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Reforming the rate structure to better reflect marginal costs :

Comments on Hydro-Québec Distribution's 2008 Rate Proposal

Testimony of Jim Lazar, in collaboration with Philip Raphals

for the RNCREQ

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Régie de l'énergie

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1 Executive Summary

This evidence demonstrates that steeply inclining block residential rates are cost-based and appropriate for Hydro Quebec (HQ). There are two completely independent justifications for this rate design:

Baseline Supply: HQ has a large but limited supply of low-cost heritage electricity, which has a very low cost to the utility. An inverted block rate has the effect of giving each residential consumer an equitable share of the low-cost power, and then allowing each customer to choose how much of the higher-cost power they wish to use, and charges them accordingly;

Load Factor: HQ, like nearly every other utility, experiences a sharp seasonal variation in demand, and must size its system to meet that seasonal weather-driven demand. A steeply inverted block rate design ensures that customers that cause spikes in demand pay the full costs of the production, transmission, and distribution facilities that must be sized to meet that peak demand. In essence, an inverted rate for smaller residential consumers performs the same function as demand/energy rates do for general service customers (and, in the case of HQ, very large residential consumers).

The most logical way to reform HQ residential rates to reflect costs and encourage the wise use of resources is to implement the following proposals:

- Reduce the basic monthly customer charge to a level that reflects metering, meter reading, and billing costs only;
- Reduce the rate for the initial block of usage and then hold it constant for an extended period of time, providing some rate and bill stability to modest users of electicity;
- Create an intermediate block, designed and priced to accommodate typical water heating usage, which has annual and time-of-day consumption patterns superior to those of space heating; and
- Increase the rate for the third block, closer to the marginal costs for space heating;
- Apply future rate increases primarily to the end-block of usage associated with space heating, until that rate reaches a level that reflects both the poorer load factor of space conditioning usage and the higher cost of new power supplies; and

- If the bill impacts on electric space heating customers is deemed to be unacceptable, consider augmenting the size of the second block to provide for an essential needs level of space heating energy in the winter months for customers without a realistic alternative to electric space heat.

In addition to discussing residential rate design in detail, this evidence proposes some concepts applicable to rates for general service customers to reflect the limited supply of low-cost heritage resource for this group of customers, and to ensure that incremental usage is priced based on the cost of incremental power supply.

This evidence does not propose any shift in the cost responsibility between the different customer classes served by Quebec Hydro. It does not propose any adjustments to the Quebec Hydro revenue requirement. That type of examination was beyond the scope of the analysis undertaken.

2 Background and Experience of Jim Lazar

Jim Lazar is a consulting economist in private practice in the area of utility rate and resource planning since 1982. His first involvement in utility ratemaking was in 1974, as an undergraduate student, when he and classmates proposed an inverted block electric rate design for the Bonneville Power Administration, a federal power marketing agency supplying power from federal hydroelectric dams and other resources. Bonneville is currently (2007) in the process currently of establishing tiered wholesale rates for its utility customers.

In 1978 - 1980, Mr. Lazar was involved in a protracted generic rate investigation convened by the Washington Utilities and Transportation Commission. His testimony in that proceeding advocated "baseline rates" in which the initial block of residential usage would be based on the cost of low-cost hydropower resources, with increasing blocks applicable to newer thermal power supplies. The Commission adopted that concept, and each of the utilities regulated by the WUTC has had inverted block residential rates since that time. These rates are discussed in greater detail in the section of this report on Current Tiered Rates in the West.

In 1980 - 86, Mr. Lazar testified before the Idaho Public Utilities Commission. Idaho adopted inverted block residential rates for Idaho Power and Avista Utilities, and these remain in effect.

In 1986 - 87, Mr. Lazar testified in Arizona on the subject of residential rate design. Arizona adopted inverted rates for Arizona Public Service Company at that time, and these rates remain in effect.

In 1979 – 88, Mr. Lazar testified in Oregon on the subject of residential rate design, encouraging adoption of inverted block rates. Oregon adopted inverted rates at that time, and these rates remain in effect for Pacific Power and Portland General Electric.

In 2003 and 2006, Mr. Lazar testified in Manitoba on the subject of residential rate design, encouraging adoption of inverted block rates. The Manitoba Public Utilities Board has directed Manitoba Hydro to present inverted rates, and that docket is ongoing.

Mr. Lazar has also testified on integrated resource planning, energy conservation program design and cost-effectiveness, and other regulatory topics. He has served on the faculty of the Western Consumer Utility Training Institute, been a speaker at conferences convened by both the National Association of Regulatory Utility Commissioners and the Western Conference of Public Service Commissioners.

Mr. Lazar is an Associate with the Regulatory Assistance Project, which provides technical assistance to utility regulators around the world, and has worked in Brazil, Namibia, Mozambique, India, Indonesia, Mauritius, China and The Philippines in association with RAP. In addition, he has worked with RAP on the New England Demand Response Initiative and the Mid-Atlantic Demand Response Initiative, and on revenue decoupling proposals in several U.S. states.

3 General Reaction to the Evidence Presented by HQ

I have been a consultant in electric utility rate design continuously since 1982, and have examined rate studies by more than fifty utilities, and appeared as an expert witness in numerous jurisdictions. I am very favorably impressed by the quality of the analysis presented by HQ in this proceeding. While I disagree with the conclusions they reach on some issues, I do not want to seem unduly critical of this utility. Indeed, I would rate it as among the best rate design discussions I have seen from an electric utility.

In HQD-12, Document 3, HQ presents extensive analysis of some rate design options for the residential class. All of these fall within a fairly narrow band of analysis. HQ considered decreasing the fixed charge by 10%, and increasing the second block by twice the increase to the first block. In my opinion, these are too modest to have significant impact on customer behavior, on customer investment in energy efficiency, or in customer fuel choice.

Given the relationship between marginal costs that are over $.10/kWh (as shown on HQD-12, Document 3, in Table 3), and average rates which are around $.07/kWh, I think that a more aggressive movement in rate design is called for. I have presented in this testimony the effect of decreasing the fixed charge by 40%, and decreasing the initial block rate as well, in order to be able to move the end block closer to marginal cost. I do not mean for that presentation to suggest that the quality of the analysis that HQ has presented is in any way inadequate.

In addition, HQ has cooperated with a request from my client for additional information in the course of this proceeding. However, I would be remiss if I did not note a certain attitude of protectiveness in some of the discovery responses.

I understand that this regulator and this utility are both relatively new to the world of utility regulation. Because much of my work in recent years has been advising new regulators in establishing their staffing plans, staff training plans, rule, regulations, and other fundamentals of regulation, I am perhaps a bit sensitive to this. In an early proceeding before the Régie, my colleague Peter Bradford referred to the free flow of information as « the lifeblood » of the regulatory process. In order for regulation to work properly, the other parties to a proceeding must have equal access to data in the possession of the utility. HQ declined to respond to some of the discovery requests we submitted and, if this were "hostile" testimony on issues such as the revenue requirement, that protectiveness would be unacceptable.

In addition, the deadlines set in this proceeding are more accelerated than I am generally familiar with. Most commissions have an open discovery period that allows for multiple rounds of discovery, so that when a response is received that prompts a follow-up request, there is time for the data to be requested and received before testimony must be prepared. We did not have that flexibility in this proceeding. It is important to adopt formal timelines that ensure that all parties have adequate time to participate.

I recommend that the regulator adopt some simple rules guiding discovery, similar to those in effect in nearly all of the jurisdictions in which I have worked, that ensure that parties to regulatory proceedings:

a) Have access to all data in the possession of the utility, including all computer models, spreadsheet formulae, and other tools needed to analyze utility data; where essential, non-disclosure agreements may be necessary, for example, when the consumption patterns of an individual consumer are required;

b) Have a discovery schedule that allows at least "two rounds" of discovery, so that questions that arise from examining an initial response can be posed and answered;

c) A deadline for testimony and evidence that allows for at least two rounds of discovery, and an opportunity, if necessary, to compel production of any withheld information; and

d) An opportunity for rebuttal evidence to be presented by all parties, at least in response to other evidence filed simultaneous with that of the party or intervenor.

With these simple guidelines, regulation in Quebec would be more consistent with my experiences in the 20+ jurisdictions in which I have testified.

4 Issues In Tiered Rate Design

Tiered rates are quite commonplace in the United States and overseas. The logic underlying these rates varies from place to place, as do the cost drivers that lead to particular solutions. However, there are certain key issues which must always be addressed, and the situation is no different in Quebec.

These issues are:

- Size of the Customer Charge (or Basic Charge)
- Number of Rate Blocks
- Size of the Rate Blocks
- Rate Differentiation For the Rate Blocks (discussed in Section 6)

4.1 Size of the Customer Charge

The utility basic charge, or customer charge, is the amount imposed independent of any usage, for the privilege of being connected to the utility system. Customer charges range from zero in many jurisdictions to as high as $20 per month on some rural electric cooperatives. These widely varying rates reflect different philosophies and different cost characteristics.

A zero customer charge, such as that imposed by Pacific Gas and Electric, California's largest electric utility, is not intended to be cost-justified. It is intended to reflect a basic political position that electricity is an essential for modern living, and to preserve as much of the revenue requirement as possible to reflect in the end-block rate to encourage wise use of electricity.

Most electric utilities subject to regulatory commission oversight impose customer charges which reflect the costs of metering, meter reading, and billing. This is the so-called "basic customer" method of cost assignment. In Washington State, for example, which has firmly adopted the basic customer method, electric customer charges range from $5.00 per month for Pacific Power to $7.50 per month for Puget Sound Energy.

Some utilities, primarily self-regulated utilities, impose much higher customer charges, which include not only metering and billing, but also customer assistance expenses, customer service expenses, uncollectible accounts, line transformer investment, and even a portion of the basic distribution infrastructure – poles, conduits, and conductors. The highest levels are justified using a method called the "minimum system" method, which assigns the hypothetical cost of a low-capacity distribution system on a per-customer basis.

HQ's current rate design falls between the second and third group. It appears that the current charge of approximately $12/month includes not only metering, meter reading, and billing costs, but also uncollectible expenses, customer assistance, and customer service. Including uncollectible expense in the customer charge is clearly inappropriate – while some customers *do* fail to pay their bills, the principal driver of their inability to pay is the size of the usage charge, not the size of the cost for metering, meter reading, and billing. These expenses should be reflected in the usage charges, just as a supermarket includes the "cost" of bananas that spoil before they can be sold in the price of bananas, not in an admission charge to enter the store.

As HQ's evidence HQD-12, Document 3, Table 2 shows, BC Hydro and Manitoba Hydro — the Canadian utilities I am familiar with that are most similar to Hydro-Québec – have customer charges of $3.63 and $6.25 per month, and the American average is $6.86 per month for the sample selected by HQ.

We requested that HQ break down their calculation of the costs associated with the Customer Charge, so that we could remove the ancillary costs that are not really strictly related to the number of customers served. We received that information as this testimony was being finalized. In my examination of it, it is clear that HQ had included uncollectible accounts, customer assistance (conservation information) and other costs not associated with metering and billing. I estimate that the actual costs associated with billing and metering are closer to $.26/day than to the $0.42/day estimated by HQ including those extraneous costs.

Including uncollectible accounts in the customer charge is clearly incorrect. When customers are unable to pay their bills, or skip town and don't pay their bills, it is due to the *magnitude* of the bills. It is the consumption that creates the majority of the bill amount, and consumption that therefore causes the uncollectible amounts. This category of costs represents a fairly large component of the $0.42/day calculated by HQ.

4.2 Number of Rate Blocks

A decision as to how many rate blocks to have is a trade-off between accuracy in conveying costs to consumers, and the value of simplicity, two of the core values in rate design expressed by Professor Bonbright (cited by HQ) and others since.

A single rate block is obviously the simplest rate design. However, it fails to recognize the differences in costs between different resources, or the differences in load factor and load shape between different types and levels of usage.

Perhaps at the other extreme, the California Public Utilities Commission has established five-block rates for Southern California Edison and Pacific Gas and Electric. These rates protect users who stay within their "baseline" from any rate increases, while pricing usage over 300% of the baseline at a price that can be politely described as "lofty."

In my experience, there are distinct categories of residential usage that justify different rate blocks for nearly all utilities. These are lights and appliances, water heat, and space conditioning. I discuss this below under Size of the Rate Blocks, because the usage for these end-uses also dictates an appropriate size of block.

In addition, for most utilities, there are different pools of resources with different costs. For many utilities, there is a very limited pool of low-cost hydroelectric power, from older dams. For most utilities, there is a relatively large pool of (usually coal and nuclear) resources which have intermediate direct economic costs (in addition to fairly significant environmental costs, which are generally not included in the price). And finally, for most utilities, there is available incremental power, mostly from natural gas and renewable resources, which has much higher cost than older coal and hydro resources.

HQ is different. First, its older resources have been consolidated into a single pool, which costs the utility $.0279/kWh. This pool supplies about 90% of the required power. This encompasses both the first and second categories of resources described above – mostly older hydro, plus some nuclear and fossil-fueled resources (including purchases). It then has incremental power supplies available, and estimates the marginal cost of these to be in excess of $.09/kWh.

My recommendation is that the Regie direct HQ to implement a three-block residential rate.

4.3 Size of the Rate Blocks

The size of the rate blocks can be based on any number of factors, and none are precisely "correct." One approach is to base block size on the available low-cost resource. Another is to base block size on typical residential usage associated with specific end-uses with different load factors. Another is to base block size on typical customer usage, to ensure that most customers will see and be able to respond to the end-block price. Each has merit.

4.3.1 Low-Cost Resource Blocks

In my 1978 proposal to establish "baseline rates" in Washington State, I proposed that the limited hydropower for each utility first be apportioned between the customer classes based on class usage, and then within the residential class on a per-customer basis. This led to initial blocks of about 600 kWh per customer per month (20 kWh/day).

In my opinion, using the low-cost resource as the basis for a rate block from HQ would be inappropriate, because this utility is just beginning to tap needed higher-cost resources. The initial block would be so large that many (perhaps most) customers would be able to meet all of their needs with the first block, and would not see any effect of marginal costs on their electric bills.

For this reason, I recommend that the heritage resource *not* be used as the basis for setting an initial rate block for HQ.

4.3.2 End-Use Blocks

In later analysis, I have proposed that the blocks be related to specific customer end uses. Load research shows that different residential end-uses have very different load factors. In the simplest of terms, these are:

- Lights and Appliances: 70%
- Water Heating: 40%
- Space Conditioning 20%

Obviously individual customer usage spans a range of uses, and different personal habits and appliance ownership affects usage significantly, but those figures provide a cost-based approach to setting rate blocks. However, because water heating and space heating are often served by natural gas, and there are a large number of combination utilities that provide both electricity and natural gas service, there is a fair amount of data on residential lights and appliances typical usage. Typical residential usage for these end-uses is on the order of 400 – 600 kWh per month (14-20 kWh per day).

Similarly there is data available on residential water heating energy usage from another source – in the summer months, most natural gas customers use little or no gas for space heating, and primarily for water heating. (Small amounts may be used for cooking and clothes drying.) Experience shows that residential water heating usage is typically about 15-20 therms per month, which translates into about 300-400 kilowatt-hours per month once the energy factors (utilization efficiency) of gas and electric water heaters are taken into account.

HQ also has data on usage by end uses, set forth on Table 5 of HQD-12, Doc. 3, which is quite consistent with data I have seen from other utilities:

Table 1. HQ Residential End Use by Type of Usage

End Use	kWh/year	kWh/day
Lights and Appliances	7,175	20
Water Heat	3,447	9
Space Heat	7,112	19 (~50/day in winter)

This data leads to an end-use based rate design generally of the following form:

Table 2. Residential End-Use Rate Blocks By Type of Usage

Block 1	Lights and Appliances	<20 kWh/day	<600 kWh/month
Block 2	Water Heat	21 – 30 kWh/day	601 – 900 kWh/month
Block 3	Space Heat	31+ kWh/day	901+ kWh/month

We requested load research data from HQ that would indicate whether the typical load patterns I have observed elsewhere are present at HQ to support this type of rate design. HQ did not provide data from its load research program that allowed me to reach a conclusive result, but, its usage for end uses is comparable to others, and frankly it is fairly intuitive that the same patterns would be present on the HQ system. Lights and appliances use is relatively steady throughout the year, and end-uses such as refrigerators continue through the night. Water heating peaks during the morning and evening when people are getting ready for school and work, and returning from school and work. Space heating is concentrated during the coldest hours of the year, driving the peak demand for winter-peaking utilities like HQ. If anything, experience shows that in colder regions, space heating is more "peaky" than in temperate climate zones.

Table 3 of HQ-12, Document 3 does indirectly show relative load factor for water heating and space heating, but not for lights and appliances. The demand charges for transmission and distribution shown are twice as high for space heating as for water heating. This implies that the load factor for water heating is judged to be twice as high as for space heating, consistent with the 40% / 20% relationship that I have observed elsewhere and is indicated above. But HQ did not do a similar presentation for lights and appliances. It is a safe assumption that had they done so, lights and appliance usage would have the lowest marginal cost of the three end-use categories.

HQ indicated in a discovery response that the load factor of 47% was identified for large residential customers, based on the billing data for those customers using in excess of 50 kW demand. It is clear that this is the *average* load factor for ALL of these customer's usage – lights, appliances, water heat, and space heat – not the marginal load factor of their incremental usage. It also seems that this is using billing data, which would measure the *monthly* load factor for each month (average demand on each bill divided by peak demand for each bill), rather than the *annual* load factor (average demand for the entire year, divided by peak demand for the entire year). The diversified load factors of 70% for lights and appliances, 40% for water heat, and 20% for space conditioning are annual load factors, upon which it is appropriate to design rates.

I believe that end-use based rate blocks should be considered for HQ, and indeed that this is the approach historically used by it. The current rate design, with a 30-kWh/day block, essentially embodies both lights and appliances (20 kWh/day) and water heat (10 kWh/day).

4.3.3 Customer Usage Based Blocks

The third approach to setting rate blocks that has often been used is to look at typical customer usage, and set the end-block of a two-block rate so that most customers will see that rate. HQ has taken this approach in their evidence, indicating that since the average customer uses 28 kWh per day (~900 kWh/month), that is an appropriate block break-point. In response to a discovery request, HQ indicated that this was the arithmetic mean, and provided the median values, which averaged 23 kWh/day (700 kWh/month). This suggests that the mean was skewed by a small number of very large customers.

HQ also indicated that about 78% of customers are currently billed in the second block in the summer, and I assume it is a higher percentage in winter. This suggests that the appropriate initial block, based on customer usage, should not exceed 700 – 900 kWh/month (23 – 30 kWh/day). Most analysts recommend larger discounts for smaller amounts of usage, so that as much usage as possible is influenced by the end-block rate. For that reason, I recommend an initial block of 20 kWh/day (600 kWh/month). This is a level consistent with those of other hydro-based utilities with which I am familiar.

The HQ bill frequency analysis indicates that about 10% of customers use less than 20 kWh/day, and these customers are collectively responsible for no more than 2% of the total residential class usage. This suggests that almost no usage would be affected by a lower price for usage below this level.

The state of California uses customer-usage based blocks, but in a much more sophisticated manner. First, there are multiple climate zones, ranging from coastal zones in the north, where there is little or no air conditioning usage, to desert zones with very high air conditioning usage, and mountain zones with very high heating requirements. Then there are multiple housing types – apartments, single-family, and so forth. The result is a specific seasonal "baseline" allowance for each housing type and climate zone. On the PG&E system, the customer baselines range from 8 kWh/day for non-heating customers in summer up to 35 kWh/day for all-electric customers in the coldest climate zone in the winter. The rate design is then, in effect, customer-specific, tied to the customer's baseline allowance. The PG&E Baseline Quantities are attached to this evidence as Exhibit A.

I am not suggesting that HQ should model its rate structure on California's. However, a much simpler application of this approach, whereby the baseline varies depending on the customer's situation, may well be helpful in reforming the rate structure to better reflect marginal costs. We will return to this question below.

The customer-usage rate blocks on the HQ system (i.e., most customers use more than 20 kWh/day) produce similar results to the end-use rate block information (lights and appliances use is about 20 kWh/day). In addition, failure to consider customer usage in the design of rates could lead to sudden and very large rate impacts for some consumers, and in general I think rate shock should be avoided.

I think it is appropriate to consider customer-usage in establishing rate blocks. Because of the high proportion of customers that use electric space heat and the bill impacts that they will inevitably incur under a marginal-cost based rate structure, I also think it useful to consider augmenting the second block to provide for essential levels of space heating in winter months for customers without realistic alternatives to electric space heat.

4.4 Recommendations on Number of Blocks and Block Size

Based on my evaluation of the HQ system and data, I recommend that the Regie consider a three-block rate for HQ to replace the current two-block rate.

The benefit of a three-block rate is quite simple: it allows a lower rate to be charged for usage below 20 kWh/day, a level that would mean that nearly all customers would see at least the second block, even in summer. By reducing the rate for this block, almost no increased consumption would be encouraged (because it is below the level of nearly all customer's usage). This would allow a rate somewhat closer to marginal cost to be imposed for incremental usage where customers actually might change their usage in response to the price. By introducing a third block, for usage above 30 kWh/day, it is possible to better isolate space heating usage, which has a lower annual load factor, and is therefore demonstrably more expensive to serve than lights and appliance usage or water heat usage. That third block would apply, at a minimum, to all *new* electric heat customers providing an incentive to invest in energy efficiency measures such as cold-climate heat pumps, to use natural gas heat, or to pay a rate closer to cost for this discretionary electricity usage.

> **Alternate Rate Proposal:** The first block would be 20 kWh/day, or 600 kWh/month. The second block would be an additional 10 kWh/day, or 300 kWh/month. The end block would be for usage above 900 kWh/day.

As we will discuss further below, this type of reform may, under some circumstances, lead to large bill increases for electric heating customers. Should these increases be deemed excessive, we recommend that the Regie consider augmenting the second block in winter for consumers dependent on electric space heat, in order to avoid penalizing those living in housing which, in response to past encouragement, is heated by electricity.

> **Alternate Rate Proposal With Winter Augmentation:** The summer rate would be as above. The winter rate would provide a second block of 20 to 30 kWh/day (900 kWh/month) instead of 10 kWh/day to existing electric heat customers. This would prevent these customers from experiencing severe bill impacts as the rate transformation is implemented.

Based on our analysis described below, we do not recommend proceeding with the Winter Augmentation option at this time.

5 Current Tiered Rates In The Western U.S.

I live near Seattle, and while I have worked around the world, the majority of my experience has been in the Western States. The purpose of this section of my evidence is to describe the tiered rates that have been established in the West. I was involved in the development of many of these rates, as I discussed in the early part of my testimony.

First, the State of Washington was an early-adopter of inverted rates. In 1978, the Washington Utilities and Transportation Commission convened a "generic" investigation into electric rate design. All three of the regulated utilities were involved, as were industrial customers, the state consumer advocate, low-income representatives, and environmental advocates. This was my first experience as an expert witness in the formal world of utility ratemaking.

The utilities generally opposed "lifeline rates" which they and the Commission defined as rates that had income-qualification to them. They argued that this put the utility in the role of a general government, funding income transfers. I testified in favor of the concept of "baseline" rates, which priced limited low-cost hydropower at a cost-based rate, and newer, higher-cost resources (then, coal) at a higher rate.

After several weeks of hearings, the Commission approved the baseline rate concept, and it has been in effect since that time. However, each utility has applied the concept differently. The current rates in effect for the Washington regulated utilities are shown below:

Table 3. Washington State Investor-Owned Utility Residential Rates

	Puget Sound Energy	Avista Utilities	Pacific Power and Light
Customer Charge	$6.02	$5.50	$5.25
First 600 kWh/month	$.0746	$.04905	$.04569
Next 700 kWh/month	$.0924	$.05706	$.07208
Over 1,300 kWh/month	$.0924	$.06689	$.07208

After the Washington decision, I appeared in Idaho and Arizona on behalf of consumer and/or environmental groups in the early 1980's. Both of these states adopted tiered rates, although of very different forms.

Idaho is a hydro-rich state, with older very low-cost hydro resources, much like HQ. Idaho Power and Avista Utilities have added coal and natural gas resources to this base over the past 25 years. The Idaho Power Company has a summer peak, driven by irrigation and air conditioning in the summer, while Avista has a dual summer/winter peak driven by irrigation and air conditioning in the summer, and electric heat in the winter. As a result of these resources and load characteristics, Idaho has adopted inverted rates that are appropriate to each utility , as shown below:

Table 4. Idaho Power Company Residential Rate

	Summer	Non-Summer
Customer Charge	$4.00	$4.00
First 300 kWh	$.05425	$.05425
Over 300 kWh	$.06106	$.05425

Table 5. Avista Utilities Idaho Residential Rate

Customer Charge	$4.00
First 600 kWh	$.05842
Over 600 kWh	$.06612

In Arizona, there is a very sharp summer peak demand associated with air conditioning, but power is neither scarce nor are the highest-cost resources operated in the winter. The utilities serve their year-round load with coal and nuclear resources, augmented by natural gas during the summer cooling season. The Arizona Corporation Commission adopted rates which are inverted in summer, reflecting the cost of incremental resources in the incremental block, but flat in the winter, when customers (primarily in higher elevations) with space heating demands actually fill a valley in demand, allowing the utility to economically invest in baseload power plants. The general residential rate for Arizona Public Service Company is shown below; this company also has optional time-of-use residential rates:

Table 6. Arizona Public Service Company E12 Residential Rate

	Summer	Winter
Customer charge	$.253/day	$.253/day
First 400 kWh	$.08570	$.08327
Next 400 kWh	$.12175	$.08327
Over 800 kWh	$.14427	$.08327

Finally, there is California. It is very much in a class of its own. Two large private utilities serve about 60% of the population, In 2000-2001, a combination of a failed deregulation experiment, a West-wide drought causing a shortage of hydroelectric power and consequent increased reliance on natural gas, and now-famous market manipulation by Enron and others caused a statewide electric power crisis. The marginal market-clearing price for power exceeded $500/megawatt-hour for weeks. Pacific Gas and Electric ultimately filed for bankruptcy, and Southern California Edison suspended interest payments on outstanding bonds for a period.

The California Public Utilities Commission responded by raising rates, but the legislature directed that "baseline" usage be exempt from crisis-era rate increases. Faced with a desire to achieve a very short-term reduction in electricity consumption, and a requirement to impose a significant increase on only above-baseline amounts, the CPUC created five-block rates that imposed what I will call "penalty" rates are the largest users, above 300% of the assigned baseline usage. This rate form has continued to this day. The basic residential rates of Pacific Gas and Electric and Southern California Edison are shown below:

Table 7. California Investor-Owned Utility Residential Rates

	Pacific Gas and Electric	Southern California Edison[1]
Customer Charge:	None	$.029/day
Baseline Usage	$.11430	$.1197
101% - 130% of Baseline	$.12989	$.1385
130% - 200% of Baseline	$.22722	$.2225
200% - 300% of Baseline	$.31719	$.25618
Over 300% of Baseline	$.36434	$.28986

As noted above, the baseline in California is customer-specific, depending on geographical location, housing type and heating system. Baselines vary from 6 to 35 kWh/day.

HQ has done a very good job describing tiered rates in Canada and in the Eastern United States, and I will not add unnecessarily to the record in this regard.

5.1 Are The California Rates Cost-Based?

The end-blocks in the California rates are clearly well above any other rates in continental North America. Some oil-based utilities in Hawaii and Alaska have comparable rates, but not utilities with access to hydro, coal, nuclear, and natural gas generation. An obvious question is whether these rates are cost-based.

[1] These rates for SCE change **daily**, based on the percentage of resources that come from the utility's own power supplies, and the percentage that is purchased from the state Department of Water Resources. The rates above were calculated as of 27 October, based on 70% Utility Retained Generation and 30% Department of Water Resources power. While this adds an almost inexplicable complexity to the California rate design, it does not affect the level of inversion shown above.

Certainly they are not tied to the embedded or marginal costs of any pool of resources providing service. The California utilities get their incremental power from natural gas generation, and the market-clearing price has seldom exceeded $100/MWh ($.10/kWh) since the 2000-2001 crisis. The California utilities are building wind, solar, and geothermal power stations, but these also all have costs well below the end-block in their rates.

Most analysts would simply term these as "penalty" rates, designed to protect small-users from cost increases, and impose these costs on "energy hogs." There is, however, a more scientific basis for these rates that should be recognized.

During the power crisis, the California PUC determined that a small amount of load reduction could have a large effect on the market-clearing price of power. When the drought was at its apogee, some extremely inefficient and polluting power plants were brought back into service to avoid blackouts. This created a demand for natural gas that drove the wholesale market price for gas from $5 to $20 and then to $50 per mmbtu. It also drove the market price for nitrogen oxide emission allowances from $1 to $8 and then to $54 per pound.

These marginal power plants had variable operating costs of more than $1,000 per MWh under these fuel and emission conditions. This, in turn, drove the market clearing price on the California Power Exchange to over $1,000/MWh, a price which affected ALL of the power traded on the PX, not just the incremental units of power produced at these high-cost power plants. The PUC was determined to achieve some short-term reduction in demand in order to reduce prices to $250/MWh or less. The extreme tailblock rates were designed to achieve this, without punishing customers limiting their usage to essential needs of power. The CPUC also ordered short-term investment in energy conservation measures that could help bring demand down to where these high-cost power plants would not be needed, and would no longer drive the market clearing price. That effort was successful, and prices have not returned to those levels.

The traditional definition of "marginal cost" is the change in total cost with respect to output, where the change in demand is very small, and not large enough to 'move the market." The California PUC was *determined* to "move the market" and thus needed to use a slightly different view of marginal cost. They looked at marginal cost as the change in total cost with respect to a change in quantity over a significant level of change. The mathematics of this approach is very easy to demonstrate.

Assume that the current demand is 100 units, at a price of $10 per unit, but that an decrease of 10 units would allow the retirement of less-efficient units, and then the most-expensive unit would have a price of $5/unit. This would drive the market clearing price to $5 per unit. Simple economic analysis would say that the new marginal cost is $10 per unit, since that is the cost of the marginal unit that could be retired. That is, the "marginal unit" is assumed to be the marginal cost.

If we measure the marginal cost as the change in total cost with respect to the change in output, the arithmetic works as follows:

Table 8. Example of Marginal Cost Measured Across a 10% Change In Quantity Demanded

	Before Demand Reduction	**After Demand Reduction**
Demand	100	90
Market Clearing Price	$10	$5
Total Revenue	$1,000	$450
Change in Total Revenue:		$550
Change in Demand		10
Marginal Cost (Change in Cost / Change in Demand)		**$55**

Under this analysis, where the market clearing price affected not only the price of the incremental units but the market clearing price for all units, the marginal cost was not the $10 cost of the marginal units nor the $5 market clearing price after demand reduction, but $55 when the change in total cost was compared with the change in total quantity. This was the kind of market shift the CPUC was attempting to achieve with the rate design that was adopted during the crisis. This is the same logic now being used throughout the industry in developing demand-response programs to shave load at the time of peak demand and market price spikes.

The residential rate design adopted by the California PUC during the 2000-2001 crisis has remained in effect after the passage of the crisis. Some analysts argue that it is no longer (or perhaps was never) cost-justified. Others believe it is an essential element of preventing a return to crisis conditions.

In California, under the failed deregulation experiment, *all* power sold by the private utilities was required to be purchased on the Power Exchange at the market clearing price. When the marginal unit had a cost of $1,000/MWh, the price of *all* power rose to that level, not just the few marginal units.

The bottom line is that there *was* a cost-based justification for the extreme block rate adopted in California, and there *may be* a continued cost-justification for this, to prevent a return of crisis conditions. It is a lesson not to be forgotten, and the persistence of this rate design reflects the lasting impression of the pain endured during the crisis. I don't suggest that rate inversion as severe as that approved in California is appropriate to Quebec, but it does have a basis in cost that is not generally recognized.

This type of situation is not applicable to Quebec, as I understand it, because the Province has made a long-term commitment to protect the heritage resource at a cost-based rate, and because there is no spot market where a market clearing price applies to all power sold. However, like California, Quebec tends to underestimate the real marginal cost associated with additional usage, as we shall see in the following section.

5.2 HQ Residential Rates Would Be More Steeply Tiered if Modeled after Rate G

HQ's general service rate applicable to medium businesses is quite typical in design. That current rate, shown below, has a demand charge and energy charge that are stated separately (HQ also applies a demand charge to the largest residential consumers, but that is *not* typical). If the cost of buying power for residential lights and appliances, water heat and space heat were calculated from the currently effective Rate G demand and energy charges, the rate blocks would be quite steep indeed.

Table 9. HQ Rate G on April 1, 2007

Fixed Charge	$12.33/month
Demand Charge over 50 kW	$15.18
First 210,000 kWh (i.e., 50 kW @ 48% annual load factor)	$.0847
Excess kWh	$.0431

The point here is that larger customers (using more than 50 kW and 210,000 kWh/year) see a demand charge of $15.18/kW for all additional demand, and an energy charge of $.0431 for all additional energy. It is relatively easy to convert these rate elements to a residential-equivalent energy rate for the three end-uses:

Table 10. Translation of Rate G Demand/Energy Into Residential End-Usage Rates

	Load Factor	kWh/kW	Demand Cost/kWh	Energy Cost/kWh	Total Cost / kWh
Lights and Appliances	70%	504	$.0304	$.0431	$.0735
Water Heat	40%	288	$.0527	$.0431	$.0958
Space Heat	20%	144	$.1054	$.0431	$.1485

In effect, HQ already charges steeply higher rates to Rate G customers for their space heating usage than it charges residential consumers. While I do not suggest that rate inversion as severe as this be imposed, it is an indication of one measure of "cost" that HQ already applies to different types of end-uses based on the load factor their system experiences.

I believe that the Rate G rate design —$15/kW + $.043/kWh — is not far from a realistic measure of marginal costs for generation, transmission, and distribution on the HQ system. Thus, the rates shown above are fairly consistent with what I would expect to see if marginal costs were applied to each of the residential end-uses (and, through the tariff, to each of the residential rate blocks I have suggested). The point here is that space heating energy costs as much as $.15/kWh to supply. Again, I do not suggest imposing marginal cost rates for all usage, but this exercise does provide an indication of the costs caused at the margin by customer usage decisions.

It goes without saying that the rate structure reform we are proposing here is in reality quite modest compared with true marginal-cost based ratemaking. To move any closer to true marginal costs would inevitably create significant bill impacts for many customers, as it did in California. Careful consideration of these impacts are their consequences in the context of a broad policy debate are a necessary precondition to such a step.

5.3 Income Effect of Tiered Rates

One common criticism of tiered rates is that they may cause sharp increased in the electric bills of low-income households. While this is true for a small number of households, it is clear that there is a relationship between income and electricity usage, and, all else being equal, *most* low-income households will benefit from tiered rates. There are several factors that contribute to this.

First and foremost, a larger proportion of low-income households live in apartments. HQ's usage data (shown in Table 8 of HQD-12, Document 3) that apartment consumption is typically significantly lower than consumption in single-family residences.

Second, low-income households do not use electricity for luxury uses such as electrically-heated spa pools. Many middle and upper-middle income households do. They do not have as many televisions as upper-income consumers. They don't own as many TIVOs or large side-by-side refrigerators. It is also true, however, that low-income families tend to live in rental housing which may have poor insulation, inefficient older appliances, and poor maintenance, but these factors can (and, in my opinion, should) to a great extent be overcome by effective utility low-income energy-efficiency programs.

Offsetting this, however, is the fact that many low-income households are senior citizens, who may spend more hours per day in their home, and therefore heat those homes more hours than working families. Many immigrant and low-income households include more than one generation, a higher number of persons per dwelling unit.

In California, as we have seen, the customer-specific baseline rate design sets different block sizes for customers with electric heat, with single-family residences, or located in harsher climate zones. This is clearly one option, but it is fairly complicated.

In many states, low-income families and those with medical conditions are eligible for direct rate relief. The "CARES" program in California limits qualified low-income families to the first two blocks of the residential rates; they are not subject to the "penalty" blocks at all. This is a reasonable option, if the provincial government determines that a rate design that reflects HQ marginal costs in the end-block would be unduly harsh for these families. It would require an administrative qualification process, but these are typically tied to other income-assistance program qualification criteria. The California medical exemption simply limits all usage above 200% of baseline to the price in the third rate block.

In most jurisdictions, the simplest way to address the cost increases faced by the relatively small number of low-income households adversely affected by a tiered rate is to provide direct energy efficiency assistance to these households, combined with direct bill assistance for those families in greatest need. Assisting families with insulation, efficient appliances, and energy education should enable most households to pay lower bills under a more aggressively tiered rate design than they do today. The energy savings provide benefits for the consumers, for the system, for the government, and for the environment. They nearly always cost less than the current rate, and far less than the marginal costs they help avoid.

In Quebec, however, the cold climate and the very high penetration of baseboard electric heating in older housing stock complicate the question further. Because of the cold climate, electric heating customers' basic consumption is very much higher than that of those who heat by other means. Consequently, aggressively tiered rate structures may result in bill increases to those who heat with electricity, and, except for the heaviest users, bill decreases for those that do not.

Furthermore, existing electric heating customers are in many cases captive, for one or more of the following reasons:

- they are tenants, with no ability to modify the heating system,
- the building has no central heating equipment, and retrofit for gas heating would be prohibitively expensive,
- gas is not available.

Finally, it is our impression that these conditions are more prevalent for the lower-income deciles of the population, though this would need to be confirmed through careful analysis.

In response to these conditions, we will present several policy alternatives, below.

6 Specific Residential Rate Proposal for HQ

After examining the information provided by HQ, including the current rates, resource availability, load research, bill frequency data, and end-use customer information, I believe that a better option is available than the modest movement in rate design proposed by HQ.

First, I recommend that the Fixed Charge be reduced to $.25/day. This is an amount that is consistent with the costs of metering and billing, but excluding extraneous costs such as uncollectible bills, conservation information, and sales assistance, which I believe should be treated as usage-related costs.

Second, I recommend that the size of the first block be set at 20 kWh/day. This is the amount that HQ indicates is associated with typical lights-and-appliances usage. As discussed above, there are definite differences in the costs of providing service to lights and appliance usage, to water heat usage, and to space heat usage. Also, by establishing a 3-block rate, the rates can be designed to provide a lower rate for essential needs of residential customers for lights and appliances, and higher rates for additional usage. This will enable a rate that provides a lower bill, but a higher marginal rate even for customers using only 21 kWh/day, while the 2-block rate proposed by HQ would not trigger a higher rate until usage of 30 kWh/day. The rate for this first block should be reduced to approximately $.05/kWh.

Third, I recommend that a second block be inserted, from 21 – 30 kWh/day. This is the amount that HQ indicates is associated with typical water heating usage. The rate for this usage would be increased from the current level to approximately $.06/kWh. This is a higher rate than is currently applicable, but because of the reduction in the Fixed Charge and the rate for the first block, customers using less than 30 kWh/day would still see their bills reduced (even though their marginal rate has increased). The increase in their end-block rate should encourage more frugal use of electricity, but their household budget will still benefit from the rate design.

Fourth, I recommend that the current rate for usage over 30 kWh/day be increased to approximately $.08/kWh. This is still only 75% of the marginal cost of providing space heat service, as shown on HQD-12, Document 3, Table 3. However, it is probably high enough to discourage use of electric resistance space heat in new residential construction. As HQ stated in HQD-12, Document 2:

> "*..each case of substitution of electric heat for another heating form generates a revenue shortfall that is significant, and more importantly, recurrent ans that is ultimately assumed by all customers.*"

The third block that I recommend directly addresses this concern about fuel choice, without placing a full marginal cost impact on existing or new space heat customers. The possibility of augmenting the second block for existing captive electric heat consumers to further dampen this effect is discussed below.

I have developed rates that I believe generate the same level of revenue from Rate D residential customers as the Company's proposal, based on my understanding of the use within each rate block. This calculation is shown below (without augmentation of the second block):

Table 11. Three-Block Residential Rate Design Proposal

	Bills x 1000	Usage By Block	HQ Current Rate	HQ Current Revenue	HQ Proposed Rate	HQ Proposed Revenue	Alternative Proposed Rate	Alternative Revenue
Fixed Charge	950,460		$0.4064	$386,217	$0.4064	$386,217	$0.2500	$237,585
O - 20	281	17,798	$0.0529	$941,514	$0.0540	$961,092	$0.0500	$889,900
21 - 30	178	6,523	$0.0529	$345,067	$0.0540	$352,242	$0.0650	$423,995
31 - 40	221	5,027	$0.0703	$353,398	$0.0733	$368,479	$0.0800	$402,160
41 - 50	235	3,836	$0.0703	$269,671	$0.0733	$281,179	$0.0800	$306,880
51-60	219	2,929	$0.0703	$205,909	$0.0733	$214,696	$0.0800	$234,320
60+	1,470	10,125	$0.0703	$711,788	$0.0733	$742,163	$0.0800	$810,000
	2,604	46,238						
Total Class Revenue $x1000				$3,213,563		$3,306,068		$3,304,840
Average Revenue / kWh				$0.0695		$0.0715		$0.0715
Block Ratio			1.33		1.36	2.9%	1.60	2.8%

As is evident, these rates encompass a Fixed Charge and rate for the first 20 kWh/day that is lower than that proposed by HQ, and an end-block rate for usage over 30 kWh/day that is higher than that proposed by HQ. Every customer using more than 20 kWh/day receives the full benefit of the lower Fixed Charge and initial block rate. One way of looking at this is that the cost benefit from HQ's revenue requirements being lower than marginal cost is distributed more equally to all consumers. Under the current and HQ-proposed rate design, the largest users get the biggest share of these below-market cost benefits.

In the HQ proposal, the ratio between the first and last block increases from 1.33 at present to 1.36. In my proposal, this ratio increases to 1.60.

It is also important to look at customer bill impacts, to ensure that the proposed rates are not causing rate shock for larger users. I have prepared a table comparing customer bills at current rates, at HQ-proposed rates, and at my proposed rates at various usage levels:

Table 12. Bill Impacts of Three-Block Residential Rate Design Proposal

Bill Impact					HQ Current Rate			HQ Proposed Rate		% Increase		Alternative Proposed Rate		% Increase
kWh/Day	kWh/Month													
0	0				$12.19			$12.19		0.0%		$7.50		-38.5%
5	150				$20.13			$20.29		0.8%		$15.00		-25.5%
10	300				$28.06			$28.39		1.2%		$22.50		-19.8%
15	450				$36.00			$36.49		1.4%		$30.00		-16.7%
20	600				$43.93			$44.59		1.5%		$37.50		-14.6%
25	750				$51.87			$52.69		1.6%		$47.25		-8.9%
30	900				$59.80			$60.79		1.7%		$57.00		-4.7%
40	1,200				$80.89			$82.78		2.3%		$81.00		0.1%
50	1,500				$101.98			$104.77		2.7%		$105.00		3.0%
60	1,800				$123.07			$126.76		3.0%		$129.00		4.8%
70	2,100				$144.16			$148.75		3.2%		$153.00		6.1%
80	2,400				$165.25			$170.74		3.3%		$177.00		7.1%
90	2,700				$186.34			$192.73		3.4%		$201.00		7.9%
100	3,000				$207.43			$214.72		3.5%		$225.00		8.5%
150	4,500				$312.88			$324.67		3.8%		$345.00		10.3%

As is evident, the HQ proposed rates would increase the bill for a customer using 100 kWh/day (three times the average) by about 3.8%, and my proposed rate design would increase that bill by about 9.6%. It is important to remember, however, that even these largest customers typically have much lower use during the non-winter months, and would see an annual bill impact of much less than 10%. I consider a 10% annual impact to be a level that borders on "rate shock" and have intentionally designed these rates so that few, if any, customers will experience rate shock. If there are some customers with very large homes, electric heat, and electrically-heated swimming pools, yes, they might experience more than a 10% rate increase, but one must ask if it is fair for these customers to be commanding more than three-times the average benefit of HQ's below-market prices.

6.1 Effect of This Rate Design Over Time

In HQ-12, Document 3, at Table 22, HQ presented the results of its analysis of a multi-year rate plan, involving a 2% annual increase, with the entire increase applied to the second block of usage. I have prepared a similar multi-year rate analysis, using my proposed rate approach. In each year, the first two rate blocks are held constant, and the 2% overall increase is recovered from the price for usage over 30 kWh/day. This price reaches $.0846 by the year 2010, still 21% below the marginal cost for space heat shown by HQ in its Table 3 of HQD-12, Document 3. The table below shows this rate development for the subsequent years:

Table 13. Example of 2009/2010 Rate Adjustments With Three-Block Rate Design

	2009 Rate Adjustment				2010 Rate Adjustment			
	HQ Proposed Rate	HQ Proposed Revenue	Alternative Proposed Rate	Alternative Revenue	HQ Proposed Rate	HQ Proposed Revenue	Alternative Proposed Rate	Alternative Revenue
Fixed Charge	$0.4064	$386,267	$0.2500	$237,615	$0.4064	$386,267	$0.2500	$237,615
O - 20	$0.0544	$968,211	$0.0500	$889,900	$0.0552	$982,450	$0.0500	$889,900
21 - 30	$0.0544	$354,851	$0.0650	$423,995	$0.0552	$360,070	$0.0650	$423,995
31 - 40	$0.0744	$374,009	$0.0816	$410,203	$0.0766	$385,068	$0.0847	$425,787
41 - 50	$0.0744	$285,398	$0.0816	$313,018	$0.0766	$293,838	$0.0847	$324,909
51-60	$0.0744	$217,918	$0.0816	$239,006	$0.0766	$224,361	$0.0847	$248,086
60+	$0.0744	$753,300	$0.0816	$826,200	$0.0766	$775,575	$0.0847	$857,588
		$3,339,954		$3,339,937		$3,407,628		$3,407,880
		$0.0722		$0.0722		$0.0737		$0.0737
	1.37	1.0%	1.63	1.1%	1.39	2.0%	1.69	2.0%

I have also calculated the impact on customer bills from this approach in the second and third years of a multi-year rate plan, as I did above. However, in doing this I noted that the three-year rate plan shown by HQ in HQD-12, Document 3 assumed three consecutive 2% increases, when in fact the current proposed increase is 2.9%. My rates are designed to produce the same revenue as those calculated by HQ, but starting from the level I have proposed in this proceeding, which includes the effect of a 2.9% overall increase. Therefore, the increase I show in 2009 is smaller than that proposed by HQ, because I am starting from a higher "base" than their multi-year example. As a result, even the largest customers receive only a 1.6% increase in the second year under my example rates. In the third year, in the context of a 2% increase, these largest customers would experience a 3.2% increase in their bills. Neither of these comes anywhere close to "rate shock" in my opinion.

Table 14. Bill Impacts of 2009/2010 Rate Adjustments With Three-Block Rate Design

		2009				2010			
		HQ Proposed Rate	% Increase Over 2008	Alternative Proposed Rate	% Increase Over 2008	HQ Proposed Rate	% Increase Over 2009	Alternative Proposed Rate	% Increase Over 2009
kWh/Day	kWh/Month								
0	0	$12.19	0.0%	$7.50	0.0%	$12.19	0.0%	$7.50	0.0%
5	150	$20.35	0.3%	$15.00	0.0%	$20.47	0.6%	$15.00	0.0%
10	300	$28.51	0.4%	$22.50	0.0%	$28.75	0.8%	$22.50	0.0%
15	450	$36.67	0.5%	$30.00	0.0%	$37.03	1.0%	$30.00	0.0%
20	600	$44.83	0.5%	$37.50	0.0%	$45.31	1.1%	$37.50	0.0%
25	750	$52.99	0.6%	$47.25	0.0%	$53.59	1.1%	$47.25	0.0%
30	900	$61.15	0.6%	$57.00	0.0%	$61.87	1.2%	$57.00	0.0%
40	1,200	$83.47	0.8%	$81.48	0.6%	$84.85	1.7%	$82.41	1.1%
50	1,500	$105.79	1.0%	$105.96	0.9%	$107.83	1.9%	$107.82	1.8%
60	1,800	$128.11	1.1%	$130.44	1.1%	$130.81	2.1%	$133.23	2.1%
70	2,100	$150.43	1.1%	$154.92	1.3%	$153.79	2.2%	$158.64	2.4%
80	2,400	$172.75	1.2%	$179.40	1.4%	$176.77	2.3%	$184.05	2.6%
90	2,700	$195.07	1.2%	$203.88	1.4%	$199.75	2.4%	$209.46	2.7%
100	3,000	$217.39	1.2%	$228.36	1.5%	$222.73	2.5%	$234.87	2.9%
150	4,500	$328.99	1.3%	$350.76	1.7%	$337.63	2.6%	$361.92	3.2%

6.2 Augmenting the second block for existing electric heating customers

As discussed above, Quebec's very cold climate and high penetration of baseboard electric heating in older housing stock creates unique challenges for rate design.

The proposal described above does, in fact, create significant (though not exorbitant) bill impacts for electric heating customers during the heating season. However, our calculations show that this impact is offset by the bill reductions for moderate users during the summer months, as well as by the reducing customer charge. The result is that, under this proposal, typical electric heating customers in fact do not bear an undue burden.

Should the Régie choose, in coming years, to proceed further down the path set out in this testimony, in a way that creates substantial bill impacts for electric heating customers, it may wish to augment the second block during the heating season for a certain subset of customers. We examined this option in developing our evidence, and it did not seem to make a meaningful difference; in order to provide such a benefit, one must either raise the end-block rate, or else raise the initial block rate, costing all users an additional amount. The former creates even more severe bill impacts for the largest users, which the latter option simply muffles the space heating price signal by collecting the same revenues from the same customers based on their non-heating consumption.

6.3 Expected Elasticity Effect of Tiered Rate Proposal

A more steeply tiered rate results in a higher price for incremental usage. This, in turn, triggers three different economic reactions. First, there is pure price elasticity – using less electricity in response to a higher price. This involves turning down thermostats, taking shorter showers, and other forms of "curtailment." The second is cross-elasticity of demand with electricity substitutes, such as energy conservation measures. If electricity costs relatively more, customers will be more inclined to invest in efficiency. The third is cross-elasticity of demand with other fuels, such as natural gas. If electricity is relatively more expensive, builders will be more likely to choose natural gas for heating newly constructed homes. All three of these responses will tend to slow the growth of electricity consumption on the HQ system.

While electricity demand is far less elastic than that of many other products and services, changes in price do have some effect on demand. A recent empirical study by Prof. Jean-Thomas Bernard of the Université de Laval demonstrated a long-term elasticity of -0.4 for domestic electricity consumption in Quebec.[2] Based on this figure, demand growth suppression of up to 1.7% in domestic demand is likely as a result of the increased marginal block prices under the proposals made in this testimony. This includes a small amount of increased demand by small-use customers whose consumption ends in the first block (which would be lower), offset by significant reductions of usage in the end-blocks. As this avoided demand is all in the high-priced post-heritage category, it will result in significant additional savings to consumers. By contrast, the same elasticity assumption would produce less than a 0.5% reduction in demand under the HQ-proposed rate design.

Increasing the cost of the marginal block will also have a beneficial effect with respect to the cost-effective energy efficiency potential. Consumers deciding whether to buy a cold-climate heat pump, install insulation, or replace their windows will enjoy larger bill reductions under a more steeply tiered rate design. The faster payback will make additional measures cost-effective, and

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2 Bernard, Jean-Thomas, *Energy Demand Elasticities: Empirical results in the Québec context* (April 19, 2006), http://www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyftr/spkr/jean_thomas_bernard.pdf.

encourage more consumers to make this investment. To the extent that HQ makes consumer energy efficiency assistance available, this trend will be further accelerated, providing economic and environmental benefits to participants and non-participants alike.

6.4 Conclusion

These examples are meant to be illustrative, not final. Our analyses have been developed with simple models, based on the billing data provided by Hydro-Québec. Before setting a final tariff, it is of course necessary to model and fine-tune the results based on a more sophisticated model or actual billing data. At this time, we do not have access to either.

Our recommendation is that the Régie direct HQ to develop and present a rate design at the conclusion of this docket which implements these policies:

- Decrease the Fixed Charge rate to approximately $.25/day
- Implement a three-block rate, with rate of approximately $.05/kWh for the first 20 kWh/day, an intermediate rate of about $.065/kWh for the next 10 kWh/day, and a rate of approximately $.08/kWh for usage over 30 kWh/day
- In future rate adjustments, apply the increase to the rate for usage in excess of 30 kWh/day until the end-block rate reaches the long-run marginal cost of providing energy from new resources.
- If this type of rate adjustment is determined to impose too severe an impact on electric heat customers, provide an augmentation of 10 to 20 kWh/day at the second-block rate for existing electric heat customers during the winter months, with the foregone revenue spread across the three rate blocks.

7 Rolling Baseline General Service Rates

Rates for commercial and industrial customers are not susceptible to the same type of rate blocking as residential consumers. There is simply not the homogeneity of usage in the general service sector. A large supermarket, even with state-of-the-art efficient lighting and refrigerator cases will use much more electricity than a small neighborhood market that has older inefficient lighting and equipment. A large office building, no matter how efficient, will use more power than a small office building, no matter how inefficient.

Fortunately, there are other options to provide a marginal price signal for the incremental usage of general service customers.

The most equitable of these is called "rolling baseline rates." Under this approach, each general service customer is allowed to use a specified percentage of past-year usage at a price based on the heritage pool of low-cost resources, and any usage above that level is priced at a higher rate, reflecting the cost of newer and higher-cost resources.

In my opinion, a three-year rolling baseline rate will be very effective at encouraging cost-effective investment in energy efficiency, protecting those businesses that make reasonable investments in energy efficiency and use reasonable energy conservation practices. Under this approach, every customer would be allowed to use perhaps 80% of their previous usage at the lower rate, and usage above that level would be at a higher rate.

The rate blocks would be designed so that if the customer used the same amount of power as in the base period, they would pay the "average" cost of the system. If they increased their usage, they would pay more, based on the higher-cost resources needed to serve growth. If they constrained their usage below their base period use, they would save the (higher) marginal rate, not the average rate. This would provide a quicker payback on energy conservation investments.

An example of this would have the following form:

Table 15. Example of Rolling Baseline General Service Rate Design

Customer Charge	$10/month
Demand Charge	$10/kW
Usage Up To 80% of Base Period Usage	$.05/kWh
Usage over 80% of Base Period Usage	$.10/kWh

Under this rate design, the customer using the historical base period usage would pay for 20% of their power at the higher rate. If they reduced usage, they would avoid the marginal cost block rate. One would design the rate so that at 100% of historical usage, the customer would experience the class average rate, but any reduction (or growth) relative to that would be priced at a level more accurately reflecting marginal cost.

The base period would roll forward every year, to reflect the most recent 36 months of usage data. Because evidence suggests that general service customers use a 2 – 4 year payback period as their maximum time horizon in evaluating energy efficiency investments, using a 3-year rolling baseline should not adversely affect customer energy efficiency efforts. In fact, it should enhance them, because the avoided rate from efficiency measures for three years (approximately the time horizon used by these customers) would reflect higher marginal cost, not lower average cost.

Some have criticized this approach as penalizing a firm that is growing and providing additional employment to the community. I would prefer to describe it as allowing that firm to grow if it pays the cost of growth, not shifting that cost to other general service customers, who may *not* have the luxury or profitability of a growing, successful business.

This approach has been used repeatedly in many jurisdictions for attracting additional load. This was done in the guise of so-called « economic development » rates that provided new and expanding loads lower rates for incremental usage, measured against a customer-specific baseline. That was appropriate where marginal costs were lower than average rates. The concept of rolling baseline rates simply reverses that rate design, pricing incremental usage at a level closer to (higher) incremental costs.

8 Summary

This evidence has sought to demonstrate a few basic elements of some fundamental rate reform for HQ. These elements include:

Limiting the Fixed Charge to the costs of metering, meter reading, and billing; this has the effect of reducing bills for small users, and preserving more of the utility revenue requirement to be reflected in usage charges;

Establishing an initial block based on the essential needs of residential consumers for lights and appliances service that nearly all of them experience. This can serve to protect the cost of essential needs from cost increases required to pay for new resources to serve load growth;

Establishing a distinct rate block related to water heat usage, recognizing that water heat has a fundamentally different load shape than space heating usage, and is less expensive to serve than space heating usage;

Establishing a distinct rate block for space heat usage, recognizing that this seasonal, weather-sensitive usage is more expensive for HQ to serve that other components of residential electricity consumption;

Proposing the option of augmenting the second block for existing electric heat customers in the winter, should the bill impacts for these customers resulting from this approach be deemed unacceptable; and

Suggesting an option for implementing tiered block rates for general service customers, by setting an individual customer baseline for each customer based on historical usage, with a marginal-cost based rate for incremental usage.

We hope that the Régie will view this as a set of constructive recommendations, and direct HQ to take steps to implement these concepts at the conclusion of this rate proceeding.

Residential
ELECTRIC
Baseline Territories and Quantities
Effective May 1, 2006

Winter
(November 1 - April 30)

TERRITORY	INDIVIDUALLY METERED (E-1,ES,ET,E-7 and CARE)		MASTER METERED (EM & EML only)
ALL-ELEC. (Code H)	Daily		Daily
P	35.1*		20.6*
Q	23.1*		17.8*
R	32.6*		19,8
S	32.3*		19,4
T	20.2*		13,5
V	26.4*		17.4*
W	29,2		16,8
X	23.1*		17.8*
Y	30.9*		19,3
Z	31.5*		25,8
BASIC ELEC. (Code B)			
P	12.7*		7,1
Q	12.6*		7.5*
R	12.1*		6,8
S	12.5*		6,3
T	9.8*		6.0*
V	10.5*		6.5*
W	11.3*		7,1
X	12.6*		7.5*
Y	12,9		7,1
Z	11.1*		8,8

Summer
(May 1 - October 31)

TERRITORY	INDIVIDUALLY METERED (E-1,ES,ET,E-7 and CARE)		MASTER METERED (EM & EML only)
ALL-ELEC. (Code H)	Daily		Daily
P	19.7*		12,5
Q	11.2*		7,9
R	22.7*		13,8
S	19.7*		12,5
T	11.2*		7,9
V	15.4*		10.7*
W	26.6*		14,1
X	12.0*		9.8*
Y	14,5		11,3
Z	13.3*		10,1
BASIC ELEC. (Code B)			
P	15.9*		7,6
Q	8.2*		5,2
R	17.6*		9,0
S	15.9*		7,6
T	8.2*		5,2
V	8.8*		5.5*
W	18.9*		10,0
X	11.9*		6.6*
Y	11.5*		5.5*
Z	8.5*		5.9*

*Changed May 1, 2006

Advice Letter 2810-E-A