the cost of post-heritage supply among the classes. These can be further grouped into two families. One family includes methods that use the cost differentials recognized for the heritage energy to differentiate the cost of post-heritage energy. The other includes methods that independently develop allocations on the basis of the characteristics of the use of post-heritage energy.

1  
2 The allocation of the costs for heritage energy between rate classes is legislated.  
3 These differentials were derived from a classification of costs as between demand  
4 and energy and subsequent allocation to rate classes. These allocations resulted in  
5 differentials in unit energy costs between rate classes. Mathematically, these  
6 differentials arise from the separate allocation of demand and energy costs to each  
7 rate class. Specifically, the relative weighting of the demand and energy costs  
8 varies for each class. Rate classes with lower load factors will have higher demand  
9 costs relative to their energy allocation, increasing their total unit costs.

10  
11 One allocation approach for post-heritage energy is that suggested by HQD, that is,  
12 to maintain the relative *proportional* prices among the various classes of customers.  
13 With a small level of post-heritage energy (small enough to not alter the  
14 classification of costs), this is roughly equivalent to pooling the cost of the post-  
15 heritage energy with the cost of heritage energy and reallocating the total (based on  
16 the previously defined determinants).

17  
18 In maintaining the same relationship of cost per customer class relative to the  
19 average energy cost, effectively multiplies the differential between customer  
20 classes. The differential between the highest and lowest unit cost is 7,7\$/MWh in  
21 the allocation of heritage energy, but increases to 22,6\$/MWh for the post-heritage  
22 energy.

23  
24 Another approach based on the legislated heritage allocation would be to maintain  
25 the absolute differential (in \$/MWh) between rate classes as defined for the heritage  
26 energy, and apply that differential to the post-heritage energy. Such an approach  
27 would implicitly determine a split between demand and energy cost of the post-  
28 heritage energy as well as implicitly allocate among rate classes. This approach  
29 would maintain the differentials between classes at the levels dictated by the  
30 heritage energy, with the maximum differential set at 7,7\$/MWh.

31  
32 The second family of allocation approaches involves analysis of the cost attributes  
33 of the post-heritage energy. This would involve undertaking a process of classifying  
34 the post-heritage energy to demand and energy based on the criteria for planning  
35 the purchase of the post-heritage energy. This classification would follow from the  
36 contract parameters for the post-heritage energy (recognizing that it is likely that  
37 the cost characteristics of the generating units are likely to be reflected in the  
38 contract terms). Such an approach may be more for the contracted generation that  
39 will be in place beyond 2006 but is not clearly applicable for short-term market  
40 purchases in this case.

41  
42 One could also contemplate classifying a part of the post-heritage energy as purely  
43 energy. Such an approach may be applicable for resources, such as wind, which  
44 may provide no reliable capacity. While wind resources vary by location, in Alberta  
45 the wind generation is near zero for 40% of the time, effectively providing no  
46 reliable capacity for a large fraction of the hours. For such a resource, a 100%  
47 energy allocation may be appropriate. This would result in a uniform allocation of  
48 that cost to all customer classes, in \$/MWh. This approach can be thought of as a

1 special case of a traditional classification/allocation process in which the capacity or  
2 demand component is zero.

3  
4 The post-heritage purchases are not based on cost of service, but on procurement  
5 in a competitive marketplace. The neighbouring open access markets are major  
6 components of the marketplace. At some point in the future, it may be appropriate  
7 to recognize the "market driven" costs incurred to serve the load characteristics of  
8 the various rate classes in the allocation of post-heritage energy costs. The  
9 "market drive n" costs that may vary between rate classes include energy  
10 purchases that vary by time of day, different risk profiles arising from differing  
11 volatility of loads and possibly differences in ancillary service charges for services  
12 such as load following.

13  
14  
15 ***Allocation of Post-Heritage Energy Deferral Account***

16 It should be recognized that it is appropriate to consider the allocation of the post-  
17 heritage energy in concert with the allocation of the forecast post-heritage deferral  
18 account. It would make little sense to allow the allocation of a post-heritage energy  
19 cost to differ depending on whether the cost was forecast or whether it was a  
20 forecast variance.

21  
22  
23 ***Recommendation***

24 At the present time, the post-heritage energy is a small amount relative to the  
25 heritage energy. In the future, as the volume and cost of post-heritage energy  
26 grows and the nature of the contracts to procure that energy significantly impacts  
27 the costs incurred by HQD, the appropriate allocation methodology should be more  
28 closely examined. At the present time, it would be appropriate to roll-in the costs  
29 of the post-heritage energy and recognize the existing allocation methodology. The  
30 allocation methodology proposed by HQD effectively accomplished this and should  
31 be approved for the current proceeding.

32