

Getting Results:

Review of Hydro-Québec's Proposed 2005-2010 Energy Efficiency Plan

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Note aux lecteurs francophones

Cette étude, dont deux des auteurs sont américains, a dû être rédigée en anglais. Nous nous excusons pour l'inconvénient que cela peut causer. Nous serions disposés à réaliser une traduction sur demande.

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Sommaire exécutif français

Mise en contexte

Au printemps 2004, nous avons étudié le Plan global en efficacité énergétique (PGEÉ) 2003-06 d'Hydro-Québec. Cette étude, contrairement à la présente, concernait la portée du plan et visait, plus précisément, à déterminer dans quelle mesure les principaux marchés et opportunités avaient été traités.

Dans l'ensemble, notre critique s'étalait pour l'essentiel sur deux niveaux. Du côté résidentiel, nous avons conclu que le plan d'Hydro-Québec négligeait plusieurs opportunités clé pour acquérir des gains en efficacité énergétique. Ces opportunités comprenaient la promotion des ampoules fluorescent compact, les laveuses de linge efficaces et des fenêtres efficaces, ainsi que la bonification du programme fédéral *ÉnerGuide pour maisons*. Du côté des marchés commercial, institutionnel et petit/moyen industriel, nous avons conclu que le plan allait probablement manquer l'essentiel des occasions intéressantes parce que les incitatifs étaient trop faibles, ainsi qu'en raison de l'absence d'un programme prescriptif complémentaire. Dans l'ensemble, nous avons jugé qu'Hydro-Québec serait en mesure de réaliser des gains supplémentaires considérables à des coûts très intéressants.

Le nouveau plan d'Hydro-Québec

En novembre 2004, Hydro-Québec a proposé un nouveau plan impliquant une augmentation des coûts, des bénéfices et des gains énergétiques prévus. Le nouveau plan comprend une série de onze programmes principaux, soit six programmes résidentiels, deux pour le secteur commercial et institutionnel, un visant la petite et moyenne industrie et deux visant la grande industrie.

En plus de ces programmes, le plan se propose d'encourager l'acquisition de gains supplémentaires par une mise à niveau de la réglementation concernant la construction neuve. Il propose également d'encourager le renouvellement des opportunités d'efficacité en travaillant en amont pour faciliter le développement et la commercialisation de nouveaux produits et stratégies.

Le tableau qui suit présente les économies annuelles ainsi que le coût total pour chacune des principales composantes du plan.

Table 1. Le nouveau plan d'Hydro-Québec : économies et coûts prévus									
	Économies (GWh/an)								Coût total (millions)
	2003	2004	2005	2006	2007	2008	2009	2010	
Résidentiel									
Diagnostic	0	43	87	130	169	208	247	280	61 \$
Novoclimat	2	6	20	43	78	80	85	94	51 \$
ÉnerGuide pour maisons	2	10	31	59	92	130	169	208	117 \$
<i>Marché de masse</i>	2	10	27	47	71	101	132	162	87 \$
<i>Faible revenu</i>	0	0	5	13	21	29	37	45	30 \$
Visites faible revenu	2	7	14	20	26	33	39	45	20 \$
<i>Expansion provinciale</i>	2	6	11	15	19	24	28	32	12 \$
<i>Thermostats gratuits</i>	0	1	3	5	7	9	11	13	8 \$
Rénovation SHQ	0	0	1	2	3	4	5	6	4 \$
Promotion de produits MC/ES	0	34	85	145	200	257	313	369	75 \$
Sous-total RES	6	100	238	399	568	712	858	1002	328 \$
Commercial/Institutionnel									
CI Initiatives pour bâtiments	0	16	65	145	228	309	387	464	146 \$
MC/ES Produits pour Affaires	0	6	34	99	175	306	469	621	162 \$
Sous-total CI	0	22	99	244	403	615	856	1085	308 \$
Petites / moyennes industries									
PMI Initiatives pour procédés ind.	0	21	48	76	107	140	173	206	49 \$
Sous-total PMI	0	21	48	76	107	140	173	206	49 \$
Grande industrie									
PADIGE	0	4	13	23	32	41	51	60	7 \$
PIIGE	0	20	90	165	240	319	394	469	64 \$
Sous-total GI	0	24	103	188	272	360	445	529	71 \$
Réglementation	0	0	0	0	60	90	134	200	2 \$
Autres*	0	0	0	0	0	0	0	0	257 \$
Total	6	167	488	907	1350	1827	2332	2822	1014 \$

* « Autres » comprend la planification, les communications, le suivi et l'évaluation, la RDDC en amont, la consultation et les frais de capitalisation.

La portée : un effort de bonne foi

Il est important de signaler *qu'au niveau de sa portée*, le nouveau PGEÉ d'Hydro-Québec semble corriger la majorité de ces lacunes. Du côté résidentiel, la société d'État propose l'ajout d'un programme de promotion des produits efficaces comprenant notamment les ampoules fluorescent compact et les laveuses à linge efficaces (quoique les fenêtres efficaces semblent avoir été laissées de côté pour le moment). De plus, l'entreprise a proposé de bonifier le programme fédéral *ÉnerGuide pour maisons*, tel que proposé. Du côté des marchés commercial, institutionnel et petit/moyen industriel, l'incitatif de l'offre standard a été bonifié et un nouveau programme prescriptif complémentaire est proposé.

Nous accueillons favorablement ces changements, qui constituent d'importantes améliorations par rapport à la version précédente du plan. En effet, le nouveau plan couvre une gamme plus large d'opportunités que son prédécesseur, et ajoute de nouvelles stratégies à son portefeuille d'outils conçus pour encourager les gains en efficacité. En proposant ces bonifications, Hydro-Québec démontre un effort de bonne foi quant à sa capacité de répondre positivement aux suggestions de tierces parties et, ultimement, à sa volonté d'augmenter son acquisition de ressources en efficacité énergétique.

Nous saluons, par ailleurs, l'effort d'Hydro-Québec pour augmenter l'accès des consommateurs à faible revenu aux bénéfices de l'efficacité énergétique. Cet effort est remarqué à travers le portefeuille de programmes résidentiels, que ce soit en élargissant le programme de visites et d'installation directe à l'ensemble de la province, en s'attaquant aux opportunités de rénovation et de nouvelles constructions de logements sociaux, ou en proposant une composante du programme ÉnerGuide pour maisons qui soit propre aux ménages à faible revenu. Ces changements attestent d'une compréhension et d'une considération des barrières de marché particulières auxquelles fait face ce segment de la population et, encore une fois, d'un effort de bonne foi pour les surmonter.

En fait, au niveau du plan d'ensemble, nous trouvons qu'Hydro-Québec a cherché, à quelques exceptions (parfois importantes) près, à rejoindre la majorité des opportunités disponibles dans la majorité des marchés.

La conception des programmes : des faiblesses

Au-delà de cette vue d'ensemble se retrouvent toutefois les programmes eux-mêmes, leur conception et les stratégies sur lesquelles ils s'appuient. Ce sont ces stratégies et ces conceptions de programmes qui détermineront, dans la pratique, la performance réelle du plan.

Nous avons examiné la conception des programmes sur la base de l'expérience et des meilleures pratiques en Amérique du Nord. Cette approche nous permet d'apprendre tant des succès que des échecs des autres afin d'assurer, au-delà des projections budgétaires et énergétiques, que la performance réelle du plan sera optimale. Nous avons également basé notre analyse sur une considération systématique des barrières de marché, soit la raison d'être des programmes en premier lieu.

Cet examen des programmes proposés, lorsque mis en relief avec les meilleures pratiques reconnues, révèle plusieurs faiblesses de conception. Corriger ces faiblesses est essentiel afin d'assurer le succès du plan, permettant ainsi que les fonds investis soient utilisés de la façon la plus efficace et efficiente possible.

Pour ce faire, tant certains changements fondamentaux que certaines bonifications devront être apportés aux stratégies existantes. Par exemple, dans les secteurs commercial, institutionnel et petit/moyen industriel, nous concluons que la structure même de l'incitatif proposé doit être revue, ne serait-ce que pour l'aligner sur les principes et objectifs proposés par Hydro-Québec. À l'opposé, nous proposons un ensemble de modifications et bonifications à l'actuel outil de diagnostic résidentiel automatisé qui ne remettent aucunement en cause sa conception fondamentale.

Ci-dessous nous présentons un sommaire des principales conclusions et recommandations que nous formulons. La liste complète des mesures proposées pour maximiser la performance du plan se retrouve à l'intérieur du texte et, par la suite, dans la section finale du rapport (voir page 147).

- > Diagnostic automatisé : Nous appuyons le programme dans son ensemble, mais proposons une série de modifications afin d'améliorer sa performance et protéger sa crédibilité. La plus importante implique la **considération de cet outil en tant que plateforme pour promouvoir les programmes « durs »** plutôt que de le considérer comme un programme en soi. Concrètement, cela implique **d'intégrer des liens directs aux programmes d'Hydro-Québec et/ou d'autres organismes**, et ce, afin de faciliter le suivi et la réalisation des mesures. D'autres modifications, moins fondamentales toutefois, joueront également un rôle dans le succès éventuel de cette mesure.
- > Novoclimat : Alors que nous appuyons ce programme dans son ensemble, nous proposons plusieurs modifications visant à surmonter le grand nombre de barrières de marché et d'acteurs impliqués. Parmi elles, les plus importantes concernent d'une part, le **transfert d'une partie de l'incitatif à l'heure actuelle voué aux acheteurs, en amont vers les constructeurs de maisons neuves** et, d'autre part, **l'intégration du nouveau système de cotation ÉnerGuide pour maisons** dans la conception du programme. D'autres modifications pourront également améliorer les résultats.
- > ÉnerGuide pour maisons : Nous appuyons fortement ce programme. Alors que nous proposons quelques bonifications pour améliorer la performance, aucune de celles-ci ne saurait constituer un changement profond.
- > Visites pour ménages à faible revenu : Alors que nous appuyons le programme dans son ensemble, nous proposons un nombre limité de modifications visant à améliorer la performance et enlever les désincitatifs involontaires. Ces recommandations ne sont pas de nature fondamentale.
- > Rénovation de logements sociaux avec la SHQ : Alors que nous appuyons le concept général, il est trop tôt – et trop peu est connu de sa conception éventuelle – pour l'analyser. Nous soulevons toutefois une

préoccupation quant à sa portée éventuelle, et formulons une recommandation en ce sens.

- > MC/ES Produits efficaces : Si nous appuyons ce programme dans son ensemble, nous proposons toutefois un grand nombre de modifications et de bonifications. Les plus importantes comprennent la création d'un **nouveau programme pour les pompes géothermiques** (ainsi que les pompes air-air pour climat froid), l'offre d'**incitatifs ininterrompus pour l'achat d'ampoules fluorescent compact**, l'ajout d'**une composante touchant les fenêtres efficaces et l'engagement d'Hydro-Québec envers un effort de collaboration continentale visant à transformer le marché de l'alimentation électrique des ordinateurs**. D'autres recommandations concernent le recours à des stratégies de promotion éprouvées.
- > Pompes à chaleur hyper-efficaces : Nous proposons **un programme entièrement nouveau** qui pourra offrir, à moyen terme, des économies considérables. Ce programme regroupe deux technologies – les pompes géothermiques et les pompes à chaleur air-air conçues pour climats froids. Nous proposons une stratégie à plusieurs axes afin de guider la conception de ce programme. Nous proposons par ailleurs de **rejeter le recours immédiat à des incitatifs directs**, privilégiant pour le moment des options de financement.
- > CI Initiatives pour bâtiments : Alors que nous appuyons ce programme dans son ensemble, nous proposons nombre de changements visant à corriger des lacunes et à améliorer sa conception et sa performance éventuelle. Les plus importants comprennent une **révision de la structure même de l'incitatif**, l'ajout d'**incitatifs visant le design de nouveaux bâtiments**, l'offre de **services de design pour les municipalités**, le recours à une **approche de marketing visant les ventes** et, enfin, la **transition vers une approche de marché** pour le plan dans son ensemble.¹
- > CI Petits consommateurs : Nous proposons ici **un programme entièrement nouveau** qui, nous croyons, s'avérera essentiel afin de profiter des gains disponibles dans le segment très distinct des petits commerces. Ce programme peut être **livré par Hydro-Québec ou par le biais d'entreprises de services écoénergétiques**. Dans les deux cas, nous proposons les grandes lignes d'une stratégie à axes multiples afin de guider sa conception.
- > MC/ES Produits efficaces pour affaires : Alors que nous appuyons fortement l'ajout de ce programme, nous proposons deux modifications. La plus importante vient de notre conclusion selon laquelle l'incitatif prévu est beaucoup trop bas et, ainsi, pourrait conduire à des taux indus

¹ Cette recommandation provient de la discussion touchant le programme CI Initiatives pour bâtiments, mais s'applique plus globalement au plan dans son ensemble.

d'opportunisme, des pertes d'opportunités et le gaspillage de ressources. Nous proposons donc un **rehaussement important de l'incitatif** proposé.

- > PMI Initiatives pour procédés industriels : Alors que nous appuyons les objectifs de ce programme, nous proposons **qu'il soit intégré à l'actuel CI Initiatives pour bâtiments** et ce, sous la forme modifiée indiquée précédemment.
- > Programmes pour grandes industries : Nous n'avons pas examiné ces programmes, et ce, en raison tant de la spécificité de chaque client du secteur que du fait que le contexte réglementaire actuel risque de changer prochainement (en fonction de la stratégie fédérale sur le protocole de Kyoto).
- > IDEÉ et PISTE : Nous appuyons ces programmes, mais nous nous abstenons de fournir des recommandations précises sur ceux-ci.

Nous croyons que, s'ils sont effectués, ces changements mèneront à des améliorations considérables, tant à la conception qu'à la performance des programmes. Cela permettra de maximiser à la fois les bénéfices énergétiques, économiques et environnementaux.

D'autres enjeux

Les barrières de marché – qui sont très nombreuses et qui affectent souvent de façon différente les multiples acteurs impliqués – constituent la *raison d'être* de programmes d'efficacité énergétique. En effet, sans ces barrières, les consommateurs appliqueraient eux-mêmes les mesures d'efficacité énergétique et aucun effort supplémentaire, que ce soit des efforts de promotion, de formation, d'incitatifs ou autres, ne serait requis. En ce sens, les programmes d'efficacité énergétique n'ont qu'un seul but : surmonter systématiquement les barrières de marché existantes.

Or, les lacunes identifiées dans la conception des programmes proviennent en partie d'une absence de considération systématique de ces mêmes barrières. C'est pourquoi nous proposons, au-delà des corrections précédentes, qu'Hydro-Québec soit appelée à étudier davantage l'ensemble des barrières de marché qui s'appliquent à chacun des marchés (et segments de marché) ainsi qu'à chacun des acteurs impliqués.

Au-delà de notre examen des programmes individuels, nous avons également examiné l'effort global que représente le plan, et ce, grâce à un exercice de balisage par lequel nous avons comparé Hydro-Québec à ses 15 pairs les plus proches. Cet exercice nous a conduit à recommander l'adoption d'un objectif d'ensemble, soit que l'effort global d'Hydro-Québec se situe parmi les cinq meilleurs (sur les 15 pairs) et

ce, à l'intérieur de trois ans. Ce objectif serait conditionnel à ce que les investissements génèrent des gains d'efficacité rentables.

Enfin, nous proposons à la Régie de l'énergie de reconnaître formellement la nature dynamique et évolutive de tout plan en efficacité énergétique. À cet effet, nous proposons d'indiquer clairement les lignes directrices qui seront utilisées à l'avenir pour juger de modifications unilatérales pouvant survenir *entre* dossiers réglementaires. Ces lignes directrices permettront de réduire l'incertitude qui, involontairement, pourraient empêcher l'apport d'améliorations dynamiques dans le temps. Nous proposons également que les coûts engendrés par les modifications survenus depuis le dernier plan approuvé, malgré les lacunes identifiées dans notre rapport, soient approuvés car fondés sur un effort de bonne foi.

Ce rapport contient un ensemble de recommandations. Certaines sont des suggestions relativement mineures, d'autres émettent des réserves, d'autres proposent des améliorations alors que certaines autres sont de nature plus fondamentale. **Nous espérons que ce rapport servira de point de départ constructif à partir de laquelle tous pourront évaluer, apprécier et améliorer le plan global en efficacité énergétique proposé par Hydro-Québec.**

| a | Introduction

In the Spring of 2004, we prepared a quantitative analysis of the costs, benefits and energy savings that Hydro-Québec could achieve if it broadened and deepened its Comprehensive Energy Efficiency Plan (hereafter “PGEÉ” for *Plan global en efficacité énergétique*). The analysis identified and indeed quantified a number of cost-effective opportunities the utility could pursue in the short-term that would result in a significant increase in savings.

In its report on that case, the *Régie de l’énergie* urged Hydro-Québec to reconsider and strengthen its plan considerably. In November, Hydro-Québec proposed a new plan with substantially greater forecast costs, benefits and energy savings. Hereafter we review that plan.

Contrary to last year’s mandate, the primary objective of this report is not to quantify the savings potential from new opportunities, nor to estimate their costs and benefits. Rather, it is to examine the strategies underlying Hydro-Québec’s proposed suite of programs, with a view to ensuring that they follow best practice. Ultimately, the goal of this report and its recommendations is to allow the Régie to assess the extent to which Hydro-Québec’s new proposals will use ratepayer funds efficiently and to maximum effect, as well as to identify specific improvements that can be implemented in the short-term.

For the purposes of this report, we have examined Hydro-Québec’s PGEÉ – both the principal testimony and appendices – in detail. We have also reviewed Hydro-Québec’s answers to the interrogatories of all parties to this filing, as well as having reviewed information from some previous filings. In addition, we have examined the practices of leading utility programs for specific program areas. These reviews allow us to compare with Hydro-Québec’s strategic approaches to each program or market segment. Additionally, we have rooted our analysis in an understanding of the market barriers that hinder customers or other market players from making cost-effective efficiency-related decisions on their own. Finally, we have relied on our own knowledge of – and experience with – best practices throughout North America, whether in the residential, commercial, institutional or industrial markets.²

In this report, we are primarily asking the question of *How should programs be designed?* In responding to this question, we systematically propose changes to program design that we believe will lead to improved performance. These proposals may include changes to current program strategies or the addition of new strategies to address neglected market barriers (see discussion on page 16), players or opportunities. Some of these proposals are fundamental in nature, while others can occur within existing program concepts and strategies.

² We have not included the *large* industries market in this review.

We noted earlier that this report is *not* primarily about assessing the reasonableness of Hydro-Québec's savings and participation forecasts. However, in a few select cases, forecasts seemed to be so vastly different from reasonable targets as to potentially harm program implementation itself (by setting targets far too low). In those rare cases, we were compelled to review and propose corrections. As such, even this exception is not so much about quantifying expectations as it is about ensuring that programs – including in this case program targets – are designed and implemented to maximum effect.

Similarly, while this report is not primarily about adding new programs, we do identify a few additional measures that offer such significant opportunities – either short- or long-term – as to merit immediate effort. These opportunities are by and large woven into our review of Hydro-Québec's proposed energy efficient products programs. We also identify two new programs that are aimed at addressing markets more effectively than if they were rolled into larger programs.

Finally, we address the question *How does this effort compare with others?* To do so, we updated and strengthened previous work and developed a benchmarking exercise. This benchmarking, based on the utility's financial commitments as compared with those of its closest peers, provides the information required to appreciate the reasonableness of the PGEÉ's overall effort. Benchmarking results are presented in the final section of this report.

This report contains a large number of recommendations. Some present “friendly” suggestions, others should be read as notes of caution, still others involve straightforward improvements, while others are more fundamental. **Ultimately, we hope this report provides a constructive plank from which to review, appreciate and improve Hydro-Québec's proposed PGEÉ.**

| b | Hydro-Québec's Plan: Overview

1. Previous Plan

In the Spring of 2004, we reviewed Hydro-Québec's 2003-06 energy efficiency plan. Contrary to the current report, the purpose of that review was not to assess program design but rather, to identify whether and to what extent major markets / opportunities were addressed. Put differently, the question then was *whether* the plan included the right programs and measures, whereas the question now is *how* those programs and measures should be implemented.

Broadly speaking, our critique was twofold. On the residential side, we concluded that the plan neglected to pursue several key opportunities for cost-effective energy savings, including promotion of compact fluorescent lighting, efficient clothes washers and efficient windows, as well as piggybacking on the federal government's EnerGuide for Houses program. On the commercial, institutional and small/medium industry sides, we concluded that the plan was likely to miss most opportunities because standard offer incentive levels were too low, and because of the absence of a complementary, prescriptive program. On the whole, we felt that addressing these markets and opportunities would allow Hydro-Québec to acquire significant additional cost-effective energy efficiency gains.

2. Hydro-Québec's New Plan

In November of 2004, Hydro-Québec proposed a new plan containing greater forecast costs, benefits and energy savings. The new plan is comprised of a series of eleven core programs, including six residential, two commercial/institutional, one small/medium industrial and two large industrial.

In addition to these programs, the plan proposes to assist in acquiring savings through new building code regulations. It also plans to facilitate renewal of efficiency opportunities by working upstream in order to enable development and commercialization of new efficiency products and strategies.

The following table presents the plan's forecast annual savings and total costs by major program component.

Table 2. Hydro-Québec's New PGEÉ: Forecast Program Savings and Costs									
	Savings (GWh/year)								Tot. Costs (millions)
	2003	2004	2005	2006	2007	2008	2009	2010	
Residential									
Automated Diagnostic	0	43	87	130	169	208	247	280	61 \$
Novoclimat	2	6	20	43	78	80	85	94	51 \$
EnerGuide for Houses	2	10	31	59	92	130	169	208	117 \$
<i>Mass market</i>	2	10	27	47	71	101	132	162	87 \$
<i>Low-income segment</i>	0	0	5	13	21	29	37	45	30 \$
Low-Income Direct Install	2	7	14	20	26	33	39	45	20 \$
<i>Provincial expansion</i>	2	6	11	15	19	24	28	32	12 \$
<i>Free electronic thermostats</i>	0	1	3	5	7	9	11	13	8 \$
SHQ Affordable Housing	0	0	1	2	3	4	5	6	4 \$
MC/ES Efficient Products	0	34	85	145	200	257	313	369	75 \$
Sub-total RES	6	100	238	399	568	712	858	1002	328 \$
Commercial/Institutional									
CI Buildings Initiatives	0	16	65	145	228	309	387	464	146 \$
MC/ES Products for Business	0	6	34	99	175	306	469	621	162 \$
Sub-total CI	0	22	99	244	403	615	856	1085	308 \$
Small / Med. Business									
SMI Industrial Process Initiatives	0	21	48	76	107	140	173	206	49 \$
Sub-total PMI	0	21	48	76	107	140	173	206	49 \$
Large Industrial									
PADIGE	0	4	13	23	32	41	51	60	7 \$
PIIGE	0	20	90	165	240	319	394	469	64 \$
Sub-total LI	0	24	103	188	272	360	445	529	71 \$
Regulations	0	0	0	0	60	90	134	200	2 \$
Others*	0	0	0	0	0	0	0	0	257 \$
Total	6	167	488	907	1350	1827	2332	2822	1014 \$
* Others includes planning, communications, evaluations, upstream RDDC, consultation and capitalization costs.									

3. Good Faith Effort

It is significant that *at the overall plan level*, Hydro-Québec's new PGEÉ seeks to correct most of these problems. On the residential side, the utility has proposed an efficient products program that is set to include promotion of compact fluorescent lighting and efficient clothes washers (though windows seem to have been left out for the time being). Additionally, the utility has proposed piggybacking on the federal government's EnerGuide for Houses program, as suggested. On the commercial side, standard offer incentives have been increased, and a new prescriptive program is proposed.

We applaud these changes, which bring significant improvements to Hydro-Québec's earlier plans. Indeed, the new plan covers a broader array of opportunities than its predecessor, and adds a valuable new strategy to its portfolio of tools for encouraging

energy efficiency gains. In bringing forth these proposals, Hydro-Québec has shown a good faith effort at being responsive to third-party suggestions and, ultimately, to increasing its acquisition of energy efficiency resources.

We also applaud Hydro-Québec's effort at increasing access to efficiency benefits by low-income customers. This effort is notable throughout the residential side of the plan, whether it be in expanding low-income home visits, addressing the social housing market's renovation *and* new construction needs or proposing a low-income-specific component to the EnerGuide for Houses program. These changes suggest an understanding of the particular barriers low-income customers face, and again, a good faith effort at overcoming them.

In fact, at the broad plan level, we found that Hydro-Québec has attempted, with several notable exceptions, to reach most major opportunities in most major markets.

4. Design Weaknesses

Beyond this broad, plan-level analysis, however, lie the program strategies and designs themselves. It is these strategies and designs that, in practice, will determine the plan's real-world performance.

We assessed program designs based on best practice experience throughout North America. This approach enables us to learn from others' successes and failures in order to ensure that, beyond forecast budgets and savings, the plan will actually perform to maximum effect. We also rooted our analysis in systematic consideration of market barriers, which are the *raison d'être* of efficiency programs to begin with.

This best practice review found a fair number of design weaknesses. Correcting these weaknesses is essential to ensuring the plan's success and, moreover, to ensuring ratepayer funds are used as efficiently and effectively as possible.

Correcting these weaknesses will require both fundamental strategy changes and smaller "tweaks" to existing strategies. For example, we find that in the commercial, institutional and industrial sectors, the current incentive structures need to be revamped, if only to match Hydro-Québec's own underlying principles and targets. At the opposite end of the spectrum, we propose a number of tweaks to the current residential diagnostic tool that do not call into question its fundamental design.

The following is a summary of the most important and fundamental of our recommendations. The full suite of conclusions and recommendations for maximizing plan performance can be found within the text, and again in the report's final section (see page 147).

- > Automated Diagnostic program: While we approve of the program as a whole, a number of changes are proposed to improve effectiveness and protect the tool's credibility. The most significant involves **designing the Diagnostic tool as a platform for promoting the utility's "hard" programs**, rather than as a core program in and of itself. Concretely, this implies **building seamless linkages to its and others' efficiency programs** to facilitate measure uptake. Other, less fundamental changes will also play a role in ensuring success.
- > Novoclimat: While we approve of the program as a whole, a number of changes are also proposed here, in order to tackle the multiple and actor-specific barriers that apply to this market. The most significant, based on successful practice elsewhere, includes **transferring a greater share of the overall incentive upstream, from the buyer to the builder community**, as well as incorporating the new **EnerGuide for Houses rating system** directly into program design. Other changes will also improve results.
- > EnerGuide for Houses: We strongly support this program. While we propose a limited number of changes to improve program performance, none can be considered fundamental changes.
- > Low-Income Direct Install: While we approve of the program as a whole, a limited number of changes are proposed in order to improve program effectiveness and eliminate unintentional disincentives. None can be considered fundamental changes.
- > SHQ Affordable Housing Renovation: While we approve of the program concept, it is too early and too little is known to conduct an in-depth analysis of program strategies. Nonetheless, we have some concerns regarding comprehensiveness, and make proposals in this regard.
- > MC/ES Efficient Products Residential: While we approve of the program as a whole, we propose a large number of changes. The most significant include **creating a separate program for geothermal (and cold-climate air-source) heat pumps, incorporating year-round rebates on compact fluorescent lightbulbs, adding a distinct efficient windows component to the program, and committing to a new North American joint effort at transforming the computer power supplies market**. Other recommendations concern use of proven promotional strategies.
- > Super-Efficient Heat Pumps Program: **This is an entirely new program** that we believe offers considerable mid-term savings potential. This program groups together two technologies – geothermal and cold-climate air-source heat pumps. We propose a multi-pronged strategy to guide program design. We also propose **rejecting the use of direct incentives** for the moment, instead focusing on financing options.

- > C&I Buildings Initiative: While we approve of the program as a whole, we propose a number of changes in order to improve program strategy effectiveness. The most significant include **revamping the incentive structure, providing new construction design incentives, paying design professionals to assist municipalities, adopting a relationship-building, sales-oriented approach to marketing and, finally, adopting a markets approach to the plan as a whole.**³
- > C&I Small Customer Program: **This is an entirely new program** that we believe is essential to acquiring cost-effective savings from this very distinct market segment. This program can be **run in-house or through the ESCO community**. In both cases, we propose a multi-pronged strategy to guide program design.
- > MC/ES Efficient Products for Business: While we strongly support the addition of this program, we propose a couple of changes. The most significant stems from a finding that the level of incentive is far too low, and will likely lead to high free-ridership, lost opportunities and wasted resources. We therefore propose **increasing the prescriptive incentive** considerably.
- > SMI Industrial Process Initiatives: While we approve of the program objectives, we believe **this program should be rolled into the revamped C&I Buildings Initiative**, under the form noted above.
- > LI Programs: We do not review these programs, as they are too plant-specific and the current regulatory context is in flux.
- > IDEÉ and PISTE Programs: We support these programs, but refrain from providing specific recommendations.

We believe these changes will lead to considerable improvements in program design and performance, thus maximizing both energy *and* net economic and environmental benefits.

Beyond our assessment of specific programs, we also examined the plan's overall financial effort, conducting a benchmarking exercise through which we compared Hydro-Québec against its 15 closest peers. This review leads us to recommend adopting an overriding target, as follows:

- > Overall plan effort: We propose adopting a target through which **Hydro-Québec's overall financial effort should rank within the top 5 among its 15 closest peers within three years**. This should be conditional on cost-effectiveness.

³ While the recommendation for a markets approach stems from our discussion of the C&I Buildings Initiatives program, it applies more broadly to the plan as a whole.

5. A note on flexibility

Finally, we believe it is important to recognize that an energy efficiency plan is and must be a living document, reacting dynamically to real-world experience on an ongoing basis. Recognizing this dynamism is not merely academic; it implies providing the utility sufficient operational flexibility to be able to adapt to circumstances that may arise in between plan approvals.

This flexibility need not mean “*carte blanche*” – Hydro-Québec must not believe that any and all unilateral changes will be approved retroactively. But while the utility needs to explain such unilateral changes, it also needs direction as to the criteria that will be used to retroactively judge them. We believe this direction must be rooted in demonstrating good faith. Specifically, this implies Hydro-Québec demonstrating the reasonableness of such changes (as opposed to *proving* that they were necessarily *the best possible* changes), and further demonstrating that its decision took into account the impact of an eventual Régie reversal of such changes (i.e. minimize the risk of creating *faits accomplis*). Providing such direction in advance will help to minimize uncertainty that could otherwise impede dynamic and iterative program improvements over time.

These principles should apply to changes that Hydro-Québec may believe are required over the coming year. As regards changes brought over the previous year, while this report pinpoints a number of design weaknesses, we believe they pass the test of “good faith”. As such, we believe the *Régie de l’énergie* should take care to not penalize Hydro-Québec retroactively.

Recommendation: Facilitate flexibility and dynamism by providing Hydro-Québec with guidelines for retroactively judging unilateral program changes, based on “good faith” principles.

Recommendation: Support recovery of additional costs incurred over the past year.

| C | Barriers to Energy Efficiency

1. Introduction

This report is rooted in an understanding and evaluation of the market barriers facing Hydro-Québec's customers in their energy-related decisions. As such, we believe it is essential to begin with a short discussion of these barriers and their implications for effective energy efficiency program design.

If energy and consumer markets functioned perfectly, there would be no need for energy efficiency programs (just as there would be no need for utility regulation). Demand would adjust seamlessly to price whenever such adjustments cost less than the marginal cost of supplying the avoided kWh. In such a world, all measures that cost less than avoided costs of electricity supply – everything from compact fluorescent lighting to efficient appliances to home energy retrofits to high-efficiency new construction – would naturally be adopted by all consumers. Neither information campaigns nor rebates or other incentives would be needed.

Unfortunately, energy and consumer markets are rife with market imperfections that act as barriers to energy efficiency. These barriers have been well-known and documented for nearly a quarter of a century.⁴

Market Barrier – any characteristic of the market for an energy-related product, service or practice that helps to explain the gap between the actual level of investment in or practice of energy efficiency and an increased level that would appear to be cost beneficial.

Describing a market barrier as “any characteristic” is indication that there might be as many market barriers as there are individuals and businesses that have them. They can be grouped along similar lines, but a fundamental point about market barriers is that they are different for different people in different situations. Like retailers who increasingly respond to the individual needs of their customers, so too must utility energy efficiency programs respond to and overcome the different sets of barriers their customers and other market actors face. What program administrators must keep in mind is that many barriers have nothing to do with energy efficiency. The photocopier salesman and car dealer have many of the same barriers to overcome.

Barriers can be grouped according to general categories listed in Table 3 below. Each barrier or group of barriers will be experienced individually by each customer. Note too that this only groups the primary barriers; other, less pervasive ones exist as well.

⁴ John Plunkett, P. Chernick, *From Here to Efficiency: Making Efficient Markets*, prepared for the Pennsylvania Energy Office, Harrisburg, PA, 1993.

Table 3. Market Barriers to Cost-Effective Energy Efficiency

Barrier	Description
Information or Search Costs	The costs of identifying energy-efficient products or services or of learning about energy-efficient practices. This would include the value of time spent finding out about or locating a product or service or hiring someone else to do so.
Performance Uncertainties	The difficulties consumers face in evaluating claims about future benefits. Closely related to high search costs, in that acquiring the information needed to evaluate claims about future performance is rarely without cost.
Asymmetric Information and Opportunism	The tendency of sellers of energy-efficient products or services to have more and better information about their offerings than consumers. Combined with potential incentives to mislead, this can lead to sub-optimal purchasing behavior.
Hassle or Transaction Costs	The indirect costs of acquiring energy efficiency, including the time, materials, and labor involved in obtaining or contracting for an energy-efficient product or service. (Distinct from search costs in that it refers to what happens once a product has been located.)
Hidden Costs or benefits	Unexpected costs associated with relying on or operating of energy-efficient products or services – for example, extra operating and maintenance costs. Alternatively, hidden benefits like reduced O&M.
Access to Financing	The difficulties associated with the lending industry's historic inability in underwriting procedures to account for the unique features of loans for energy-savings products (i.e., that future reductions in utility bills increase the borrower's ability to repay a loan).
Bounded Rationality	The behavior of an individual during the decision-making process that either seems (or actually is) inconsistent with the individual's goals.
Organization Practices or Customs	Organizational behavior or systems of practice that discourage or inhibit cost-effective energy-efficiency decisions. For example, procurement rules that make it difficult to act on energy-efficiency decisions based on economic merit because focused only on first-cost.
Misplaced or Split Incentives	Cases in which the incentives of an agent charged with purchasing energy efficiency are not aligned with those of the persons who would benefit from the purchase, e.g., landlord/tenant relationship.
Product or Service Unavailability	The failure of manufacturers, distributors, or vendors to make a product or service available in a given area or market. May result from collusion, bounded rationality, or supply constraints.
Inseparability of Product Features	The difficulties consumers sometimes face in acquiring desirable energy-efficiency features in products without also acquiring (and paying for) additional undesired features that increase the total cost of the product beyond what the consumer is willing to pay.
Irreversibility	The difficulty of reversing a purchase decision in light of new information that may become available, which may deter the initial purchase. For example, if energy prices decline, one cannot resell insulation that has been blown into a wall.
Adapted from: J. Eto, R. Prael and J. Schlegel, <i>A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs</i> . July, 1996.	

Almost every barrier for any market actor group and in any market sector stems from this list.

The need for corrective demand-side management (DSM) programs has been understood for well over two decades. In that time, tens of billions of dollars have been invested in DSM programs, producing hundreds of TWh of electricity savings (at below the cost of additional supply). In the same time, a wealth of experience has been generated and shared within the community of DSM practitioners.

2. Barrier Complexity

Over time, market barriers have come to be understood with increasing sophistication, allowing for much improved program design rooted in a stronger understanding of real-world market dynamics. As with the construction of power plants (or any industrial facility, for that matter), use of state-of-the-art design and practices is necessary to maximize production (energy savings) and minimize costs.

Table 4 provides the results of a recent energy efficiency program evaluation done by *RLW Analytics* for the Long Island Power Authority. RLW asked groups of market actors to rate a list of market barriers in order of importance. In the study, respondents were asked to rate the barriers on a scale of 1-5, where “1” means they strongly disagree with the statement and “5” they strongly agree. Each group’s data were then averaged and the result for each barrier and market actor was determined.

The sorted results of this analysis show that the importance of each barrier varied by market actor group. For example, in Line 5 of the table, the statement reads, “If an energy efficient system breaks down, it will cost more to fix than a standard efficiency system”; from the averages that appear across the line it is clear that, although utility program designers may view HVAC engineers and HVAC dealers as having similar barriers, this evaluation would contradict them. They do not see this fundamental concept in the same way: one group believes the equipment is harder to fix; the other doesn’t. The barrier, asymmetrical information, must be addressed, but can only be addressed when program evaluation indicates which opinion is closer to the norm. It is up to the program administrators to determine where their program is on the continuum of market transformation. From this information they can determine which barrier they are facing and which strategy or strategies they should use to address it.

Another example of the diverse nature of barrier interpretation can be seen in the second cell in Line 7 in the table, “Energy efficient equipment is much harder to find than standard efficiency equipment.”; the HVAC contractors, those who install it, and the HVAC vendors who stock, or don’t stock it, think that it is hard to find; and the HVAC engineers, whose job it is to specify the equipment, think it is easy to find. Can one approach influence all three of these actors? No, the answer is, they need to be considered individually.

Table 4. Different Barriers for Different Actors: Results of a C&I Market Barrier Analysis

	Market Barriers	Architects (29)*	HVAC Engineers (10)	Lighting Designers (5)	Developers (10)	HVAC Contractors (45)	HVAC Dealers (15)	Lighting Contractors (35)	Lighting Dealers (30)	Motor Dealers (15)	Occupants (5)
1	It is too time consuming to collect information about energy efficiency options.	2.69	2.67	3.14	2.30	2.00	N/A	2.40	N/A	N/A	2.24
2	Building occupants are not very aware of energy efficiency options.	3.81	3.61	4.59	3.79	N/A	2.73	N/A	3.50	2.14	N/A
3	It is difficult to evaluate savings benefits for energy efficient equipment.	2.38	3.59	4.28	3.91	4.24	4.14	4.09	4.13	3.93	4.20
4	The organization responsible for selecting equipment is often not the same organization that is responsible for operating the equipment.	3.84	3.35	4.19	2.23	2.31	N/A	2.83	N/A	N/A	2.76
5	If an energy efficient system breaks down, it will cost more to fix than a standard efficiency system.	1.83	4.14	1.32	1.78	N/A	1.64	N/A	2.30	1.80	N/A
6	The construction budget cannot handle the additional cost of energy efficient equipment.	2.51	3.47	3.18	3.85	3.71	4.17	4.00	3.93	3.92	N/A
7	Energy efficient equipment is much harder to find than standard efficiency equipment.	2.31	2.09	3.93	4.07	3.49	3.78	3.31	3.57	2.00	2.88
8	Perspective building tenants do not consider long-term operating costs when selecting rental space.	2.93	2.74	2.80	4.09	2.36	2.45	1.91	N/A	1.27	2.00
9	Manufacturers charge too much of a premium for energy efficient equipment.	3.12	3.68	4.40	1.75	3.44	3.54	3.49	3.77	3.79	N/A
10	Prices of high efficiency equipment are artificially inflated.	2.24	N/A	4.47	1.55	3.36	2.61	3.09	3.03	2.80	3.16

*(n) = number of participants in survey. Participants ranked the statements from 1 to 5, 1 being strongly disagree with the statement and 5 being strongly agree. (i.e. barrier confirmed.) **Bold** numbers represent the barriers that the category agrees with the strongest. **Shading** identifies the cells discussed in the text.

What seemed like a simple set of barriers became geometrically larger as each market actor expressed its opinion. This is further complicated when multiple market actors are working together on one project; in those cases, multiple barriers require multiple strategies. The strategies involve market interventions – the deliberate effort to reduce market barriers and thereby change the level of investment in (or practice of) energy efficiency.

3. A Portfolio of Strategies

Where does this daunting matrix of barriers leave DSM administrators as they attempt to implement programs? How do they persuade the business and home owners, who exhibit a discount rate that can exceed 25%, to install energy efficient equipment; business owners who would rather pay a premium each month by wasting energy than incur the upfront-costs or the performance risk, of the energy-saving replacement? Paying as you go requires no action. They persuade them to take action by attacking the barriers from all fronts.

Most often, the reaction by program administrators to evaluation results, like those in the table above, is to develop broad program initiatives thought to attack all barriers at once. Often, these are forged of information campaigns and financial incentives, powerful but blunt instruments if left to their own.

We raise the issue of market barriers because for Hydro-Québec's – or any organization's – energy efficiency programs to be successful, it must be rooted in a deep understanding of them. Merely throwing money or information at the market is often not enough (or can be *too much*). This leads to a "*jack of all trades, master of none*" outcome, where the program components are not designed to directly address a distinct market actor's barrier but rather enough of a variety of barriers to offer something to everyone. The result can be high freeridership rates, wasted financial resources and wasted time for program staff and customers. As a result, either the "close rate" is unnecessarily low, or else the ¢/kWh cost is unnecessarily high.⁵

Instead, programs need to adopt a portfolio of strategies, each one aimed at overcoming a specific barrier as it applies to a specific market actor. Of course, not every barrier needs to be addressed with the same effort, as Table 4 illustrates. But program design does need to be sophisticated in identifying and addressing market barriers – and in setting evaluation and metrics to measure progress – if it is to succeed. While this adds to complexity, it is the only way to obtain maximum savings in the most cost-efficient manner possible.

We have reviewed Hydro-Québec's proposed programs and program changes in light of the market barriers they – and their customers, and other market actors – face. We

⁵ Close rate refers to the ratio of finished projects to applications.

have done so based on best practices in North American energy efficiency programs. Hydro-Québec's strategies have improved and, over time, are moving closer to addressing market barriers, but are still lacking in many respects. For example, in some instances Hydro-Québec explicitly addresses market barriers within its testimony. In others, it either ignores them or seems to view them simplistically.⁶

Our review pinpoints a number of ways in which Hydro-Québec could significantly improve its strategic approach by targeting their effort toward overcoming market barriers. Ultimately, Hydro-Québec should focus on improving its understanding and consideration of market barriers in order to ensure future programs are designed to maximum effect.

Recommendation: Undertake a comprehensive review of market barriers in order to inform future program design and ensure maximum effectiveness.

⁶ See HQD-1, doc. 1, pages 54-55 for a good discussion of market barriers and ways in which program design addresses them. Conversely, see HQD-5, doc. 7, pages 3-4 for evidence of the need for greater understanding of market barriers.

| d | Program Review -- Residential

1. Automated Diagnostic Tool

i. Introduction

One of the key barriers to energy efficiency faced by residential customers is lack of information. Customers typically lack knowledge of the full breadth of efficient technologies and practices available to them. More importantly, they do not possess the knowledge and/or tools required to assess the value of a given measure. This includes knowledge of a measure's performance as compared to baseline energy consumption, as well as economic analysis of its net benefits, given measure costs and avoided electricity rates. Often, the transaction costs associated with obtaining and analyzing all of the required information outweighs the measure's perceived benefit for individual consumers. Uncertainty regarding a given measure's performance may further undermine the customer's perception of measure value.

Energy audits are a key tool in the portfolio of options for addressing these information-related barriers. Residential energy audits can be conducted during home visits, through mail-in questionnaires or, thanks to recent improvements in computing power, using dynamic web-based tools. Programs throughout North America use one or a combination of these audit tools.

ii. Hydro-Québec's previous version

Hydro-Québec's previous PGEÉ included a web-based residential diagnostic tool. The tool is comprised of a detailed questionnaire on a home's building envelope, energy consuming equipment and occupant behaviour. The tool simulates a home's energy use and costs disaggregated by major end use, and provides customized suggestions from a database of behavioural, equipment and renovation measures.

An advertising campaign was developed to encourage participation in the program. No incentives were offered for completing the questionnaire, and no direct marketing was planned. The only medium for completing the questionnaire was online.

Hydro-Québec forecast receiving 250,000 completed questionnaires per year starting in 2004. Forecast savings were 173 kWh/year per participant. By the end of the third

quarter of 2004, less than 57,000 questionnaires – 23% of forecast participation – had been completed.

iii. Hydro-Québec's current proposal

Hydro-Québec has brought two primary changes to its original program:

- ✓ It has added an incentive component, in the form of a two-CFL giveaway, for questionnaire completions; and
- ✓ It has added a direct mailing component (1 million mailings have been completed to date) in order to proactively reach its customer base.

In addition, it has increased its marketing efforts for this program and examined approaches at reaching specific segments, in particular hard-to-reach customers.

The combination of these changes has led to a surge in respondents, allowing Hydro-Québec to maintain its original forecast participation for 2004 and thereafter.

Simultaneously, Hydro-Québec has launched a pilot project with Negawatts Inc. in order to assess the relative benefits of a community-based, on-site audit approach. Results are expected in 2005.

iv. Discussion

Overall

There are a number of issues inherent in designing an audit program. These include:

- ✓ Type of audit (on-site home visits, mail-in, online)
- ✓ Tools to maximize participation
- ✓ Report content (techniques to maximize follow-up)
- ✓ Approaches to hard-to-reach (HTR) customers
- ✓ Data updates and evaluations

Below we address each of these points.

Type of Audit

Audit programs have a long history in North America. While some utilities have favoured on-site home visit audits, others have favoured mail-in or online pre-programmed audits.

Experience has shown that on-site home visits generate greater per-customer energy savings than questionnaire-based audits. On the other hand, these savings tend to come at a greater per-kWh cost, and are incapable of reaching as many customers as quickly as on-line and mail-in tools.⁷

Given the ongoing evaluation of the on-site, community-based home visits approach, it is too early to judge the relative merits of the two approaches. We do suggest, however, that depending on evaluation results, Hydro-Québec may consider using the community-based approach to complement its current mail-in/online strategy by targeting specific market segments.⁸

In particular, we believe this approach could be used to target the large residential customer segment. While not the original philosophy behind the Negawatt community-based approach, we believe the two can be combined – using billing data to identify geographic regions or “pockets” with relatively high consumption, and deploying the community-based approach to those areas in particular. Such areas could, given the higher efficiency potential, justify the presumably higher costs of the home visits approach.

Recommendation: Approve Hydro-Québec’s current automated on-line/mail-in diagnostic program approach.

Recommendation: If results of the ongoing evaluation of the *Negawatts* pilot project are positive, consider supplementing the current automated diagnostic approach with targeted on-site home visits. Specifically, consider using the on-site visits to target communities with above-average residential consumption.

⁷ For example, assuming Hydro-Québec’s 250,000 questionnaire target is reached, we estimate that achieving the same level of participation through home visits would require roughly 1,000 full-time-equivalent dedicated staff.

⁸ This supplemental targeting approach was recently recommended in a review of DSM audit best practices. See Quantum Consulting, *National Energy Efficiency Best Practices Study: Volume R7 – Residential Audit Programs Best Practice Report*, December 2004, p. R7-23.

Tools to maximize participation

In addition to common marketing efforts and special approaches for hard-to-reach market segments (see below), participation rates in on-line/mail-in rebate programs can be positively affected by three factors:

- ✓ Incentives;
- ✓ Web-based link placement; and
- ✓ Unplanned external events.

Hydro-Québec's initial forecasts of participation rates in the on-line audit program exceeded rates seen in similar programs elsewhere. However, the utility's decision to launch a CFL giveaway should be applauded: not only has the giveaway increased participation significantly, it has done so using a very low-cost measure that is in and of itself cost-effective. We urge the Régie to support this approach, while allowing Hydro-Québec the flexibility to modify the offering in the future.

Experience shows that web-based uptake is positively affected by placement of the audit link on the utility's home page. Currently, Hydro-Québec's audit program link is hidden several layers below the home page. This link placement will stifle participation once the effect of the CFL giveaway wears off. We urge that Hydro-Québec add a direct and well-promoted audit link to its home page.

Finally, external events, such as news coverage of energy or environmental concerns, can have a positive impact on program participation. Hydro-Québec can capitalize on such events by intensifying its marketing efforts during such periods. We urge Hydro-Québec to retain significant enough operational flexibility to take advantage of externally-induced periods of peak interest in energy/environmental matters.

Recommendation: Approve the CFL giveaway approach.

Recommendation: Relocate the audit program link to a prominent place on Hydro-Québec' web home page.

Recommendation: Encourage Hydro-Québec to integrate the operational flexibility required to leverage unanticipated, externally-generated opportunities by intensifying marketing efforts during periods of peak interest in energy / environmental issues.

Report content and follow-up

Automated audits have been applied by utilities throughout North America for a quarter of a century. In that time, significant improvements have been made to encourage customer follow-up and measure uptake.

In its current form, Hydro-Québec's audit program most closely resembles the *California Statewide Home Energy Efficiency Survey* ("SW HEES") audit program. Mandated by the California Public Utilities Commission and launched in 2002 by the State's major investor-owned utilities, the program included direct mailings of audit questionnaires to some regular and all hard-to-reach customers, as well as promotion of an on-line audit. SW HEES is recognized as among the best practices in residential audit-type programs.⁹

We reviewed the full list and sequence of measures proposed in Hydro-Québec's audit reports, and further ran a number of simulations on its and other audit programs, including the HEES audit. We believe that Hydro-Québec's own report template should undergo several improvements, some of which are inspired by aspects of HEES. Specifically:

- ✓ **Categorize measures.** The report should divide measures into four categories: "tips", "no-cost/low-cost measures", "cost-effective investments" and "others". This facilitates the customer's understanding of available options. Furthermore, it more closely fits typical real-world decision-making processes and, as such, will have a greater chance of success at encouraging follow-up.
- ✓ **Link to programs.** The customized report is a unique opportunity not only to educate customers on energy saving technologies, but to guide them toward available incentives. While the audit may in and of itself lead to certain savings, there are far more interesting savings opportunities to be captured through active participation in Hydro-Québec's other, incentivized programs. Encouraging and indeed ensuring this follow-through should be viewed as an essential component of the audit's mission.

Unfortunately, Hydro-Québec's audit template either neglects or seriously underpromotes available programs. For example, Hydro-Québec's own thermostat rebate program is not noted under the recommendation to purchase electronic thermostats.¹⁰ While some weatherization recommendations refer to EnerGuide, there is neither a link to the program's own web page (or to any additional information whatsoever), nor even a phone number for obtaining more information. This effectively hinders participants from following up to learn more about available opportunities.

The audit report template needs to provide seamless linkages to Hydro-Québec's (and others') programs. At a first level, audit recommendations that could involve a Hydro-Québec program area should provide a single-page fact sheet describing the program, its benefits, relevant examples and indications as to how to participate. This page should be hyperlinked on the web version, and included in paper version in the mail-in reports. At a second level, more

⁹ Quantum Consulting, *National Energy Efficiency Best Practices Study: Volume R7 – Residential Audit Programs Best Practice Report*, December 2004, p. R7-38.

¹⁰ See HQD-5, doc. 8.3, annexe 2 – en liasse.

detailed information, including how-to guides or promotional materials, can be offered on the web version and listed on the paper versions for free telephone orders.

- ✓ **Link to further information.** Where no such programs exist, recommended measures should be supplemented, for the web-based versions, with links for further information such as lists of relevant retailers or contractors, or alternatively, to on-line calculators or other tools. All measures should be accompanied by a 1-800 number for more information.
- ✓ **Non-energy benefits.** There is a growing body of evidence that customer decisions to invest in energy efficiency measures are strongly influenced by non-energy benefits such as improved comfort, productivity or environmental “good”. In fact, for many residential efficiency purchases and decisions, non-energy benefits can be nearly or just as important drivers to action as direct energy bill savings.¹¹

Understanding the customer value of non-energy benefits related to efficiency measures is essential to influencing customer decisions. Given this, Hydro-Québec should integrate discussion of non-energy benefits wherever possible in its measure descriptions.

- ✓ **Explain technical terms.** Many customers do not understand the precise meaning of valuable technical or economic terms. For example, participants may not be able to interpret “*Période de récupération de l’investissement*”. Short descriptions of this and similar technical terms should be offered to facilitate participant understanding.

Recommendation: Modify the audit template in order to provide seamless linkages to promotional and incentive programs. Also categorize recommended measures, offer links, promote non-energy measure benefits and explain technical terms, as explained in the text above.

¹¹ Recent work by the utility NStar (in Massachusetts) and NYSERDA (in New York State) have illustrated this point clearly. Evaluations for the latter suggest that non-energy benefit values range from anywhere between 30-90% of actual bill reduction benefits for appliances, and 100-110% for building envelopes. Leah Fuchs, L. A Skumatz and Jennifer Ellefsen, “Non-Energy Benefits (NEBs) from Energy Star : Comprehensive Analysis of Appliance, Outreach, and Homes Programs”, *American Council for an Energy Efficient Economy 2004 Summer Study*, August 2004, 2.79-2.89. See also Rudolf Boentgen and S. Bonanno, “Statewide Non-Electric Benefits Development in Massachusetts”, *ACEEE 2004 Summer Study*, August 2004, 2.26-2.33. In Québec, a recent survey of EnerGuide for Homes participants indicates that, among factors leading them to request an EnerGuide evaluation, increased comfort was nearly at par with energy savings among Québec participants (39% named “making house more comfortable” as their primary reason and 30% as their secondary reason, compared with 43% and 39% for “keeping energy costs down”). See Victor Tremblay, *EnerGuide for Houses Statplus Report April 1 2003 to March 31 2004 – Analytical Report*. Statplus, November 2004, p. 33.

Hard-to-reach (HTR) customers

Many, though not all, audit programs today make specific attempts at targeting “hard-to-reach (HTR)” customers. These customers typically include the poor, the elderly and linguistic minorities. A number of methods have been adopted in various regions to target HTR customers, including use of direct mailings, minority-language questionnaires and non-profit community-based organizations.

We reviewed the report of Hydro-Québec's *Comité de travail sur les approches de déploiement du Diagnostic énergétique résidentiel*.¹² We also reviewed Hydro-Québec's response to this committee's recommendations.¹³ Broadly speaking, we are impressed with the breadth of measures contemplated for addressing the HTR market, and generally support the activities undertaken and planned as laid out in the evidence.

Our only concern regards the proposed approach for reaching linguistic minorities. Hydro-Québec proposes to reach these customers through “evening meetings with members of Italian, Lebanese, Chinese, Jewish and Spanish-speaking community associations” [our translation].¹⁴

The barrier to participation being linguistic in nature, we are surprised not to see the option of direct mailing of diagnostic forms translated into minority languages. This approach is common elsewhere. In California's HEES program, for example, all four investor-owned utilities mail forms in Spanish (to Spanish-speaking residents), while three of four offer them in Chinese and one offers them in Vietnamese.¹⁵

Any translation effort in Québec would need to target communities with sufficient populations of non-French or English-speaking members. According to Canadian census data, Italian, Arabic and Spanish are the most commonly-spoken non-F/E languages at home (each comprises over 1% of the Québec population, while together they comprise 280,000 people).¹⁶ We believe these – and possibly Chinese – would be natural targets for such an operation, though an assessment of the total costs is required prior to recommending it.

¹² See HQD-3, doc. 2 – en liasse, November 12, 2004. Note that the report itself is dated May, 2004.

¹³ See HQD-3, doc. 1, p. 24-26.

¹⁴ HQD-3, doc. 1, p. 25.

¹⁵ Quantum Consulting, *National Energy Efficiency Best Practices Study: Volume R7 – Residential Audit Programs Best Practice Report*, December 2004, p. R7-38.

¹⁶ BC Stats, *2001 Census Profile – Québec*, revised Jan. 27, 2004.

Finally, we cannot help but note that the “Jewish” community is comprised primarily of English- and French-speaking members, and for the most part does not constitute a linguistic minority.

Recommendation: Review the approach to linguistic minorities and examine the option of providing direct-mail minority-language questionnaires.

Data updates and evaluations

Audit programs provide a breadth and depth of information, from measure lifetimes to costs and net savings data. These data can change quickly. A 2002 study, for example, found that audit software over- or under-estimated measure impacts by up to 50%.¹⁷ Furthermore, costs of new technologies can evolve significantly in short periods of time. If such changes are not accounted for in the audit template, they can lead to lost credibility and ultimately, reduced participation and savings. In fact, frequent updating of programmed information is a key component to successful audit programs.

Hydro-Québec has not specified how and to what extent it plans on ensuring regular updates. However, a review of its current audit template reveals the types of problems that can arise in the absence of frequent and vigilant reviews.

One such example is the measure recommending installation of compact fluorescent lighting. As of the time of writing this report, Hydro-Québec’s recommendation for interior lighting reads:

“À l’intérieur, privilégiez les fluorescents compacts – dont le coût unitaire est d’environ 12 \$ taxes comprises) [sic] –, car ils sont moins énergivores que les ampoules à incandescence...”¹⁸

Of course, CFLs today cost far less than \$12. Hydro-Québec itself is paying retailers \$4/bulb, including processing costs, for its own CFL giveaway.¹⁹ More significantly, participants to the audit have the option of receiving coupons wherein CFLs are being

¹⁷ As noted in Quantum Consulting (2004), p. R7-10.

¹⁸ HQD-5, doc. 8.3, Annexe 2 – en liasse. Further verified online on February 1, 2005.

¹⁹ HQD-5, doc. 2, p. 17.

sold for between ~\$2-4/bulb.²⁰ This error creates two potential problems for participants.²¹

- > Participants who don't proceed to review the coupons may significantly overestimate the costs of this measure, and are thus more likely to not follow through with purchase decisions.
- > Participants who do proceed to review the coupons and who take note of the discrepancy will become distrustful of the accuracy of the audit's other recommendations, and will be less likely to follow through with them as well. Word of mouth can further undermine the audit's credibility.

Given the above, we urge Hydro-Québec not only to correct this particular error but, more importantly, to institute a continuous verification/update process. This process should focus on measures known to have rapidly evolving costs and/or energy savings, and should pay particular attention to ensuring consistency between audit recommendations and information contained in other program promotions.

Recommendation: Install a continuous data verification/update process for revamping key information inputs to template recommendations and ensuring consistency with both market conditions and Hydro-Québec's own promotions. Ensure that the process targets new technology measures subject to rapid improvements/changes.

v. Conclusions and Recommendations

Broadly speaking, we believe the residential diagnostic program is a valuable "backbone" program, and further support the current CFL giveaway. We also believe that to the extent a home visit approach is adopted, that it should complement, not substitute, the automated off-site diagnostic tool, and that it should notably be considered for targeting specific customer segments with high savings potential.

We do, however, believe that a number of changes should be brought to improve the existing program. While the full suite of proposed changes are listed above, we would like to highlight the most important ones. Specifically, we believe the program needs to be understood as a backbone program to promote Hydro-Québec's other promotions and, as such, needs to be revamped to lead participants more seamlessly

²⁰ The February, 2005 promotions, for example, include 2-packs of CFLs for 7,99 \$ (*Coop*) and 8,98 \$ (*Home Depot*); a 4-pack for 12,49 \$ (at *Matériaux à bas prix*) and a 6-pack for 15,98 \$ (at *RénoDépôt*). Most of these – and some others at lower cost – were also available in the January promotion. It is unclear whether and to what extent Hydro-Québec incentives may have influenced these prices.

²¹ We note that 90% of reports generated include a recommendation to purchase CFLs. These problems thus apply, in this case at least, to the *near-totality* of participants. (See HQD-5, doc. 7, p. 17.)

to promotional materials or contacts. Furthermore, report recommendations should be categorized according to broad cost/hassle factors, so as to mimic more closely consumers' own decision-making processes. Finally, an updating mechanism must be put into place to ensure that report information is consistent with both market realities and Hydro-Québec's own promotions, and to avoid future credibility problems.

Finally, the program should undergo other minor modifications as noted above, in order to improve performance and maximize results.

2. Novoclimat

i. Introduction

When building a new home, higher levels of energy efficiency, including and beyond the current Novoclimat prescriptions, make economic sense in that their discounted lifetime savings exceed incremental costs. However, a number of market barriers hinder adoption of these cost-effective levels of efficiency.

Barriers to efficient new home construction include lack of knowledge and/or tools required to assess the value of efficiency improvements. This barrier is similar to the one discussed in the introduction to our review of the Residential Diagnostics program. Furthermore, in some cases, the incremental capital investment required may not be available, despite the fact that lower energy bills should, in theory, allow financial institutions to increase mortgage limits. The new home construction market is also an example of split incentives, wherein the builder making the design and construction decisions is different from the owner who will be paying the higher or lower energy bills. Other barriers including measure performance uncertainty, restrained reasoning, product or service unavailability and incorrect price signals all join in to hinder cost-effective consumer decisions.

Best practice new construction efficiency programs are rooted in an understanding of these market barriers as well as of the breadth of market actors involved. They typically adopt a systematic approach to overcoming each one as it applies to each individual market player.

ii. Hydro-Québec's previous version

The Novoclimat program is run by the *Agence de l'efficacité énergétique*. It promotes new homes that meet efficiency requirements located part-way between current practices and R-2000. To do so, training (and technical support) is offered to designers, builders and inspectors, an inspection protocol is used to ensure conformity with program requirements, and the Agency markets the Novoclimat brand.

Hydro-Québec's role was previously limited to paying a share of the inspection costs as well as a share of the *Agence's* fixed program-related costs. In 2003, Hydro-Québec increased its contribution in order to cover a share of the incremental costs associated with applying Novoclimat to social housing units, a new program element.

iii. Hydro-Québec's current proposal

Hydro-Québec is proposing to increase its investment in the Novoclimat program. Specifically:

- > **Mass market:** Hydro-Québec is proposing to introduce two financial incentives: the first, covering roughly 50% of incremental costs, would be offered to purchasers while the second, representing an additional 14% of incremental costs, would be paid to builders.
- > **Social housing segment:** Hydro-Québec is proposing to increase its fixed-fee payment to the *Agence* in order to account for the increased costs associated with the new social housing element. Hydro-Québec is also proposing to increase the incentive offered to builders to cover roughly 75% of the incremental building costs for this segment.

These come in addition to its current fixed fee payments to the Agency, as well as to the variable fees paid to cover its share of inspection costs.²²

iv. Discussion – Mass market

Over the years, the Novoclimat program (and its previous versions) has systematically failed to achieve expectations. In fact, compared with leading new construction programs elsewhere, both past and forecast market penetration are abysmal. We suspect that this is at least partly due to a lack of measures aimed at addressing the full breadth of market barriers and players in the new construction market, as discussed below. We further believe that a suite of strategies can be used to target each barrier as well as each market player.

Understanding and addressing barriers

As noted earlier, best practice programs are designed to address and overcome the market barriers that hinder acceptance of cost-effective energy efficiency measures. In the case of residential new construction markets, six barriers must be addressed:

- > Buyer's barrier: higher first cost
- > Buyer's barrier: access to capital
- > Buyer's barrier: performance uncertainty
- > Builder's barrier: reluctance to adopt new practices
- > Builder's barrier: lack of knowledge of efficiency practices
- > Builder's barrier: incremental cost for efficiency inspections

²² See HQD-1, doc. 1, p. 33.

The new homes construction market is also an example of split decision-making, in which multiple actors all play key roles in the decision-making process. A successful program will address not only each barrier individually, but each market player as well. These include buyers, builders, lenders and real estate agents.

In the past few years, North America has been home to a resurgence of interest in energy efficiency. One result of this resurgence has been a wealth of new experience with residential new construction programs. A number of programs run in the past few years provide not only a commonality of practices, but remarkably positive results to substantiate the value of their approaches.

We reviewed program characteristics from five U.S. states – New Jersey, Texas, Wisconsin, California and Vermont – recognized as industry leaders in residential new construction energy efficiency market transformation. We then reviewed Hydro-Québec/AEE's Novoclimat approach in light of these recognized best practices.

Below we provide our analysis and recommendations regarding the Novoclimat program. We first address the mass market for new homes, which we examine through the lens of the six barriers indicated above, and for which we provide recommendations for improvement in light of North American best practices. We then add a supplemental discussion of the program's approach to social housing units. Finally, we address some issues regarding manufactured homes, as well as concerns regarding savings and participation assumptions.

*Buyer's barrier: first-cost*²³

The first barrier to adoption of efficient new homes is the incremental capital cost. The market for new homes is highly first-cost – or price – competitive. While other factors such as comfort and style also play an important role, energy efficiency ranks very low among them.

There are several complementary strategies for addressing the first-cost problem:

- > **Incentives (to reduce first cost).** Incentives provided to either home buyers or builders are the most direct response to this barrier and the simplest way to eliminate it altogether.

Some efficiency programs focus almost entirely on the incentive strategy. For example, the *New Jersey Energy Star for Homes* program provides incentives

²³ The “first-cost” barrier discussed below is actually the result of a wide array of barriers presented in Table 3.

covering 100% of incremental construction costs.²⁴ Combined with measures aimed at other barriers, the New Jersey incentive approach has been very successful, moving the State from a 4% market share to a 35% market share in only three years. Most other successful programs, however, have placed far greater emphasis on the supply side (builders), offering higher incentives and adopting a broader suite of measures to address other barriers. For example, in Texas and Vermont, incentives are focused almost exclusively at builders, with tremendous results (nearly 50% market share in Texas in 2004).

An additional strategy adopted by an increasing number of leading energy efficiency program administrators involves capitalizing on the offer of financial incentives to encourage adoption of additional measures. For example, Efficiency Vermont links eligibility for incentives to installation of at least four compact fluorescent light fixtures in high use areas, and provides supplemental incentives for installation of more. Today, new ES homes in Vermont achieve an average of 11-12 CFLs.

- > **Buyer education (aid in understanding net benefit).** The incremental costs associated with the Novoclimat home generate bill savings that should be superior to incremental mortgage payments and, as such, are cost-effective from the buyer's standpoint. However, most buyers fail to appreciate the scale of bill savings. Another way of addressing the first-cost barrier is to convince potential buyers of the net economic savings of a Novoclimat home.

Marketing campaigns aimed at explaining net bill savings to potential customers are standard fare in nearly all residential new construction programs. However, the extent of marketing efforts can differ significantly. The best programs enlist the active participation of the new homes industry in "co-marketing" or cooperative marketing efforts. For example, in Texas, arguably the continent's most successful efficient homes construction program, builders who take part in *TXU Energy Delivery's* program must participate in cooperative marketing, wherein the industry as a whole promotes greater understanding of the benefits, including bill savings, of owning *Energy Star* homes (and simultaneously self-promotes participating builders). TXU's new homes market moved from a market share of 1% to more than 46% in the past three years.²⁵ Cooperative or joint marketing approaches have proven to be particularly successful, and are key elements of the vast majority of the continent's most successful new homes programs.

²⁴ American Council for an Energy Efficient Economy, *Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs*. M. Kushler, D. York, P. Witte. December 2003. See also Hoffman et al., "Welcome to Regional Roundup 2004", presentation to the ACEEE's National Symposium on Market Transformation, March 2004.

²⁵ Information obtained from a number of sources including Oncor Electric (2003 and 2004 reports), the Public Utilities Commission of Texas, TXU Electric Delivery Co., the Electric Utility Marketing Managers of Texas Organization and discussions with the program manager.

A complementary approach consists of providing education on energy savings benefits to real estate agents. Real estate agents often act as the buyer's technical advisor, and are therefore key – though oft-neglected – actors in buyers' decision-making processes. Bringing the real estate industry on-side is another component of the very successful Texan program, where the *Energy Star for Homes* concept has now been integrated into the formal curriculum for realtors-in-training.

- > **Brand marketing (increase resale value).** Another strategy to address the first-cost barrier is to develop and market the *Novoclimat* brand as a value-added component of the new homes market. This can be done through the existing certification process and the same co-marketing or cooperative marketing approaches described previously, although branding can also be quite costly. The goal is to add value to the market's perception of energy efficient homes, thereby implicitly offering a higher resale value to home buyers. The new CMHC insurance premium incentive (see discussion in next subsection) can add considerably to bringing resale value benefits to the forefront.

The initial absence of any incentives in the Novoclimat program was a clear obstacle to success, as it left a critical barrier unaddressed. Hydro-Québec's decision with the AEE to support 50% of the incremental cost is obviously a good faith effort at improving program participation. However, best practice suggests that incentives can be used more effectively when aimed primarily at the builder community, and when *supplemented by the full suite of strategies required to address the other barriers and players* (see below).

Given this experience, we urge Hydro-Québec's to consider shifting more of its incentive dollars away from the buyer and more upstream toward the builder community.²⁶

While shifting more incentive dollars upstream, the Novoclimat program should also undergo several additional improvements in order to maximize its effectiveness. These improvements should be rooted in the best practices noted above. It should be noted that the latter two strategies lend themselves well to the likelihood of changes to the regulatory baseline occurring in the coming years.²⁷

²⁶ We should note that we also disagree with one of the premises of Hydro-Québec's justification for its focus on residential clients. Specifically, Hydro-Québec has stated that homeowners require a payback period of no more than 5 years because the average homeowner only remains in their home for 7 years (HQD-5, doc. 7, p. 22). Firstly, to the extent average rollover is 7 years, a five year payback is likely to be rationally insufficient for a considerable share of homeowners, assuming a normal distribution. However, new construction home owners (as opposed to purchase of existing homes) are likely to remain in their home for longer than 7 years on average. In any case, we do not believe that the payback period is the primary decision-making driver for new construction energy efficiency.

²⁷ HQD-1, doc. 1, p. 33.

Recommendation: Shift a share of the proposed customer incentive upstream to builders, subject to adoption of the full suite of complementary strategies discussed below.

Recommendation: Link a part of the customer incentives to installation of additional efficient lighting or appliance measures.

Recommendation: Supplement the (reduced) incentives with an aggressive co-marketing effort in conjunction with participating builders.

Recommendation: Engage the real estate industry in discussions aimed at providing education to realtors regarding energy efficiency benefits, in particular through curriculum development.

Buyer's barrier: access to capital

A related though distinct barrier is homebuyers' access to capital. Indeed, even if the measures presented previously allow buyers to overcome their concerns regarding higher first costs, they may not have access to the additional capital required. This barrier applies to relatively few home buyers, especially in the current low-interest rate environment. However, the measure described below addresses *both* access to capital and other barriers, and as such could play a useful role in enabling greater participation.

This barrier is directly related to another party, the mortgage lender. Assuming that energy bill savings compensate the higher capital cost of the Novoclimat concept, mortgage lenders should logically raise the borrowing limit accordingly. Unfortunately, many lending institutions fail to account for reduced operating expenditures (bill payments) in calculating their lending limits.

In the United States, financial institutions have for many years offered and promoted (to various degrees) an *Energy Efficient Mortgage*.²⁸ In Canada, at the federal level, the Canadian Mortgage and Housing Corporation (CMHC, or SCHL in French) accounts for energy savings in its calculation of mortgage limits. Furthermore, the CMHC recently launched a new program under which energy efficient new homes (or home renovations) are eligible for a 10% reduction in the agency's loan insurance premium, or an extension of the mortgage period to up to 35 years.²⁹

²⁸ In the U.S., mortgages run through the federal relender *Fannie Mae*. Fannie Mae has offered energy-efficient mortgages (EEMs) to its client institutions for over 20 years. EEMs increase the borrowing limit in accordance with reduced energy consumption, accounting for the home owner's increased ability to pay.

²⁹ Canadian Mortgage and Housing Corporation, "Press Release – Save on Home Energy Costs Thanks to New CMHC Initiatives", November 18, 2004.

The new CMHC product should be integrated into the Novoclimat marketing procedures. Not only does the incentive make efficient new homes more affordable, they also increase the homes' resale value by offering prospective buyers reduce financing costs. This dual advantage needs to be clearly and compellingly marketed.

Perhaps more importantly still, this incentive can be used as a catalyst for Hydro-Québec and the AÉÉ to renew efforts at developing energy efficient mortgage products with Québec's main financial institutions. Such products not only make economic sense for the institutions, but help to break down a key barrier to customer adoption of higher first-cost homes.

Recommendation: Integrate the new CMHC (SCHL) incentive into the Novoclimat marketing effort with a focus on its dual cost and resale value benefits.

Recommendation: Renew efforts aimed at having financial institutions offer energy efficient mortgages, wherein mortgage limits are raised in accordance with lower operating costs of efficient homes.

Buyer's barrier: performance uncertainty

The third barrier on the demand side of the new homes equation is the buyer's uncertainty regarding future energy and bill savings. This is related to *engineering* estimates, and is distinct from the buyer's inability to calculate the long-run *economic* value of savings.

The simplest and most common way of addressing this barrier is through a combination of a formal inspection/certification process, and simplified performance ratings.

Regarding the former, we note that the Novoclimat program already incorporates an inspection/certification process. Regarding the latter, however, the program is limited to a pass/fail; no variable performance scores allow buyers to comparison shop.

In the United States, the Home Energy Rating System (HERS) provides a 0-100 rating system through which consumers can compare home performance. In Canada, EnerGuide for Houses will soon provide a similar rating system for new home construction, therefore offering a low-cost piggybacking opportunity for Novoclimat. For that reason, we urge the Novoclimat program to incorporate the EnerGuide rating system into its own program design. Doing so will offer customers a stronger metric with which to understand performance. Perhaps more importantly, it will provide a strong impetus to the builder industry to constantly seek performance improvements.

Combining inspection/certification with the EnerGuide rating will allow Novoclimat to simultaneously address quality control *and* performance.

A supplemental approach – guaranteed savings – is currently being applied in Arizona, where *Tucson Electric Power* had already achieved a 32% market share for Energy Star homes by 2002.³⁰ TEP offers Energy Star home buyers a guarantee that their aggregate annual electrical bills for heating and cooling will not exceed the home's rated consumption for five years. While this approach could be useful in an eventual enhanced program, and especially in a natural gas utility program, we do not believe it would be appropriate for Hydro-Québec at this time, especially considering the number of other, simpler improvements that can be immediately brought to Novoclimat.

A related barrier to energy savings uncertainty is lack of information about other, non-energy benefits. As indicated in the previous section (Diagnostics program), non-energy benefits, such as reduced mold and mildew from proper HVAC sizing and installation, can be just as valued by customers as energy savings themselves. Yet the quality control benefits of Novoclimat certified homes are not well known. Again, Hydro-Québec and the Agence de l'efficacité énergétique seem to understand this and address it in their own marketing efforts.

Recommendation: Incorporate new EnerGuide for New Homes rating in the Novoclimat program design.

Recommendation: Support the Novoclimat's marketing of non-energy benefits.

Builder's barrier: reluctance to adopt new practices

Builders respond to market demand, which places little emphasis on energy savings attributes. As such, builders have little interest in spending the time, effort and money required to revisit legal and accepted building practices.

Best practices pull together four strategies for overcoming this first builder-related market barrier:

- > **Financial incentives (to compensate first cost).** Financial incentives in this case are used as carrots to convince builders to spend the additional time and effort at developing new practices. Without financial incentives, and assuming little if any independent demand, builders would have little reason to revisit accepted practice.
- > **Recruitment.** Best practice energy efficiency programs focus on ongoing recruitment as well as building and maintaining solid relationships with the

³⁰ See Quantum Consulting, *National Energy Efficiency Best Practices Study: Volume R8 – Residential New Construction Best Practice Report*, December 2004, p. R8-17.

builder community. Full-time staff are required merely to interface with builders and sell the program to prospective partners.

- > **Marketing.** Many of the best practice utilities we examined used co-marketing as a tool to entice builder participation. Co-marketing can be done in a variety of ways but essentially offers builders marginally-free or low-cost advertizing, offering them a competitive advantage. When done jointly with the building industry, co-marketing acts as an incentive to builders – allowing them to distinguish themselves in the marketplace – while simultaneously integrating marketing efforts seamlessly within the industry's own channels.
- > **Sales training.** Another key tool used by utilities and other energy efficiency promoters is offering free training to sales staff on the advantages of energy efficient homes.

Hydro-Québec has proposed to add an incentive to builders equal to approximately 14% of incremental costs. Experience shows that a larger share of Hydro-Québec's contribution to this program should be aimed at the builder community. Higher incentives combined with more resources for recruitment, marketing and sales training are required to maximize the program's chance at success.

We also note that Hydro-Québec believes a significant part of Novoclimat's failure in 2003 relates to the lack of marketing efforts on the part of builders.³¹ We believe the Novoclimat program would benefit from adopting an *aggressive* co-marketing approach to increase consumer demand *and* integrate energy efficiency into builder marketing efforts. This is key to transforming the market for new homes, as opposed to merely generating temporary change.

Recommendation: Increase the builder's incentive, and focus additional resources to ongoing recruitment, marketing and sales training.

Recommendation: Develop an aggressive co-marketing effort with participating builders, along the lines of the TXU Electric Delivery's approach.

Builder's barrier: lack of knowledge of efficiency practices

A similar though distinct barrier to the reluctance to change practices, is the lack of knowledge of efficient building practices. There are two key remedies to this barrier: training and design assistance.

³¹ “Les entrepreneurs ont effectué peu de promotion pour ce programme [Novoclimat] en 2003 et par conséquent, celui-ci était peu connu des clients.” HQD-2, doc. 1, p. 7.

The Novoclimat program currently offers both training and design assistance to prospective builders. While many programs elsewhere in North America offer training for free, we note that Novoclimat charges for the service. Offering training for free has advantages and drawbacks. Unfortunately, we do not have sufficient information to judge the program's current success, but urge Hydro-Québec and the AEE to consider offering training free of charge should participation problems arise.

Recommendation: Offer Hydro-Québec the flexibility to finance builder training fees should participation prove insufficient.

Builder's barrier: incremental cost for efficiency inspections

Finally, builders are generally unwilling to foot the bill for third-party inspection costs. As such, financial incentives that cover 100% of the cost of *ex-post* efficiency inspections are a critical tool. Our understanding is that Hydro-Québec is proposing to cover the totality of inspection costs related to electrically-heated participating homes.³² This is essential to the program's success and should be maintained as is.

Recommendation: Approve Hydro-Québec's proposal to cover the full cost of efficiency inspections.

v. Discussion – Social housing market

Hydro-Québec has proposed to cover 75% of the incremental costs of Novoclimat efficiency standards for social housing units.

The social housing market presents a set of barriers that is entirely different from the mass market for new homes. Real estate agents play virtually no role, and the role of financial institutions is much smaller. In terms of barriers, first-cost and capital access barriers play a much greater role.

Because of the different nature of barriers to this market, it is entirely appropriate to adopt a different strategy, one rooted far more in direct financial incentives. That being said, we fail to understand why Hydro-Québec has chosen not to cover the totality of incremental costs.

Based on our calculations, the incremental costs of the Novoclimat concept in social housing units is approximately 4.1¢/kWh. This compares with avoided costs of just under 10¢/kWh for heating loads, the primary end-use affected by the program. As such, every kWh saved by this program represents an incentive TRC ratio, not

³² See HQD-5, doc. 4, p. 14.

including considerable non-energy benefits, of at least 2.5:1. Assuming Hydro-Québec pays the full incremental cost, its own benefit/cost ratio will mirror this.

In the mass market, reasonable arguments can be made both in favour of and against covering the full incremental costs. However, the social housing market represents a unique opportunity: there is a foreseeable, one-time surge in construction over the coming years; non-participants will likely be locked into unduly high energy consumption for decades to come (lost opportunity); and barriers are almost entirely related to first cost and access to capital.

In the long run, we urge Hydro-Québec to work with the *Société d'habitation du Québec* so that the SHQ incorporates energy savings into its own capital cost subsidy cap calculations. Doing so makes economic sense for the SHQ (if done correctly, the increased subsidy cap will be equal to the agency's reduced operating costs, discounted for time preferences). It will also go a long way to reducing the first-cost and capital access barriers, and will allow Hydro-Québec to significantly *reduce* its incentive.

In Massachusetts and New Jersey, the social housing agencies integrated energy efficiency criteria into its scoring system for attributing scarce funds. Today, nearly all proposals in those States meet *Energy Star for Homes* criteria; not doing so renders them non-competitive. The SHQ should adopt a similar approach.

In the short-run, however, we strongly urge Hydro-Québec to adopt a no regrets policy by covering the full incremental cost of Novoclimat for social housing. Doing so will capture more long-term energy savings with a very high benefit/cost ratio. It will also contribute further to the company's stated goal of transforming the market by 2008. Additionally, Hydro-Québec should investigate opportunities for bulk purchasing of efficient appliances to further maximize acquisition of cost-effective energy savings.

Recommendation: On an interim basis, increase the proposed incentive to the social housing segment in order to cover the full incremental costs.

Recommendation: Engage the SHQ toward integrating energy savings into subsidy cap calculations. Once achieved, reduce the direct incentive accordingly.

Recommendation: Investigate opportunities for bulk efficient appliance purchasing to acquire additional cost-effective savings.

vi. Discussion – Other aspects

A note on manufactured homes

We understand that Hydro-Québec is forecasting that nearly one third of its non-low-income Novoclimat participants are expected to be manufactured housing units.

Manufactured housing indeed offers a tremendous opportunity for energy efficiency gains. By establishing solid relationships working upstream with manufacturers and builders, Hydro-Québec can achieve higher market penetration more easily than with the regular, more disaggregated market.

That being said, the manufactured homes market calls for entirely different program strategies. Many programs fail to understand the precise nature of the relationships between manufacturers, builders and buyers. Furthermore, this market segment presents characteristics of split incentives, wherein the builders and manufacturers are both responsible for quality assurance and may both be liable for call-backs.

One of the key characteristics of the manufactured homes industry is the difficulty manufacturers and builders have in sharing responsibility for quality. Indeed, quality concerns can arise from poor manufacturing or poor installation. As such, customer callbacks can lead to acrimony between manufacturers and builders concerning liability issues.

A program focused on quality assurance at both ends of the production/assembly line is key to success. Indeed, experience with successful energy efficient manufactured homes initiatives shows that such programs, if structured correctly, can and should be sold on these and other non-energy benefits. For example, by providing in-factory quality assurance certification, the program can offer added value to builders. Similarly, by providing on-site inspections and certification, a good program offers added value to manufacturers. Offering a neutral evaluator in cases of liability disputes further adds to the value for both parties.

Additional value can be brought to manufacturers by selling their ability to access innovation, thus providing competitive advantage. This is borne out in Wisconsin, where participating manufacturers are now implementing efficiency recommendations even when not required for *Energy Star* certification.³³

It is not clear from Hydro-Québec's testimony whether and to what extent it is proposing to modify the Novoclimat concept to fit the special needs, barriers and values of the manufactured homes market. At this point, we can only urge that it does so.

³³ Dave Kinyon, M. Meunier, D. Ackerstein, K. Kuntz, "It's Not about the Savings: Achieving Energy Efficiency in Systems-Built Homes", ACEEE 2004 Summer Study, 2004, 2.203-2.212.

Recommendation: Develop a distinct program strategy for the manufactured homes segment, focused on non-energy quality assurance and innovation benefits.

A note on forecast participation rates

Hydro-Québec is forecasting a total of 25,573 participants to the Novoclimat program over the course of the PGEE's eight years. More than half of these are units, not buildings. Assuming that the number of housing starts in Québec *declines* by 8%/year over the coming six years (2004 saw yet another increase, this time of 16% over 2003), this equates to an average market penetration rate of only 8% over the current PGEE's lifetime, as indicated in Table 5.

Table 5. Novoclimat: Current Target Market Penetration									
	2003	2004	2005	2006	2007	2008	2009	2010	2003-10
Total Housing Starts (f'cast)	50,289	58,448	53,772	49,470	45,513	41,872	38,522	35,440	373,326
Electric Heat Share	82%	82%	82%	82%	82%	82%	82%	82%	82%
Electric Heat Market	41 237	47 927	44 093	40 566	37 320	34 335	31 588	29 061	306 128
HQ Forecast Participants									25 573
HQ Forecast Participation Rate									8%
Notes: Housing starts data for 2003 and 2004 from Statistics Canada. Data for 2005 onward assume 8%/year rate of decline. Percent electric space heat from 2003 data supplied by Hydro-Québec (HQD-5, doc. 1, p.5).									

Excluding from these values the 2003-04 period, the market penetration climbs to less than 12%. On the other hand, adjusting for actual energy savings (because of the preponderance of social housing units) would reduce the effective weighted rate. In either case, this rate is excessively low, and is nowhere near what is needed for the program to achieve its stated goal of market transformation.³⁴

Successful residential new construction programs that combine the strategies noted above have generated participation rates of 30-50% and higher in a matter of a few years. For example, New Jersey's program raised the market share of Energy Star homes (i.e. homes that are at least 30% more efficient than the country's model energy code) from 4% to 35% in the space of 3 years. The TXUED program out of Texas has moved high-efficiency homes from a 0.1% market share to a nearly 50% market share in 3 years. The Tucson Electric Power program had already achieved 32% market share by 2002. Vermont's market share has risen to 35% (buildings, not units).

³⁴ See HQD-5, doc. 8, p. 11: "Oui, ce programme en est un de transformation de marché, avec l'objectif de préparer le marché au rehaussement de la réglementation attendu en 2007."

While it is understandable that Hydro-Québec doesn't expect to achieve 30-50% rates immediately, there is no reason why its current program – if complemented by the cost-neutral and low-cost measures we've proposed – should not achieve similar market penetration rates quickly. This is all the more true given the recently-announced CMHC mortgage insurance premium incentive (rebate or amortization period extension) for energy efficient homes, as well as the likelihood of other incentives or campaigns to be launched under the federal government's forthcoming climate change plan.

Based on the experience of other utilities, we believe a much higher target over the 2005-2010 period, in the range of at least 25% *on average*, is appropriate.³⁵

Recommendation: Reject Hydro-Québec's target market penetration and adopt a target market share of 25% on average during the period 2005-2010.

A note on regulatory review

We took note of Hydro-Québec's proposal to encourage a tightening of Québec's building codes as regards energy efficiency by end of 2007. Ultimately, regulatory approaches are by far the most cost-efficient way to achieve energy savings, and are to be strongly encouraged. We support and commend Hydro-Québec's proposal in this regard, as well as its proposal to maintain and upgrade the Novoclimat program in light of a higher regulated baseline.

Recommendation: Approve Hydro-Québec's budget request relative to the building code review committee.

vii. Conclusions and Recommendations

Hydro-Québec's proposed changes to the Novoclimat program represent significant improvements in that they address key barriers that were previously neglected. The strategies adopted – direct financial incentives – are valid for responding to specific barriers, namely higher first-cost (buyers) and reluctance to engage in new practices (builders). The fact they simultaneously address the supply and demand sides of the equation is equally important.

³⁵ Our calculation of this rate is based on: a rate of progression for 2005-07 similar to the lower band experienced in best practice regions; a regression in 2008 following implementation of a new energy code for buildings; and steady progress thereafter. We believe that market penetration by 2010 should be in the range of 40%.

That being said, best practice experience suggests that Hydro-Québec's proposed incentive dollars would be more effective if more heavily weighted toward builders. We also believe that a part of the remaining customer incentive could be linked to additional lighting and appliance measures.

We also believe the proposals should be supplemented by further barrier-breaking strategies. These strategies, for the most part low-cost, have been used successfully, in conjunction with the existing and proposed suite of measures, by leading North American utilities. They include aggressive co-marketing with builders, education targeted at the real estate community, renewed effort at developing an energy efficient mortgage product with Québec financial institutions and, finally, training of builder sales staff.

Table 6 below summarizes our proposals to adopt a broad suite of strategies aimed at overcoming market barriers in the *mass market* segment.

Table 6. Novoclimat: Current and Proposed Strategies – Mass Market														
Barriers:	BUYERS							BUILDERS						
	First-Cost			Access to Capital		Savings disbelief		Reluctance			Know-ledge		Insp. costs	
Strategies:	Financial incentives	Aggressive co-marketing*	Educate realtors	Increase lending limits (primary loan)	Increase lending limits (insurance premium)	Inspection	Certification	Financial incentives	Aggressive co-marketing*	Sales staff training	EnerGuide rating system	Builder training	Design assistance	Cover 100% inspection fee
Requires buy-in from:	--	Builder	Real-tors	Banks, Caisses	CMHC	Inspec-tors	Inspec-tors	--	Builder	Builder	--	Builder	Builder	--
Previous PGEÉ (< 2005):														
Proposed PGEÉ (≥ 2005):	✓							✓						
Recommended PGEÉ:	↓	✓	✓	✓				↑	✓	✓	✓	✓		
Legend :  Strategy is partially applied  Strategy is applied in full  New proposal  Modification														
* Aggressive co-marketing is included twice, once under "Buyers" and again under "Builders". It is the same strategy, and works to address barriers to both the demand and supply sides of the market equation.														

In addition, while we applaud Hydro-Québec's proposal to increase its incentive to the social housing market, we believe this segment deserves a more aggressive approach, given its specific characteristics. As such, we urge that Hydro-Québec cover 100% of incremental costs for this market segment in the short run. In the long run, we believe that the utility can help the Société d'habitation du Québec to revise its own subsidy cap calculations to account for reduced operating costs. When that revision takes place, Hydro-Québec will be able to lower its incentive significantly, thus generating savings compared to its current proposal.

We also note that manufactured homes are expected to play a significant role in this program, and urge Hydro-Québec to ensure the program adopts a strategy unique to this market and its players. Experience suggests that this strategy should be focused away from energy savings and instead on quality assurance and innovation benefits.

Finally, we urge the Régie de l'énergie to not accept as reasonable Hydro-Québec's forecast market penetration for this program. While the program has had serious problems in the past, these were due to the lack of strategies for overcoming key market barriers. To the extent Hydro-Québec adopts the strategies described above, we believe the Novoclimat concept should capture an average market share of at least 25% in the period 2005-10.

3. EnerGuide for Houses

i. Introduction

The stock of existing homes offers considerable energy savings opportunities, primarily through a combination of inexpensive air leak sealing measures (caulking, weather stripping), more expensive equipment replacements (windows, doors, HVAC systems) and measures aimed at improving envelope insulation.

The EnerGuide for Houses program was developed by Natural Resources Canada. The program is a typical home rating approach, similar to the HERS rating system used in the United States for the past 15 years. Specifically, the EnerGuide program offers participants an initial home energy audit (“A” evaluation), comprised of a blower door test, a walk-through for data collection and consumption modelling, a report with recommended measures, costs and benefits and an EnerGuide rating and label. A follow-up visit (“B” evaluation) allows for the verification and quantification of adopted measures, and provides a second EnerGuide rating and label.

In Québec, the *Agence de l'efficacité énergétique* is responsible for delivering the EnerGuide for Houses program. Since its inception, 5450 Québec households have taken part in the program, more than half of whom participated in the last year alone.³⁶

ii. Hydro-Québec's previous version

Hydro-Québec's previous plan provided training to trade professionals and covered a portion of the 'A' evaluation audit costs for duplexes and triplexes. It did not provide incentives for measure implementation. In the Spring of 2004, Hydro-Québec indicated its willingness to provide an incentive for low-income households on the order of \$2000 per home.

In previous testimony in Régie docket R-3526-2004, we analyzed and recommended a measure by which Hydro-Québec would “piggyback” on the EnerGuide program by providing implementation incentives to all its customers, not merely its low-income segment. We suggested that such piggybacking would be critical to meeting Hydro-Québec's projected measure uptake rates. We recommended basing the additional incentive on the spread between the 'A' and 'B' audit evaluations, thus leveraging the program's current points system.

³⁶ Tremblay, Victor, *EnerGuide for Houses Statplus Report April 1 2003 to March 31 2004 – Analytical Report*, Appendix 1, November 2004.

iii. Hydro-Québec's current proposal

Hydro-Québec is proposing a number of improvements to its support for the *EnerGuide for Houses* program. Chief among these is the piggybacking measure we proposed last Spring. The suite of program contributions are as follows:

- > Contributions to cover a share of the AEE's training and evaluation costs as well as a share of the 'A' and 'B' inspections (as previously³⁷);
- > Support for program marketing and awareness campaigns;
- > An incentive equal to 2x the federal government's incentive to home efficiency improvements as measured by the 'A' to 'B' evaluation rating spread, for an average estimated combined incentive of \$1800/home; and
- > A special low-income household incentive equal to 4x the federal government's incentive, on average, and under which the participant's contribution is limited to the lower of 10% or \$250.

Furthermore, it is worth noting that while the mass market incentive is currently limited to single family homes, it is likely to be expanded to cover duplexes and triplexes in the coming months.³⁸

iv. Discussion – Mass market

Overall concept

We strongly support Hydro-Québec's approach to this program. Home retrofit opportunities are both substantial and notoriously difficult to access. Experience with mass market weatherization retrofit programs in North America has proven difficult, and most efforts have been less than comprehensive in their approach. Market penetration has, with few exceptions, been less than 1% per annum, with the exception of programs targeted at high-use customers.

The *EnerGuide for Houses* program offers a unique opportunity for Hydro-Québec to piggyback on a well-defined, stable, consistent and credible program. Doing so allows Hydro-Québec to leverage a solid program structure and co-marketing opportunities, thus enabling greater savings and reducing its cost of saved energy. The sheer extent

³⁷ In addition to its previous contributions, Hydro-Québec will compensate Natural Resource Canada's declining contribution to single family 'A' inspections so as to maintain a market price of \$150/home.

³⁸ See HQD-5, doc. 1, p. 15.

of potential energy savings – roughly 6500 kWh/year according to the OEE – should make this a priority program for Hydro-Québec.³⁹

By proposing to offer considerable incentives for measure implementation, Hydro-Québec is addressing the main market barrier not currently addressed: first cost. This barrier is critical, and Hydro-Québec's proposed incentives will move the opportunity for substantial energy savings from a very small subset of the population into the mainstream. In other words, the piggybacking incentives proposed by Hydro-Québec are not only key to maximizing efficiency – by facilitating greater cost-effective savings – but will contribute to equity concerns as well.

We have not conducted a thorough investigation of the EnerGuide incentive structure to which Hydro-Québec's incentives will be pegged. However, we agree with Hydro-Québec that the principles upon which the structure is based are sound. Rather than provide the same incentive irrespective of measure costs, the structure has been designed to more closely match incremental costs at various efficiency levels.⁴⁰ This is the most appropriate approach to determining incentive levels.

Finally, we urge Hydro-Québec to market this program aggressively, and to be vigilant in ensuring a sufficient supply of trained evaluators.

Recommendation: Approve Hydro-Québec's proposal to piggyback on the *EnerGuide for Houses* program by building on the OEE's incentive structure.

Audit costs

Hydro-Québec has proposed to maintain upfront 'A' evaluation audit costs at their current level of \$150 per audit. In other regions, audits are often provided free of charge, in order to overcome first-cost and information-related barriers and encourage greater participation.

Defining the optimal audit fee is not a simple matter. On the one hand, experience shows that when customers have to pay for audits, participants are more likely to follow through and implement recommended measures. On the other hand, first-cost tends to hinder participation in the first place, especially when potential savings are unknown. It is unclear the extent to which presumably higher measure uptake will compensate lower participation rates.

Buying down the cost of the first audit to an affordable \$50 level would not be very costly. Using Hydro-Québec's participation assumptions, and assuming 20-year weighted average measure life, we calculate the additional cost to Hydro-Québec at

³⁹ See HQD-5, doc. 8, p. 13.

⁴⁰ See HQD-5, doc. 7, pp. 31-33 for a discussion of the basic approach.

0.5¢/kWh.⁴¹ From a TRC perspective, the net cost is zero (it is merely an internal transfer). To the extent this additional utility cost enabled significantly higher participation and did not lead to considerable reductions in measure uptake, doing so could prove a powerful improvement to overall program performance.

For this reason, we recommend that Hydro-Québec and the AEÉ launch a limited pilot project in which audits are provided at a reduced \$50 rate. This pilot should be on a limited scale and be implemented in 2005. Assuming 500 participants (~5% of the total 2005 target), the pilot would cost \$50k and would enable Hydro-Québec to evaluate the participation and measure uptake impact of this alternative approach. Depending on results, Hydro-Québec could modify its mass market approach in its 2007 PGEÉ filing. We do not propose eliminating fees altogether.

Recommendation: Launch a limited-scale (500 household) pilot project aimed at assessing the merits of buying down 'A' audit costs to \$50.

Free drivers

We did not set out to examine the reasonableness of Hydro-Québec's, the AEÉs and the OEE's participant, savings and free ridership estimates.⁴² However, we do believe it is important to note and correct a weakness in Hydro-Québec's net savings calculations.

In forecasting program savings, Hydro-Québec has made a series of assumptions about participation based on past Québec experience. Among these assumptions is the participation rate, itself based on the idea that 75% of reports will recommend cost-effective measures, that of those, 60% will be implemented and that of those, 10% will be free riders.

These assumptions ignore free drivership. Free drivers are customers who implement measures without taking advantage of program incentives. In the case of the EnerGuide for Houses program, there can be two types of free drivers: those who are encouraged to implement measures after hearing about the EnerGuide program (but who don't go through the program itself), and those who receive 'A' audits and proceed to implement some measures without receiving the 'B' audit required to obtain rebates. Free drivers are the opposite of free riders, who benefit from incentives for measures they would have implemented anyhow.

⁴¹ Assuming no change in energy saved. In practice, the cost should be even lower as savings increase.

⁴² Although we do note some confusion regarding past performance. Specifically, Hydro-Québec's estimates for both number of participants and measure uptake are considerably different from those noted in the Statplus report to the OEE. See HQD-5, doc. 8, p. 11, HQD-5, doc. 7, p. 27, Statplus report, Appendix 1 and Statplus report Appendix 4.

Free drivership can be seen in both the Québec and Canada-wide data reported in the Statplus report, as indicated in Table 7:

Table 7. EnerGuide Free Drivers: Indications from 2004 Québec Survey Results ⁴³	
"Of all homeowners who carried out work following 'A' audit..."	
...implemented measures	81%
...plans to get 'B' label	72%
...plans to apply for incentive	46%
<i>Note: sample size of 168 out of several thousand.</i>	

Here we see that while 81% implemented measures, only 46% planned to apply for the incentive. If these survey results are representative, this would suggest a free drivership rate on the order of 75% in 2004. While we doubt that free drivership will remain as important once Hydro-Québec markets its new incentive proposal, the possibility of considerable free drivers is strong.

The extent of free drivership is important not only in designing Hydro-Québec's marketing effort, but also in determining program costs. For example, if free drivership is strong, the average cost of energy saved under this program will in fact be lower than expected.

In response to one of our interrogatories, Hydro-Québec indicated that it could conduct an evaluation of both free drivership and free ridership by 2006. We encourage it do to so.

Recommendation: Evaluate the free drivership and free ridership impacts of the EnerGuide for Houses program.

High-use customers

The EnerGuide for Houses program is fundamentally similar to a number of U.S. programs aimed at encouraging "deep" weatherization upgrades. These efforts begun 15 to 20 years ago, and have had mixed results. By and large, participation has been limited to 1% per year.⁴⁴

Contrary to the mass market approach, several utilities have chosen to target high-consumption clients. The reasoning behind this strategy is that such customers offer higher savings potential *and* could be easier to convince, given higher bills and, in

⁴³ Tremblay, Victor, *EnerGuide for Houses Statplus Report April 1 2003 to March 31 2004 – Analytical Report*, Appendix 4, November 2004.

⁴⁴ It is important to keep in mind that contrary to most other programs (new construction, appliances, lighting, etc.), retrofit markets are by and large one-off and, as such, *annual* participation rates are much lower than their non-retrofit counterparts.

many cases, discomfort due to poor weatherization. Indeed, results have borne out their assumptions, as these programs have achieved significantly higher penetration rates than their mass market counterparts.

Table 8 provides the effective annual participation rates for six North American residential retrofit programs.

Table 8. EnerGuide: Measure Uptake in Other Residential Retrofit Programs⁴⁵			
Utility and Program	Participants	Eligible	Annual Participation Rate*
<i>Austin Energy Home Performance with Energy Star</i>	1,342	180,000	0.8%
<i>Keyspan Energy Services Residential Weatherization Program</i>	877	600,000	0.2%
<i>SMUD Efficiency Equipment Loan Program</i>	3,360	370,000	0.9%
<i>Tacoma Power Residential Weatherization Program</i>	630	145,000	0.4%
Vermont Gas Systems high-use weatherization program*	127	4,600	2.8%
NSTAR Residential High-Use Program*	3,827	76,945	5.0%
* Programs in bold are targeted at high-use customers.			
* Participants are deemed those that implement measures. Customers who merely receive audits are excluded from our calculation.			

There are several differences between the EnerGuide for Houses program and the programs listed in the table above, as there are significant differences between the utilities themselves and Hydro-Québec. Nonetheless, these programs' experiences suggest that it is possible to achieve significantly higher participation among high-use customers.

We support Hydro-Québec's proposal to offer and market its incentives to *all* Québec customers for two primary reasons: first, because of fundamental equity and economic efficiency reasons, and second, because of its ability to leverage considerable federal government resources. Nonetheless, we believe that Hydro-Québec could launch a more aggressive marketing effort aimed at high-use customers. This could involve targeted bill inserts, protocols for customer complaint staff. It should also leverage data obtained through the *Diagnostic* program. Finally, should the community-based on-site visits approach be used to target high-use clients as suggested earlier, additional synergies could be formed.

Such a targeted marketing effort should result in additional energy savings all the while reducing unit costs. Note that we do not propose increasing the incentive level offered to all customers.

⁴⁵ Derived from Quantum Consulting, *National Energy Efficiency Best Practices Study: Volume R4 – Residential Single Family Comprehensive Weatherization Best Practice Report*, December 2004, p. R4-11 and our own data.

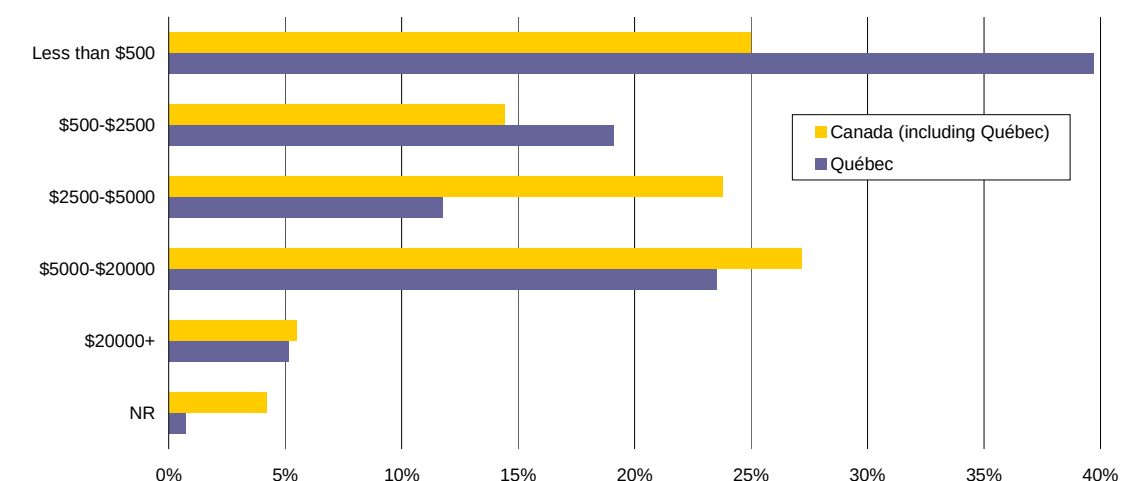
Recommendation: Implement an aggressive *EnerGuide for Houses* target marketing effort aimed at high use customers, while maintaining the same incentive level.

Promotion of the CMHC incentive

Finally, as with the Novoclimat program, we note that information and opportunities involving the new CMHC incentive should be integrated into Hydro-Québec's own marketing efforts for this program. Indeed, the CMHC incentive applies not only to new homes but also to capital loans for energy efficiency home renovations. By adding a stronger incentive to the tail-end of renovation opportunities, this incentive may prove to be extremely useful for encouraging implementation of "deep" measures.

This is particularly important in Québec, where data suggest that higher follow-up rates may be offset by implementation of lower-cost (and thus lower efficiency gain) measures, as noted in Figure 1 below.

Figure 1. EnerGuide for Houses: Cost of 'B' Audit Renovations



Source: Tremblay, Victor, *EnerGuide for Houses Statplus Report April 1 2003 to March 31 2004 – Analytical Report, Appendices 3 and 4, November 2004*. Note that removal of Québec's data from the Canadian whole would illustrate an even greater difference.

Given the above, we urge Hydro-Québec to ensure that the new CMHC incentive is clearly and systematically integrated into Hydro-Québec's own marketing efforts for the EnerGuide for Houses program (including in the Diagnostic report template, as noted earlier).

Recommendation: Ensure systematic integration of the new CMHC incentive into Hydro-Québec's EnerGuide for Houses marketing efforts.

v. Discussion – Low income market segment

Hydro-Québec's proposal to provide additional incentives and modified program offerings to its low-income customer segment represents an important addition to its low-income value proposition.

By offering incentives two times greater than those aimed at the general population, Hydro-Québec is in essence offering a nearly-free full-scale weatherization program.

We have some doubts as to the usefulness of insisting on a minimum contribution in the case of very low-income customers.⁴⁶ For this segment, the primary market barrier is access to capital, not lengthy payback periods, and in many cases, the barrier is absolute. We suspect that for a very minor additional investment, Hydro-Québec could achieve considerably great participation. We calculate that eliminating the minimum charge currently proposed would increase total program costs by just over 1%, notwithstanding improved success at achieving stronger participation rates.

Nevertheless, we understand that the initial test phase is already underway. As such, we can only urge Hydro-Québec to reconsider its requirement for a minimal capital contribution in light of the forthcoming results, and to address this concern in its post-test phase reporting.

Recommendation: Consider the option of eliminating its minimum contribution requirement for all or a subset of low-income customers, and report back to the *Régie* on this option following results of the initial test phase.

vi. Conclusions and Recommendations

We strongly support Hydro-Québec's proposal to piggyback on the OEE's *EnerGuide for Houses* program with the nature of the incentives proposed. If marketed appropriately and aggressively, we believe this program can play a central and cost-effective role in the utility's energy efficiency efforts.

In order to optimize program delivery, we make several secondary recommendations. Firstly, we urge the utility to investigate the relative costs and benefits of buying down the 'A' audit price to \$50, specifically by launching a limited (roughly 500 household)

⁴⁶ See HQD-1, doc. 1, p. 41. Hydro-Québec seems to suggest that the \$250 or 10% contribution was established in order to "ensure [the client] is able to recoup his investment in the first year".

pilot project. This pilot project would come at minimal cost and may identify an opportunity for significantly increasing participation while lowering average costs.

Secondly, we believe that Hydro-Québec should rethink its requirement for low-income customers to contribute to the capital cost of measure implementation, given the unique extent of the capital barriers they face.

Thirdly, we recommend that Hydro-Québec launch an aggressive marketing campaign – over and above its mass marketing effort – targeting high-use customers. This does not imply changes in the incentives offered.

Finally, Hydro-Québec should evaluate the program's free ridership effect, given the likelihood of such an effect. Assuming this effect is detected, actual program costs will prove to be lower than currently perceived.

4. Low-Income Direct Install

i. Introduction

Low-income customers face some of the most pervasive barriers to energy efficiency measures of any customer category. In some cases, low-income customers face similar barriers to those of other residential customers, but much more acutely. For example, while many residential customers may be reluctant to pay a higher first cost for an energy efficient washing machine, low-income customers most often are limited to either buying used machines or to using laundromats. In this case, while the “regular” residential customer is faced with information, hassle and cost-related barriers, the low-income customer’s barrier is far more acute: energy efficient washers simply do not exist in the market he’s limited to.

In other cases, low-income customers face entirely different barriers. For example, while most middle or upper class customers are homeowners, low-income customers are more commonly tenants. Because of the split incentives inherent in this situation, low-income customers have little ability to influence the degree to which their home is weatherized.

These and other segment-specific barriers render low-income participation in most standard energy efficiency programs extremely difficult. This problem has been recognized by governments and utilities throughout North America for more than two decades, and has resulted in the provision of programs designed specifically for this market segment. In some cases, these programs are limited to “minor” or low-cost measures such as weatherstripping and low-flow showerheads, while in others, “heavier” measures, including full-blown home weatherization services, are offered. For the most part, these services are offered free of charge.

In Québec, the Agence de l’efficacité énergétique has run a low-income home visit program since 1997.

ii. Hydro-Québec’s previous version

Hydro-Québec has supported the AEE’s low-income initiative since its inception. In fact, Hydro-Québec’s commitment to this program has remained relatively stable over time, even when other energy efficiency efforts were being scaled back.

The standard program was offered in a few select areas of the province. Through the program, community organizations, generally non-profit consumer or environmental groups, were paid as delivery agencies to visit low-income households, install low-

cost measures like caulking, weatherstripping and low-flow showerheads and educate them on ways to reduce their home energy bills.

In the program's first five years, delivery agencies were paid \$250 per home visit. Delivery agents are generally required to stay in homes an average of 1.5 hours, and are further expected to install an average of \$50 worth of energy saving materials. These can be chosen from a list of eligible measures provided by Hydro-Québec and the AEE.

iii. Hydro-Québec's current proposal

Hydro-Québec has recently brought a number of changes to its program, for which it now seeks approval. These include:⁴⁷

- > Extending the program to major towns within nearly all of Québec's 17 administrative regions⁴⁸;
- > Offering the free installation of an electronic thermostat by a qualified electrician (this is widely referred to as "volet 2" of the standard "volet 1" program);
- > Integration of the web-based *Diagnostic* tool into the home visit protocol;
- > Addition of a computer-based statistical tool to be filled in during the visit;
- > A three-day training session for delivery agents regarding the new program components; and
- > A 12% increase in its per-visit contribution (up to \$280) as well as an additional incentive (\$70) to cover the electricity portion of costs for non-electrically heated home visits.

When combined with the low-income EnerGuide for Houses program, these changes constitute a significant expansion of both the breadth and depth of the original program.

⁴⁷ We exclude from this list the addition of a low-income EnerGuide for Homes program, discussed in the previous section (see page 55).

⁴⁸ Only the North of Québec as a region is not covered.

iv. Discussion

Given the particular circumstances and market barriers facing low-income customers, we broadly support this proposal. While certainly not as cost-effective as other programs, we note that according to Hydro-Québec, it nonetheless screens positively as a function of the total resource cost (TRC) test. We also note that in many instances, low-income programs fail the TRC but are nonetheless included in utility programs for equity reasons.⁴⁹

We support this proposal primarily because of the two new components – the thermostat installation and provincial coverage – and with the understanding that the EnerGuide for Houses low-income program is simultaneously proposed. With these three additions, the majority of low-income households in Québec will have access to a portfolio of opportunities for energy savings, large and small. This will effectively offer lower-income households a chance at benefitting from the same or similar levels of energy efficiency gains and bill savings than their middle- or higher-income counterparts.

Furthermore, although further expansions could be investigated in coming years⁵⁰, we believe these three new components are so significant as to warrant a development period of their own.

Despite this broad support, we do have several more minor areas of concern.

Delivery agency disincentive

We understand that under current program design, Hydro-Québec requires that delivery agencies install on average \$50 worth of material per home. These costs are borne by the delivery agency and, as such, are covered by the \$280 total contribution.

This structure presents an unintentional disincentive to direct installation of efficiency measures. Indeed under this approach, the delivery agency is strongly encouraged *not* to provide direct installation of measures that might exceed the \$50. Furthermore, this disincentive has no relation to cost-effectiveness.

For example, replacing incandescents with compact fluorescent lightbulbs would cost less than 2¢/kWh at current prices, and offset avoided costs of 7.8¢. This is a greater than 4:1 benefit/cost ratio. Yet for a delivery agency, the payment structure strongly

⁴⁹ In theory, the TRC should account for non-energy benefits including the economic and social benefits of participation by low-income customers. When we say that these programs often fail the TRC, it is because in practice, the TRC is often poorly designed and incapable of integrating these societal benefits.

⁵⁰ We refer here to possible “middle-level” measures aimed for example at door frames or appliance replacement. We have not analyzed the costs and benefits of this opportunity.

discourages implementation of this measure, to the extent its “regular”, more labour-intensive measures are already implemented. We strongly suspect that this disincentive is leading agencies to under-prescribe easy measures that would require no additional time and that would otherwise be extremely cost effective.

In order to correct this disincentive, we believe that Hydro-Québec should assume the cost of materials directly. In lieu, agency contributions could be reduced. As such, any additional cost from this correction will be linked directly to very cost-effective net gains.

This measure is essential to aligning the delivery agency’s interests with Hydro-Québec’s interest in maximizing acquisition of low-cost energy efficiency gains.

Recommendation: Immediately reconsider the delivery agency payment approach with a view to isolating material costs from agency fees in time for the next contract season.

Delivery agency costs

Recently, Hydro-Québec increased its payments to delivery agents so that total payments were increased from \$250 to \$280 per home visit. While welcome, we note that this was the first increase in more than five years and, as such, falls short of accounting for inflation. We also understand that current projections include no increase in payments to delivery agencies through 2010.⁵¹

We note that Hydro-Québec has recently made additional requirements of delivery agencies that involve additional costs, including capital expenditures, for them. These include the purchase of computers and peripheral computer equipment required for integrating the diagnostic tool into home visits. We also understand new administrative burdens have also been imposed, largely for data gathering purposes. These new capital and human resource costs, in addition to general inflation, do not seem to be accounted for in Hydro-Québec’s current budget to 2010. While this may be the result of an oversight, we urge Hydro-Québec to revise its delivery agency budget upwards.

Recommendation: Adopt an annual revision of the fee schedule paid to delivery agencies and index them to inflation for budgetary purposes.

⁵¹ See HQD-5, doc. 5, p. 5.

Delivery agency consultations

Finally, we understand that neither Hydro-Québec nor the Agence de l'efficacité énergétique currently consult delivery agents on a regular basis. As a result, program operations can be hindered. For example, by not informing delivery agencies of marketing pushes, these front-line actors can be caught off-guard with insufficient resources to respond to sudden surges in interest, thus harming both participation and satisfaction rates. Similarly, the addition of a slew of new reporting requirements, while useful from a program evaluation perspective, can actually hinder on-the-ground implementation (by occupying valuable client/agency time). Yet without regular consultation, Hydro-Québec may be unaware of the extent of these problems.

From a program management perspective, we believe it is essential for Hydro-Québec and the Agence de l'efficacité énergétique to create a permanent consultative committee. This committee should ensure that delivery agents are treated as partners. In so doing, it will enable Hydro-Québec to receive the street-level feedback needed to ensure the program is sustainable and is achieving maximum impact.

Recommendation: Institute a permanent consultative committee to enable ongoing discussion and consultation with delivery agencies.

Equity concerns

We noted earlier that the broadening and deepening of Hydro-Québec's low-income portfolio of efficiency measures is key to enabling this consumer segment to benefit from the PGEÉ as a whole. In fact, our review of the low-income portions of Hydro-Québec's overall residential effort – including this program, the SHQ affordable housing renovation program and the low-income segments of the Novoclimat and EnerGuide initiatives – suggest that low-income customers are slated to benefit from 16% of total residential sector energy savings.⁵² This is more or less proportional to the low-income share of the total residential population.

That being said, the higher cost of low-income measures and programs also means that its share of total residential costs is significantly higher, at roughly 28%.⁵³

We do not believe this is reason for alarm. Indeed, to the extent Hydro-Québec adopts the recommendations we've laid out for its non-low-income residential programs, we believe that actual participation is likely to exceed Hydro-Québec's current forecast. This is particularly true for the Novoclimat and Energy Star programs. As a result, the proportion of costs attributable to low-income customers would be lower than current forecasts.

⁵² Based on Hydro-Québec's forecasts.

⁵³ Our calculation of both savings and cost shares excludes the residential diagnostic program from the denominator, since this program is likely accessible to both populations.

Nonetheless, this finding reinforces the need to focus on bringing improvements to its mass market program designs.

Other opportunities

The low-income market may present additional opportunities for cost-effective energy savings. Specifically, it is possible that some appliance replacement initiatives could prove to be cost-effective additions. However, given the equity issue noted previously, we believe the coming year should be focused on consolidating new low-income programs and measures, while improving program design of mass-market residential programs. Additional measures could be developed in the ensuing years.

v. Conclusions and Recommendations

By and large, we support this program and Hydro-Québec's proposed changes. By combining education, direct installation of small measures, direct installation of more precise thermostats and, ultimately, the possibility of deep renovations to building envelope (see discussion and recommendations on page 55), this combination of measures recognizes low-income barriers and provides this segment with a portfolio of measures of similar value to those accessible by the majority of Hydro-Québec's customer base.

Despite this broad support, we do believe that Hydro-Québec should bring several adjustments to its *base* program approach, especially in light of its recent province-wide expansion. These adjustments are aimed at eliminating unintentional disincentives and improving the ability of delivery agencies to meet program goals.

5. SHQ Affordable Housing Renovation

i. Introduction

Affordable housing is comprised of a number of different types of housing units. These include government owned and operated units as well as private units with regulated rents.

Publically-owned and operated affordable housing units offer unique opportunities for energy efficiency improvements. These opportunities are eased by centralized control of renovation policies and schedules. Throughout North America, programs aimed at both weatherization and direct-install of efficient lighting and appliances have been operated for decades. In the U.S., utilities have run such programs jointly with the Housing and Urban Development Agency (HUD; similar in nature to the SHQ) for many years.

ii. Hydro-Québec's previous version

Hydro-Québec had initially planned to introduce a renovation program aimed at the SHQ's stock of affordable housing units in 2002. It subsequently withdrew its intention (announced in R-3519-03).

iii. Hydro-Québec's current proposal

Hydro-Québec is once again proposing to develop a program jointly with the *Société d'habitation du Québec* (SHQ). The program would be aimed primarily at the SHQ's HLM (*habitation à loyer modique*) units, although it hopes to eventually develop similar initiatives for rent-regulated private units (regulated by the Québec government's *Accès Logis* and *Logement abordable Québec* programs).

Hydro-Québec is currently in talks with the SHQ and the various local OHQs⁵⁴, and the program characteristics won't be known until at least the Spring of 2005. Nonetheless, Hydro-Québec has indicated that the program would focus on intervening in natural renovation cycles in order to implement "hard" measures ((thermal envelope, electric and mechanical systems) that reduce thermal losses and control indoor temperatures. To do so, Hydro-Québec expects to contribute 75% of

⁵⁴ Offices d'habitation du Québec.

incremental efficiency-related renovation costs, as well as offering to install electronic thermostats free of charge.

iv. Discussion

Based on the limited information available, we agree that the coming renovation cycle presents an otherwise lost opportunity to apply cost-effective retrofit measures to existing affordable housing stock. As such, there should be considerable potential for cost-effective savings, and we support Hydro-Québec's decision to reconsider this market.

Beyond conceptual support, there is not enough information about Hydro-Québec's anticipated program design to enable a rigorous analysis. For this reason, we limit our additional commentary to a single concern: comprehensiveness.

In its testimony, Hydro-Québec states its intention to:

“favour measures that are not under occupant control, i.e. measures relating to the thermal envelope and electromechanical systems that reduce thermal losses and enable improved control of individual unit temperatures”⁵⁵

We are unclear as to the meaning of “favour”. It may simply imply focusing on these “heavy” measures while not neglecting other available measures. However, to the extent Hydro-Québec is not planning on including the full suite of cost-effective measures, we have some concerns.

The natural renovation cycle represents a lost opportunity market, meaning that whatever “hard” measures are not implemented at the time of renovation will either be lost for decades or will cost substantially more to achieve at a later date. This is of course the case for building envelope and mechanical equipment, but is also the case, for example, for lighting. Specifically, we urge Hydro-Québec to include lighting retrofits in this program, as they offer an easy and low-cost opportunity that, if neglected, would be more costly to apply at a later date. Lighting could include use of Super T8s for hallways and other common areas (see discussion at the end of the section starting at page 130), or pin-based CFLs for individual housing units. Select appliance replacements may also prove cost-effective in some cases.

Recommendation: Integrate lighting retrofits into the Affordable Housing program design, including implementation of Super T8s and pin-based CFLs.

⁵⁵ Our translation from HQD-1, doc. 1, p. 46.

Recommendation: Consider integrating an appliance replacement component where economics warrant.

We also take the opportunity to encourage Hydro-Québec to ensure renovations are designed in an integrated and comprehensive fashion. Specifically, it should ensure that interactive effects, for example between improved building envelope efficiency and sizing of HVAC equipment, are captured in the renovation process. Too often, these interactive effects are neglected, and a part of the benefits of improved building envelopes are lost because HVAC equipment is oversized.

Recommendation: Ensure comprehensive and integrated renovation designs that account for the interactive effects of measures, including on HVAC capacity sizing.

v. Conclusions and Recommendations

At the time of writing, not enough is known about this program's eventual design characteristics to allow for rigorous analysis. At this point, our only concern regards the possibility that Hydro-Québec may neglect lighting (and, possibly, appliance) opportunities in its focus on building envelope and electromechanical equipment. Not including these measures would translate into lost opportunities for easy, cost-effective efficiency resources.

6. MC/ES Efficient Products Residential

i. Introduction

Appliances and electric/electronic equipment present significant opportunities for energy efficiency gains. Technological improvements mean that new equipment often consumes 50% or less energy compared with predecessor models, while providing similar or enhanced services. For example, efficient clothes washers use 50% less electricity than standard models and simultaneously reduce water consumption and improve washing quality. Compact fluorescent lightbulbs consume 75% less electricity than incandescents, while providing the same lumen output. Today's refrigerators consume less than half the power of fridges 15 years old. For these reasons, active promotion of efficient appliances and other electricity-consuming devices is normally a key component of any energy efficiency plan.

Because this category includes a broad range of equipment, market barriers may vary from product to product. Nonetheless, the most significant barriers are usually the same. These include first cost, information/search costs, hassle costs and product unavailability. The first cost barrier was described in the introduction to previous programs, and is both the simplest and most commonly understood problem. For example, even though their combined lifetime capital and operating costs are far lower than for incandescent bulbs, CFL price tags are in the range of 4 to 10 times higher, and customers may not understand or believe the lifetime savings claims. The other barriers can be just as important. For example, as long as the first-cost barrier hinders customer demand, retailers will tend to limit product availability or provide low-quality store placement (store rear, low shelf space, etc.), creating a chicken-and-egg dilemma.

Efficient products promotional programs have been around for more than two decades. In that time, program approaches have evolved significantly, from an initial focus on resource acquisition to a more recent emphasis on market transformation. Furthermore, the U.S. government's *Energy Star* labelling program has succeeded in achieving solid consumer notoriety, and a recent agreement with Natural Resources Canada has significantly expanded the range of ES-qualified products in this country.⁵⁶ As with other program areas, best practices adopt a combination of strategies rooted in addressing and overcoming market barriers.

⁵⁶ A 2002 study found that in the U.S., the *Energy Star* brand was recognized by nearly half the adult population. See The Cadmus Group, *National Analysis of CEE 2001 Energy Star Household Surveys – Final Report*, August 1, 2002.

ii. Hydro-Québec's previous version

Until now, Hydro-Québec's energy efficiency efforts had by and large neglected the market for efficient products (with the exception of electronic thermostats).

iii. Hydro-Québec's current proposal

In May, 2004, we conducted a review of Hydro-Québec's demand-side management efforts and pinpointed significant, unaddressed opportunities. Among these, we developed scenarios for distinct efforts aimed at increasing penetration of compact fluorescent light bulbs and fixtures (CFLs), high-efficiency, horizontal-axis clothes washers and efficient windows.

These opportunities were chosen because significant technology improvements achieved in recent years have opened the door to easy-to-achieve, cost-effective efficiency gains. In energy efficiency parlance, these are "low-hanging fruit". We concluded that Hydro-Québec could obtain savings of nearly 750 GWh/year by 2010 from these three measures, with the vast majority coming from CFLs. We did not analyze the full breadth of other potential appliance/electric/electronic equipment opportunities.

In its 2005-2010 DSM plan, Hydro-Québec has proposed a new program incorporating a number of energy efficient products. The full suite of products includes CFLs and efficient washers as well as a host of other products, though it excludes, for the time being, efficient windows. The *Efficient Products Mieux Consommer / Energy Star* program is in fact an amalgamation of four distinct measure-types, namely: lighting, appliances/electronics, thermostats/timers and geothermal heat pumps. Altogether, Hydro-Québec forecasts savings of 369 GWh, half of which is to come from CFLs.

We begin by addressing the overarching issue of aggregation – that is, the reasonableness of aggregating the full suite of efficiency opportunities noted above into a single program.

Beyond the aggregation issue, we proceed by distinctly addressing the new components of the MC/ES program, namely the promotion of efficient lighting and appliances/electronics. Finally, we discuss a couple of notable opportunities – namely efficient windows and computer transformers – that we believe should be added to the program immediately. We treat geothermal heat pumps in an entirely distinct chapter following this one.

iv. Discussion – Product aggregation

Before we examine each aspect individually, it is important to address the implicit decision to combine a vast array of products – thermostats, timers, lightbulbs, clothes washers, refrigerators, dishwashers, freezers, driers, stoves, water dispensers and geothermal systems – into a single program.

There are reasonable arguments to support or oppose combining appliance measures with lighting in a single program. On the one hand, they address very different decision-making processes – one involves rare and considerable expenditures, often financed, the other a more frequent, minor expense. On the other hand, they share many of the same consumer-related characteristics: they are common products (found in every household), their primary purpose is not HVAC-related, they face similar market barriers and they benefit from the same well-known label (*Energy Star*). As such, we see no reason to oppose Hydro-Québec's proposal in this regard.

With regard to thermostats and timers, we are more skeptical. Firstly, thermostats and timers are viewed primarily as energy-saving or comfort-related devices. Secondly, to the extent Hydro-Québec continues to insist on promoting non-programmable electronic thermostats (we disagree with this position), their ineligibility for Energy Star sets them apart from the other products from a consumer standpoint. Nonetheless, given their size, cost and retail placement characteristics, there are valid arguments for rolling them into the products program, and so we will not oppose it.

The same cannot, however, be said for geothermal heat pumps. Geothermal pumps are part of an entirely different market – the market for primary home heating systems. Their sale and installation involve a completely different set of market actors – ranging from home builders to contractors to financial institutions – and, as such, their promotion requires working through entirely different channels. From a barriers perspective, they more closely resemble those that apply to the new homes construction market. Finally, their capital cost and long lifetimes put them in a completely different category from a consumer perspective.

For these reasons, we urge that geothermal heat pumps be considered on their own merits, in the context of a distinct program. We address this program separately in section 7 on page 91.

Hereafter, we address the major new components of Hydro-Québec's program to the exclusion of geothermal heat pumps.

Recommendation: Remove geothermal heat pumps from the MC/ES program and create a distinct heat pump initiative.

v. Discussion – Efficient lighting (CFLs)

Hydro-Québec's proposal

Hydro-Québec is proposing to provide information and/or incentives to encourage customers to purchase compact fluorescent (CFL) bulbs and fixtures. As noted earlier, CFLs represent a “low-hanging” fruit in that they offer significant savings at minimal costs (~0.5-2¢/kWh at the TRC level (notwithstanding considerable non-energy benefits); less for Hydro-Québec). For that reason, CFL incentives are standard fare for DSM programs everywhere.

Hydro-Québec's Plan provides little information about the nature of the efforts it intends to deploy. However, it does indicate and in fact insist that the program is “first and foremost an awareness program”.⁵⁷ Relying solely on awareness in the CFL market would completely ignore the most significant market barrier – first cost. We can only assume that, given the tremendous low-cost kWh opportunities available and the nature of market barriers for CFLs, incentives will be a key component of Hydro-Québec's promotional efforts aimed at compact fluorescent lighting.⁵⁸

Temporary Joint Promotions

Assuming Hydro-Québec intends on applying incentives to CFL-related opportunities, the next question is what form of incentives. Again, Hydro-Québec's testimony does not provide a clear indication of the incentives it intends to use. However, at close reading (HQD-1, doc. 1, p. 52, l. 8-12), the testimony seems to imply using a well-known strategy that we will call “temporary joint promotions (TJPs)”, and that we discuss hereafter.

The TJP strategy implies launching occasional and temporary promotions that combine the efforts of utilities, manufacturers and retailers. For example, utilities throughout the U.S. northeast, under the banner of the *Northeast Energy Efficiency Partnerships (NEEP)*, run TJPs on a roughly semi-annual basis. Successful TJPs work as follows:

- > Utilities (or other energy efficiency agencies) launch a call for tenders in which manufacturers and retailers are invited to propose promotional events and indicate the financial assistance requested;

⁵⁷ See HQD-1, doc. 1, p. 52 and HQD-5, doc. 8, p. 23.

⁵⁸ Hydro-Québec indicates that it will provide incentives for “measures whose incremental cost is significant or that are not adopted very much” (HQD-5, doc. 4, p. 5). It is unclear how the utility interprets these criteria. For example, CFL incremental costs could be considered significant relative to standard bulb costs, or insignificant on an absolute scale (a few dollars).

- > Winners are chosen based on the maximum savings achievable within a given budget; and
- > Winning proposals are for a short duration (e.g. two weeks) and include a host of promotional efforts (direct marketing, advertisements, in-store promotional materials, product placement, rebates, etc.).

TJPs are a valid, even powerful marketing strategy. They can allow a utility to harness the time and resources of manufacturers and large retailers that may be available on a limited-time basis. These efforts attract upstream market participants precisely because of their temporary nature. They thus lead to promotional efforts that would otherwise be out of reach for utilities, including use of store flyers, store-sponsored promotions, in-store advertising, acquisition of prime shelf space, and other internally-managed strategies.

Temporary Joint Promotions have also proven to be very cost-efficient for utilities, given the ability to leverage investment dollars from manufacturers and large retailers. Furthermore, providing incentives upstream rather than at the consumer level can have a multiplier effect (as costs grow down the chain) that can result in greater savings for consumers (although loss of free drivers from rebates may compensate this benefit). Finally, TJPs can be effective tools for reaching retailers whose policies don't allow for mail-in rebates.⁵⁹

Based on recent evidence from other regions, we strongly encourage use of this strategy.

Recommendation: Adopt a temporary joint promotions strategy, using best practices developed and applied by the Northeast Energy Efficiency Partnerships as a guide.

However, it is critical that TJPs be used to complement, not *substitute*, standard purchase incentives, for two reasons:

1. *Québec is a late-starter.* CFL penetration in Québec markets is substantially lower than in other regions of North America, owing primarily to the absence of any incentive and promotional efforts until now. While CFLs represent a good value proposition to consumers *on paper*, in practice market barriers remain important given the roughly 4-10x higher first costs. It is far too early in Québec's CFL efforts – and the savings opportunity is far too important *and* cheap – to simply neglect proven incentive strategies. Ongoing rebates are needed to kick-start the CFL industry. Adopting a TJP strategy *before* or *in the absence of* such incentives is like “putting the cart before the horse”.

⁵⁹ This is the case with Costco, for example.

2. *The TJP strategy ignores some market segments.* Significant numbers of customers and market segments will not be served by these TJP promotional events. This applies specifically to (a) customers whose purchase decisions occur outside the very limited timeframe of the occasional promotion and (b) customers who will purchase their bulbs and other lighting products at non-participating stores, whether for reasons of income, transportation or habit.⁶⁰

CFLs represent a cost-effective opportunity on an ongoing basis, and it is in the interests of both economic efficiency and equity that consumers who purchase their units at other times throughout the year or at smaller stores be enticed to purchase CFLs. In fact, even regions with leading TJP strategies continue to offer CFL rebates on a continuous basis.⁶¹ As such, we strongly urge that Hydro-Québec use a TJP strategy as a *supplement* to conventional, “24/7” CFL rebates (see below).

CFL Rebates

Rebates and other direct incentives to compact fluorescents are used in leading CFL programs throughout North America. This includes regions that rely solely on rebates, and regions that combine rebates and TJPs.

The appropriate level of rebate or other incentive should be based on an understanding of the product's market barriers and its cost-effectiveness both to participants and Hydro-Québec. In the case of lighting, barriers to CFL uptake relate primarily to a lack of information, an inability to calculate and/or confirm long-run savings estimates and, of course, higher first-costs.

Despite generous economics (CFLs offer participants a benefit/cost ratio of roughly 10:1), the first-cost market barriers in the case of CFLs are significant, and need to be countered by a significant reduction in the first-cost differential with incandescents. Given the very low cost involved in offsetting this differential, we believe Hydro-Québec should offer rebates in the range of \$2-4/CFL (\$4 at the outset, declining over time to \$2).⁶²

A \$3/CFL (average) rebate would cost Hydro-Québec approximately 1.5¢/kWh, including rebate processing costs. This compares very favourably with avoided costs

⁶⁰ Temporary joint promotions tend to work with large-scale retailers like Home Depot, Réno-Dépôt and the like, and are unlikely to reach smaller *quincailleries* or even *dépanneurs* still patronized by many Québeckers. As such, they will likely fail to serve many customer segments, including (i) low-income customers, (ii) customers who use vehicles only occasionally or not at all, and (iii) rural customers for whom the drive to a major retailer is not perceived to be worth the cost differential relative to incandescents available at local stores or cooperatives.

⁶¹ This is in fact the case in most of the U.S. Northeast, where TJPs are used to great effect.

⁶² This can be in a variety of forms, including in-store and mail-in rebates, although the two can lead to tremendously different results (administrative costs, free drivers, etc.).

for lighting of 8.0¢/kWh. Given the current low cost of CFLs, Hydro-Québec could and should use this opportunity to acquire much more significant DSM savings from compact fluorescent lighting. We provide more information below on the energy impacts such an effort would generate.

Recommendation: Offer a standard, year-round rebate of roughly \$3 per CFL (starting higher, declining with time) in addition to temporary joint promotions with large retail outlets.

Hydro-Québec's savings estimates

In its Plan, Hydro-Québec indicates that it expects its proposed approach to CFLs to generate annual savings of 181 GWh by 2010. This is based on assumptions regarding average savings per bulb and a target of 10.5 million CFLs installed (net of baseline) by 2010.

We are surprised by these estimates, for two reasons: (a) they seem to significantly underestimate the per-bulb net savings, and (b) the program's targets fall far short of what is achievable. We address each of these concerns below.

Regarding the per-bulb estimate, Hydro-Québec has used the following assumptions to arrive at a weighted average bulb savings of 17.3 kWh/yr:

- > an average CFL of 17.5w (presumably replacing 70w incandescents on average, a standard 4:1 differential);
- > cross effects for various HVAC-type customers as determined in R-3519-2003, phase II;
- > unknown average use/day; and
- > unknown market share of customer heat types (for cross effects calculation).

We have recalculated the savings estimate using the following assumptions:

- > same distribution of bulbs as Hydro-Québec (average 17.5w)
- > same cross effects assumption as Hydro-Québec (from R-3519-2003, ph.II)
- > standard operating hours per bulb (3 hrs/day)
- > reasonable assumptions regarding disaggregation of heating loads across customers.

From these assumptions we conservatively arrive at unit savings of 34.5 kWh/yr, or more than double Hydro-Québec's estimate. This accounts for *average* negative cross effects of 40%. We fail to understand how Hydro-Québec arrived at its figure.

Regarding the 2010 target for CFLs, Hydro-Québec has established its goal as 10.5 million units (above-baseline) installed between 2004 and 2010, or an average of 1.5m/yr. This objective implies an average of 0.4 CFL purchases per household per year over the period. It includes the free CFLs given away under the Residential

Diagnostics program. Assuming that only 65% of respondents receive the free CFLs, this alone will account for more than 2 million units by 2010.⁶³

This target is unreasonably low. By comparison, the average CFL purchase rate achieved throughout the entire northeast region of the United States *in 2003 alone* exceeded 0.8 CFLs/household. In the Pacific Northwest, data for 2001 indicate 1.9 new CFL purchases/household.⁶⁴ If anything, Hydro-Québec's effort should be expected to exceed these rates over the coming 6 years, given the much lower CFL bulb prices relative to previous years.

Given the above, it is more realistic to expect the CFL component of the MC/ES program to achieve roughly 600 GWh/year savings by 2010, as indicated in Table 9. Note that this assumes achieving an annual market share of 0.9 CFLs/home by 2007, or a cumulative share of 2.2 CFLs/home. For comparison purposes, a recent study of the home lighting market in Massachusetts found that the State had vastly exceeded this threshold *in 2003*.⁶⁵ In fact, data suggest that the entire U.S. northeast has already exceeded this threshold. We can think of no reason why Hydro-Québec could not achieve it by 2007.

Table 9. MC/ES Program: Updated CFL Unit and Savings Projections								
	2004	2005	2006	2007	2008	2009	2010	Avg.
Households ('000)	3,377	3,412	3,442	3,471	3,499	3,526	3,552	
New CFLs/home (gross)*	0.09	0.50	0.75	0.90	1.05	1.15	1.20	0.81
Cumul. CFLs/home (gross)*	0.1	0.6	1.3	2.2	3.3	4.4	5.5	
New CFLs/home (net)*	0.04	0.44	0.68	0.81	0.95	1.03	1.05	0.71
New CFLs (net)* ('000)	118	1,501	2,334	2,824	3,311	3,616	3,732	2,491
Cumul. CFLs (net)* ('000)	118	1,619	3,953	6,777	10,088	13,704	17,435	
Gross savings (GWh/yr) ⁺	7	93	227	390	580	788	1003	
Net savings (GWh/yr)⁺	4	56	136	234	348	473	602	
* Difference between gross and net CFLs is function of baseline sales ("tendancier").								
+ Difference between gross and net savings is function of cross effects.								

While we did not set out to review Hydro-Québec's energy savings targets per se, we believe the combination of extremely understated per-unit savings *and* the unduly low target penetration rates deserve to be updated immediately. Not doing so will provide an inaccurate signal to the *Régie*, intervenors and perhaps most importantly, program managers themselves. Regarding the latter, neglecting to correct this target can have a very practical impact, hindering results by setting goals far too low.

⁶³ The Residential Diagnostic program expects to receive 1.6 million completed questionnaires, some of which may be repeats from a single customer. *HQD-1, doc. 1, p. 29.*

⁶⁴ A part of this can be explained by a surge in interest following the California energy crisis.

⁶⁵ Megdal & Associates and Opinion Dynamics Corp., "Evaluation of the Massachusetts Energy Star Residential Lighting Program – Market Progress as of 2003". Presentation slides, 2004. CFLs achieved a market penetration of 3.4 units/household in 2003.

Recommendation: Reject Hydro-Québec's targets for CFL sales and savings, and adopt net targets of 0.8 CFL sales/home/year by 2007 and 1.05 by 2010, and a total energy savings target of 600 GWh/year by 2010 for this measure.

Quality concerns: PEARL

Our final commentary on the CFL component of this program concerns quality assurance.

Compact fluorescent technology has vastly improved over the past decade. Previous bulbs took several seconds from switch to start, flickered regularly and cost between 5-10 times more than today's versions, which offer instant start, no flickering and cheap prices. The remaining quality issue concerns rated lifetimes, a key issue given that CFLs are often sold in part on the assumption they last "up to 10 times longer" than regular bulbs.

Ensuring that CFLs live up to their rated life claims is essential to protecting consumers as well as to protecting the integrity of CFLs in the marketplace.

Recently, concern over lifespan issues led a number of organizations to form an independent, third-party testing process known as PEARL (for *Program for Evaluation and Analysis of Residential Lighting*). PEARL has recently completed its sixth testing round, and continues to find a significant number of non-compliance bulbs. In fact, non-compliance issues are so important that the U.S. Department of Energy has decided to make PEARL results "actionable", meaning failure to pass will result in *Energy Star* delisting. Furthermore, the DOE has decided to subsume PEARL itself, establishing a formal government-approved process to be funded by bulb manufacturers. It is expected that the new process will make data results available to utilities and other interested parties at a cost estimated to be in the range of \$10,000 to \$20,000.

Quality testing has already resulted in a significant number of delisted products, i.e. products that, despite being energy efficient compact fluorescents, are not allowed to use the *Energy Star* seal. In fact, 35 models have already been delisted and at least an additional 45 are likely to be delisted shortly due to poor test results.⁶⁶ However, delisting models will not remove them from the market. The ultimate ability of testing

⁶⁶ Confidential PEARL test results from rounds 1 through 5. Cumulative results are up to date as of January 5, 2005, and include: 129 models tested, of which 45 passed or are likely to pass, 35 have already been delisted, 45 failed but haven't yet been delisted and 4 passed but with poor results. The reader should bear in mind that products tested are a *biased* sampling, weighted toward suspect products. As such, the PEARL test failure rate is in no way indicative of the failure rate of CFLs as a whole.

to correct this problem and safeguard consumers and CFL integrity, rests with its ability to affect the market.

For this reason, energy efficiency programs increasingly ensure that rebates and other incentives for CFL products are limited to *Energy Star* approved models. Furthermore, because there is a lag between test results and *Energy Star* labelling action, utilities increasingly base their eligible products lists on PEARL test results. This is critical to overcome quality problems and protect consumers.

Given the above, we urge Hydro-Québec, to the extent possible, to focus incentives and promotions on CFLs that have passed third-party testing. We further urge Hydro-Québec to purchase continuous access to PEARL testing results, and be prepared to adjust its promotions accordingly (by dequalifying non-compliance models).

Recommendation: At a minimum, limit any and all CFL promotions, including incentives, to Energy Star certified models.

Recommendation: Purchase access to PEARL testing results, ensure continuous revision of qualified products as new test rounds are completed and, wherever reasonable, further limit promotion-eligible CFLs to those that have passed PEARL or other independent testing.

This concludes our comments regarding the CFL component of the MC/ES program.

vi. Discussion – Efficient appliances

Hydro-Québec's proposal

As with its lighting measure, Hydro-Québec is proposing to provide information and/or incentives to encourage customers to purchase energy efficient appliances, including clothes washers, refrigerators, dishwashers, freezers, driers and stoves.⁶⁷ Once again, the plan provides little information on Hydro-Québec's specific intentions. Responses to interrogatories did not generate any further insight.⁶⁸

Nonetheless, using Hydro-Québec's data, we disaggregated their forecast Y2010 savings on a per measure basis, as provided in Table 10 below.

⁶⁷ For the sake of simplicity, we are not addressing the water distributor measure. This allows us to deal with appliances as a whole.

⁶⁸ See notably HQD-5, doc. 8, pp. 19-23.

Table 10. MC/ES Program: Hydro-Québec Appliance Measure Savings Assumptions⁶⁹

Appliance Measure	Unit Savings (kWh/yr)	2010 Target (units > baseline)	Energy savings in 2010 (GWh)
Clothes washer	596.0	4,250	2.5
Refrigerator	83.4	24,000	2.0
Dishwasher	127.6	21,500	2.7
Freezer	34.6	13,400	0.5
Clothes dryer	26.0	28,000	0.7
Stove	64.0	16,250	1.0
Total Appliances	91.2	62,300	9.5

It is apparent from this table and from Hydro-Québec's testimony that the utility does not expect appliances to play a serious role in its efficiency efforts. In fact, all appliances together account for a mere 0.3% of the PGEÉ's forecast savings. For all intents and purposes, we understand that Hydro-Québec does not plan on addressing the appliance market in any meaningful way.

That being said, we also understand that Hydro-Québec has only recently decided to develop an appliance program and, as such, may not have had the time to fully analyze the market. For example, we note that Hydro-Québec seems unaware of the list of available *Energy Star* appliances and products (HQD-5, doc. 8, p. 20), even though this list is easily and publicly available. We also note that while the testimony provides total target appliance-related savings net of baseline ("*tendanciel*"), Hydro-Québec does not seem to know what the baseline is.⁷⁰ Nor, in fact, does it seem to have its own forecast of market penetration, even though the table provided in its testimony does, implicitly, provide such a target.⁷¹

As we suggest hereafter, it is apparent that Hydro-Québec's target savings from the appliance measures in this program have no bearing to what a reasonable program could and should produce. This may simply be the result of Hydro-Québec not having had enough time to fully examine this efficiency opportunity.

⁶⁹ Derived from aggregated table presented at HQD-1, doc. 1, p. 51.

⁷⁰ See HQD-5, doc. 8, p. 19, response 9.2.g.

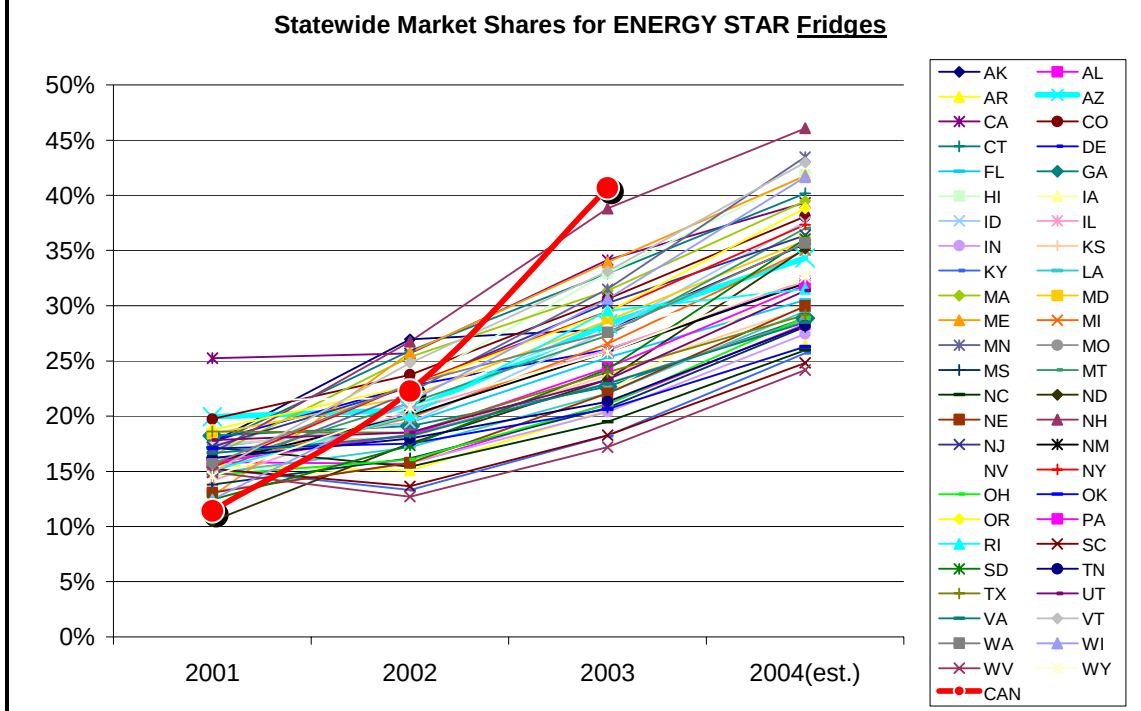
⁷¹ In its responses to our interrogatories, Hydro-Québec notes: "*The Distributor cannot provide this information [its forecast of the measures' market penetration by 2011]. As mentioned in the original testimony, the Distributor established preliminary assumptions for this program whose content will continue to evolve over time. We therefore did not associate a forecast participation level to each measure that could be promoted in the context of this program.*" (HQD-5, doc. 8, p. 19, response 9.2.f). It is hard to reconcile this statement with the table at HQD-1, doc. 1, p. 51, which provides precisely the type of measure penetration assumptions Hydro-Québec now suggests are not provided.

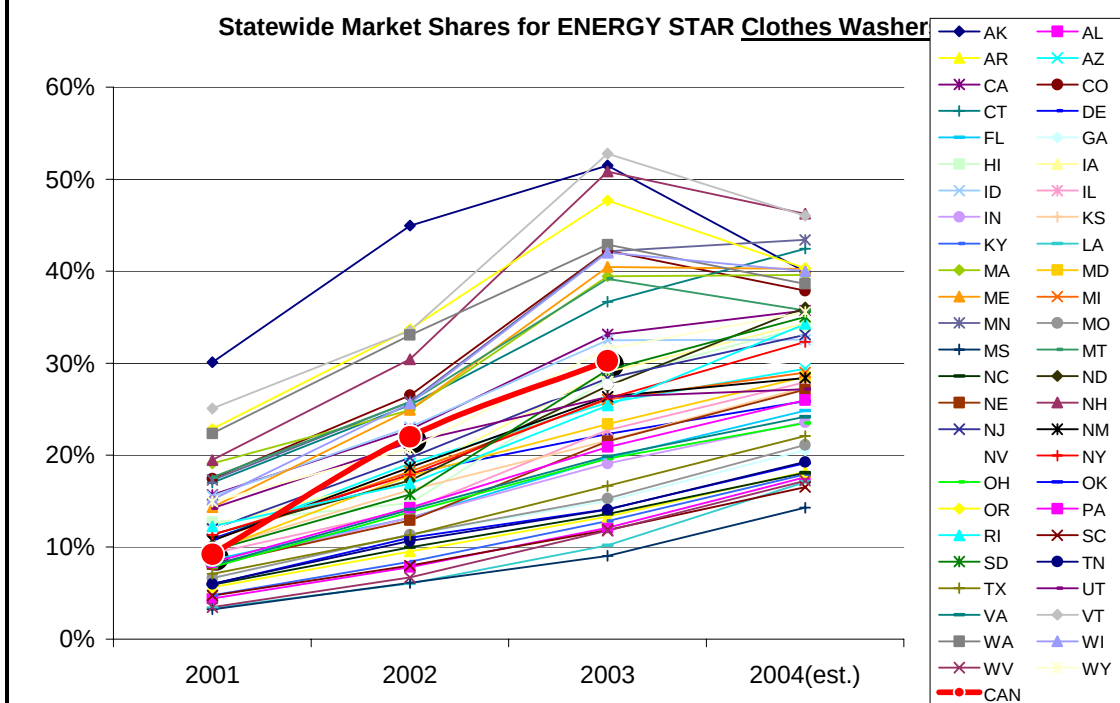
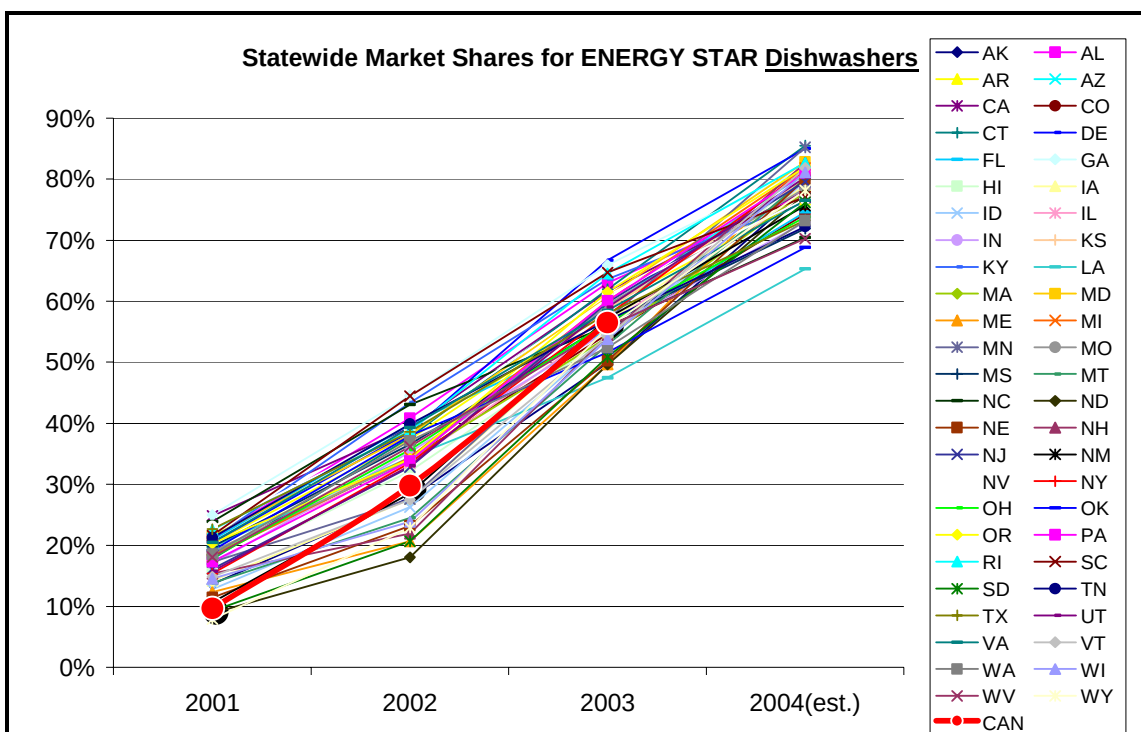
Energy Star appliance market shares

One reason Hydro-Québec may believe that appliances offer little to no energy savings opportunities is that *Energy Star* appliances have achieved good market penetration in the past few years (largely due to North American energy efficiency programs). Indeed, our compilation of the most recent data available from the U.S. and Canadian markets suggests that market shares of *Energy Star* appliances have grown dramatically in the past three years.

In the series of graphs contained in Figure 2, we present approximate market share growth for U.S. States from 2001 through 2004 for the three major appliances. We then plot Canadian 2001-2003 CAMA-based market share data on top (red circles). Reliable Québec-specific sales data is not available.

Figure 2. Select *Energy Star* Appliance Market Shares in U.S. States and Canada





Notes:

> U.S. data sources vary significantly from year to year as different retailers choose to report their sales data. As such, individual State data are not reliable. This graph serves only to illustrate overall trends.

> Estimates for 2004 are based on unweighted average reported market shares for 1st, 2nd and 3rd quarter sales.

> Sources: Energy Star sales databases compiled by D&R International for 2001, 2002, 2003 and 2004. Canadian data reported by CMA and provided to us by Natural Resources Canada on February 8, 2005.

These data suggest that on the whole, market penetration of *Energy Star* appliances resembles penetration rates in the U.S. Furthermore, the Canadian data can be used to corroborate the overall picture, despite individual discrepancies noted at the bottom of Figure 2.

Based on these data, we assume the following approximate *baseline* market shares for Québec in 2004:

- > Clothes washers: 29%⁷²
- > Dishwashers: 65%
- > Refrigerators: 45%

These data suggest a strong likelihood – though not certainty – that *Energy Star* dishwashers have already captured a significant market share in Québec. While it is important to note that *Energy Star* does not necessarily equate with the highest cost-effective efficiency performance level (see SEHA discussion immediately following the clothes washers example below), this does suggest a limited potential for significantly increasing current *ES-certified* dishwasher sales.

The opposite is true however for clothes washers, whose current estimated market share provides significant upside opportunity. The same may also apply to fridges, as well as to other appliances and equipment.

Example – Clothes washers

Efficient clothes washers reduce energy (and water) consumption by over 50% while providing increased capacity and improved washing. As such, they present the most significant appliance-related energy savings opportunities on the 2005-10 horizon.

As noted previously, Hydro-Québec expects its PGEÉ to lead to the sale of 4,250 *Energy Star* clothes washers by 2010, net of baseline (although, as noted, it says it does not know what the baseline is).

In Québec, the market for new clothes washers in 2003 was approximately 205,000. Assuming that Québec's market share for efficient washers is slightly lower than Canada's, we estimate that some 765,000 *Energy Star* washers will be sold in the absence of Hydro-Québec's effort (baseline) from now until 2010. In fact, Hydro-Québec's PGEÉ target impact represents far less than 1% of baseline sales.

This target is unreasonable. In addition to significant energy savings, efficient clothes washers offer consumers multiple benefits, including better quality washes and higher

⁷² Based on information supplied by a leading manufacturer, *Energy Star* clothes washers in Québec in 2003 had a smaller market share than in Canada as a whole. We therefore adjust our expected 2004 Canadian baseline downward by two percentage points for the Québec-specific discussion below.

capacity loads. There is simply no reason Hydro-Québec could not significantly improve their market penetration over the life of the PGEÉ.

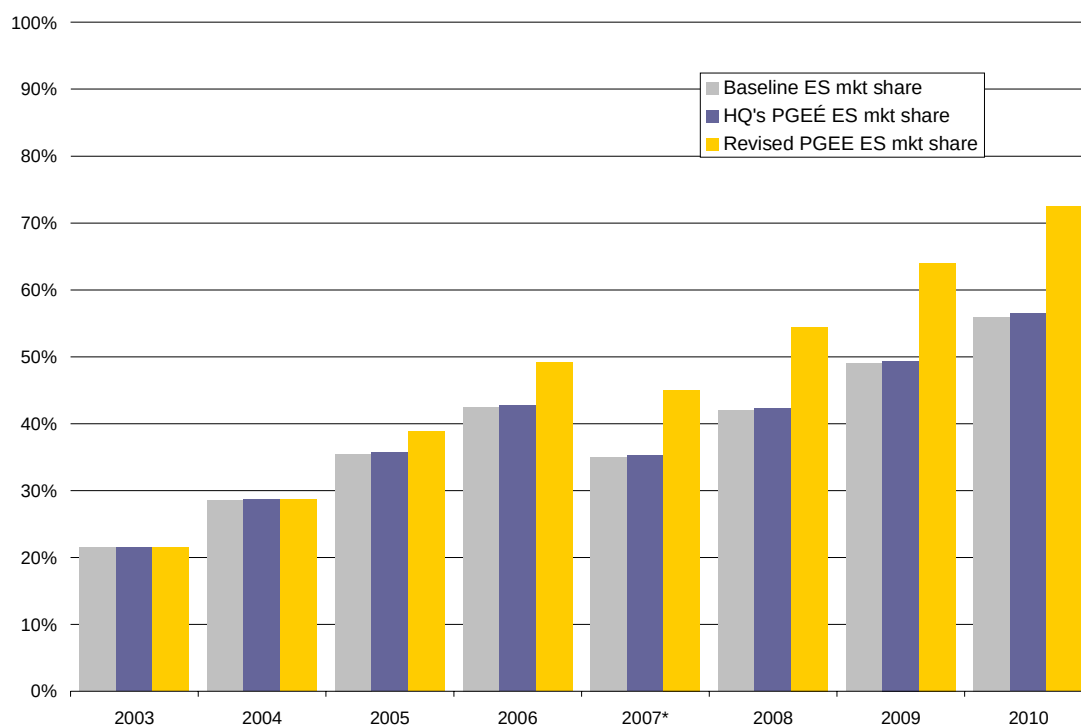
While we did not set out to review Hydro-Québec's energy savings targets per se, we believe this target is so unreasonably low as to require immediate updating.

A reasonable efficient clothes washers effort by Hydro-Québec, using a combination of incentives and other market strategies, could *conservatively* increase Québec's market share by 10% above baseline by 2007. Table 11 below presents our assumptions regarding the sales impacts of a reasonable clothes washer promotional effort (we spread the growth of the 10% target over 3 years, and slowed the growth rate thereafter).

Table 11. MC/ES Program: Hydro-Québec Washer Sales Target and Revised Target										
	2003	2004	2005	2006	2007 ⁺	2008	2009	2010	2003-2010	2005-2010
Baseline Market										
Washer sales ('000)	205	209	213	218	222	226	231	235	1760.0	1345.0
Baseline ES mkt share	21.5%	28.5%	35.5%	42.5%	35.0%	42.0%	49.0%	56.0%	39.2%	43.5%
HQ PGEÉ Target										
HQ Net market share	0.0%	0.1%	0.2%	0.2%	0.3%	0.3%	0.4%	0.4%	0.2%	0.3%
Total market share	21.5%	28.6%	35.7%	42.7%	35.3%	42.3%	49.4%	56.4%	39.4%	43.8%
HQ Net sales ('000)*	0.0	0.3	0.4	0.5	0.6	0.7	0.8	1.0	4.3	4.0
HQ Gross sales ('000)	44.1	59.9	76.1	92.9	78.2	95.7	114.0	132.9	693.8	589.8
Revised Target										
Revised Gross mkt share	21.5%	29%	39%	49%	45%	55%	64%	73%	47%	54%
Revised Net mkt share	0.0%	0.1%	3.3%	6.7%	10.0%	12.5%	15.0%	16.5%	8.3%	10.8%
Revised Net sales ('000)	0.0	0.3	7.1	14.5	22.2	28.3	34.6	38.9	145.9	145.6
Revised Gross sales ('000)	44.1	59.9	82.8	107.0	99.9	123.4	147.8	170.7	835.4	731.5
* We assume Hydro-Québec's target involves 300 units in 2004 and 23% annual growth thereafter (total 4251 by 2010).										
⁺ By federal regulation, minimum efficiency of clothes driers sold in Canada will increase in 2007. We assume that the Energy Star label will simultaneously increase its efficiency requirements, though by a smaller margin (see text below).										

As can be seen in this table, a reasonable Hydro-Québec effort should result in cumulative net sales, above the market baseline, of nearly 150,000 energy efficient clothes washers by 2010, or 10.8% market share. This compares to Hydro-Québec's target of slightly more than 4,000, or 0.3% market share. The difference is illustrated in Figure 3 below.

Figure 3. ES Clothes Washers: Baseline, Hydro-Québec Market Share and Revised



Legend: Grey bars = naturally occurring ES market share (baseline). Blue bars = assumed market penetration after the PGEE, according to Hydro-Québec's targets. Orange bars = market penetration from a reasonable PGEE effort.

Conversely, while Hydro-Québec suggests per-unit savings of nearly 600 kWh/year, we believe actual savings will be significantly *lower*. Specifically, we assume savings of 421 kWh/year until new regulations come into place in 2007, and 163 kWh/year thereafter. Table 12 presents the net energy impact of our adjustments to market penetration (higher) and energy savings (lower).

Table 12. MC/ES Program: Hydro-Québec Washer Savings Forecast and Revised										
	2003	2004	2005	2006	2007	2008	2009	2010	2003-2010	2005-2010
HQ net unit sales ('000)	0	0	0	0	1	1	1	1	4	4
HQ net new savings (GWh/yr)	0	0	0	0	0	0	1	1	3	2
HQ net cum. savings (GWh/yr)	0	0	0	1	1	1	2	3	8	8
Revised net unit sales ('000)	0	0	7	15	22	28	35	39	146	146
Revised net new savings (GWh/yr)	0	0	3	6	4	5	6	6	29	29
Revised net cum. savings (GWh/yr)	0	0	3	9	13	17	23	29	95	95

As can be seen, Hydro-Québec's implicit assumptions regarding the savings to be obtained through *Energy Star* clothes washers are out of step with what a reasonable program effort should achieve. As with the CFL example earlier, while we did not set out to review the reasonableness of savings and participant assumptions, we feel it is necessary to do so when understatements (or overstatements) are so significant as to pose a risk to successful program implementation. In the case of clothes washers, setting a net market share target in the range of 40 times less than what is reasonably achievable would hinder both the Régie's – and the program manager's – ability to effectively measure success and adjust program strategies in due course.

Recommendation: Reject Hydro-Québec's targets for net *Energy Star* clothes washer sales, and adopt targets of at least 10% attributable market share (above baseline sales) by 2007 and 16.5% by 2010.

Other appliances and SEHA

Hydro-Québec's testimony reveals an implicit target of less than 10 GWh/year savings for all appliance measures combined by 2010. We recall that we believe that *clothes washers alone* should generate nearly 30 GWh/year by that same date.

According to the data presented previously, *Energy Star* certified models seem to have penetrated the refrigerator and dishwasher markets more significantly than for clothes washers. However, to the extent market transformation has occurred, Hydro-Québec should set its sights on "raising the bar" to higher efficiency levels.

Hydro-Québec has indicated in its testimony that it recently begun the process to becoming a member in full standing of the Consortium for Energy Efficiency (CEE). This is a positive development. The CEE has recently been developing a second tier of efficiency levels for precisely the reason noted above. This second tier, known as SEHA (for *Super Efficient Household Appliances*) will raise the bar and allow utilities where ES products have achieved significant market penetration to switch their efforts to a higher level.

We have not reviewed the extent to which Hydro-Québec could achieve additional savings based on new SEHA standards. However, we strongly encourage Hydro-Québec to investigate this opportunity with the CEE, and report back to the Régie in its next filing.

Recommendation: Investigate opportunities for encouraging market adoption of SEHA Tier-2 appliances, and provide analysis of these opportunities in next year's regulatory filing.

Market strategies

Hydro-Québec provides no information as to the strategies it intends to deploy in order to increase sales of efficient appliances.

Much of the discussion we noted earlier regarding CFLs applies to the appliances market. Specifically, appliances share similar market barriers with CFLs, and to a large extent, the same market actors are involved. As such, the combination of standard rebates covering the majority of incremental costs, and temporary joint promotions involving larger retailers and manufacturers, previously proposed for CFLs, should also be retained for efficient appliance efforts.

One notable difference between appliances and CFLs, however, is the role and influence of front-line sales staff. Indeed, sales staff can influence consumer appliance purchase decisions significantly, which is why in addition to rebates and joint promotions, best practice suggests that a third tool should be used – the “sales person incentive factory funded”, or *spiffs*.

Spiffs are a common marketing tool aimed at a key but otherwise neglected market player: the salesperson. In fact, *spiffs* provide incentives directly to frontline sales staff for sales of a given product. *Spiffs* have been used to great success in a number of energy efficient appliance programs. For example:

- > **In the Northwest U.S.**, \$10/unit *spiffs* were used very successfully by the *Northwest Energy Efficiency Alliance*, in conjunction with a full suite of other marketing strategies, to transform the market for efficient clothes washers. In the three years *spiffs* were used, NEEA doubled the market share of *Energy Star* washers throughout the four states of the northwest (a region similar in population / economic clout to Québec). By 2003, *Energy Star* clothes washers already represented 43% of all washers sold on the northwest market.
- > **In British Columbia**, a six-month real-world experiment allowed analysts to compare the effects of efficient appliance promotions with and without *spiffs*. The experiment included full-scale promotional efforts aimed at sales of efficient refrigerators (with *spiffs*), clothes washers (with *spiffs*) and clothes driers (advertising only). Using econometric models, the analysis concluded that *spiffs* led to significant increases in sales of efficient fridges and washers. On the other hand, the *spiff*-free clothes washer promotion was judged to have produced zero net impact on sales of efficient models.⁷³

By providing incentives to a key though otherwise neglected market player, *spiffs* offer an excellent opportunity for moving increased sales of efficient models. They should

⁷³ Habart, Jack, J. Kelly, I. Sulyma and K. Tiedemann, “Impacts of an Energy Star Promotion”, in *Proceedings of the 2004 American Council for an Energy Efficient Economy Summer Study*, 2004, 2.140-2.151.

be used to complement standard rebates and temporary joint promotions, as well as other marketing strategies not discussed here.⁷⁴

Recommendation: Build the efficient appliances effort around a combination of standard rebates, joint promotions and salesperson incentives.

vii. Discussion – Efficient windows (new)

We were surprised to see in its initial testimony that Hydro-Québec had not proposed to include efficient windows in its *Energy Star* program. Efficient *Energy Star* windows offer a considerable energy savings opportunity for Québec. In fact, in previous work on this question, we estimated short-term achievable cost-effective savings from an efficient windows effort at 185 GWh/year within 8 years.⁷⁵ Given more recent estimates of the current market share of efficient windows in Québec, savings could be higher.⁷⁶ With Québec's cold climate and high electric space heat saturation, efficient windows should play a major role in Hydro-Québec's MC/ES program.

Upon review of its responses to our clients' interrogatories, we now understand that Hydro-Québec is open to including a windows initiative as part of its *Mieux consommer / Energy Star* program.⁷⁷

The windows replacement and new construction markets are affected by first cost, capital and information-related barriers.⁷⁸ Furthermore, they involve four key players – consumers, retailers, manufacturers and home builders.

The best practice model for efficient windows programs is the Pacific Northwest, where the *Northwest Energy Efficiency Alliance* achieved 75% market share within a few years of aggressive, supply-side efforts. The NEEA effort was focused *entirely* upstream at the manufacturing level, and comprised the following key features:

⁷⁴ Other strategies include offering salesperson training and designing/distributing promotional materials.

⁷⁵ Eric Belliveau, C. Neme, J. Plunkett and P. Dunsky, *Opportunities for Accelerated Electrical Energy Efficiency in Québec: 2005-2012*, submitted as evidence in Régie de l'énergie Case Docket R-3526-2004, revised version dated May 16th, 2004. Available at http://www.regie-energie.qc.ca/audiences/3526-04/MemoiresParticip3526/Memoire_RegroupExpertEfficaciteEnergetique_Rev_17mai04.pdf.

⁷⁶ We previously assumed 35% baseline market share in 2005. However, Hydro-Québec has indicated that it considers the baseline to be 25% (HQD-5, doc. 3, p. 8), whereas the *Association des industries de produits verriers et de fenestration du Québec* considers it to be a fair bit lower. Although net savings may be lower if new construction building codes are adopted as hoped for by Hydro-Québec, most of the windows market is likely in replacement, not new construction (HQD-5, doc. 3, p. 3-5).

⁷⁷ See HQD-5, doc. 3, p. 7-12.

⁷⁸ We do not suggest targeting retrofit markets, as the costs would likely be prohibitive in most cases.

- > Extensive and regular outreach to manufacturers and retailers with dedicated field staff – to recruit them into the program, obtain regular feedback and sales data, provide sales training on how to sell efficient windows to consumers, support placement of point-of-purchase marketing materials, etc.
- > Co-op advertising with leading manufacturers and retailers, including a focus on “market hungry” manufacturers
- > Technical assistance to manufacturers on window design and production processes for producing them cost-effectively

The NEEA program achieved market transformation without the use of incentives. This resulted in extremely cost-effective savings. If Hydro-Québec were to pursue the same approach, we previously estimated that savings could be achieved for less than 1¢/kWh. Alternatively, to the extent Hydro-Québec chooses not to launch an aggressive technical assistance effort, it should consider providing upstream production incentives to manufacturers and/or builders, in addition to adopting the outreach and co-op advertising strategies noted in the first two points above.

Finally, we note that Hydro-Québec has indicated that windows may be included in the regulatory revision it is working at. While a regulatory revision is ideal, its *possibility* should in no way hinder development of an efficient windows program, which could either enable regulatory adoption or move the efficiency targets forward even further.

Recommendation: Immediately develop an efficient windows initiative as part of the MC/ES programme. This initiative should focus simultaneously on upstream collaboration with – and incentives to – the windows manufacturing industry, and sales-end promotions at the retail level.

viii. Discussion – Efficient computer power supplies (new)

Computer power supplies consume a surprising amount of energy. A typical desktop computer consumes about 340 kWh/year (home and office average), while stand-alone servers can consume upwards of 1000 kWh/year.⁷⁹ Of this energy, 30-45% is lost through inefficient power supplies. Power supplies thus offer an opportunity for considerable energy savings.

Recently, a continent-wide program was launched to capture this opportunity for energy efficiency gains. The “80+” program is aimed at transforming the power supply market for desktop and stand-alone servers from current standards to 80%-or-higher

⁷⁹ By comparison, a typical refrigerator might consume ~650 kWh/yr.

efficient power supplies. These power supplies will save on average more than 80 kWh/year per desktop and 300 kWh/year per server. Given extremely fast computer rollover, transformation on the supply side can lead to 100% market penetration within four years.

In Québec, we estimate computer sales of approximately 1.3 million desktops and 50,000 servers per year. Transforming this market from current standards represents an opportunity for nearly 500 GWh/year savings for Hydro-Québec.

The 80+ program has adopted a five-pronged strategy:⁸⁰

- > Have utilities commit to providing incentives to upstream market participants via the program administrator (Ecos Consulting). Incentives are set at \$5 for efficient desktop power supplies and \$10 for efficient stand-alone servers;
- > Use the pull of incentives to encourage computer makers to require their suppliers to ship qualified, high-efficiency power supply units;
- > Simultaneously have large organizations (governments, corporations) signal their intention to write 80% efficiencies into their future procurement specs;
- > Through these pull strategies, encourage power supply manufacturers to develop and commercialize 80%+ efficient units; and
- > Through the combination of the above strategies, create an “on-the-ground” reality that will influence the next Energy Star specifications round. This round will determine the efficiency standard for power supply units starting in 2006/07.

Progress to date has been considerable. A number of utilities, including all four California utilities, Efficiency Vermont, National Grid, Nstar and others, have committed to providing incentives to 80+ sales. Recently discussions have begun with several large corporations toward including 80+ in their computer procurement specs, while the U.S. government’s *Federal Energy Management Program* has advised all government agencies to do the same. Significantly, positive discussions now appear to be underway with a leading computer manufacturer. Finally, the first 80+ qualified power supply has now passed independent EPRI-PEAC testing and is commercially available.⁸¹

The 80+ program is a unique opportunity for Hydro-Québec to join with leading North American utilities in transforming the market for energy efficient power supplies. This is a very near-term possibility with a small window of opportunity – if enough leading utilities offer the incentives for short-term sales, it is likely to result in permanent market transformation.

⁸⁰ Discussions with Sam Sirkin, Program Development Director, Ecos Consulting, 2004 and 2005.

⁸¹ Announced on February 16th, 2005 jointly by Ecos and Sea Sonic Electronics Corporation of Taipei.

We reviewed this program⁸² and find that the cost, risk and hassle to Hydro-Québec of joining are minimal to nil.

- > *No hassle:* This is a turnkey project through which Hydro-Québec need only join its name to other sponsors. Indeed, the program administrator, Ecos Consulting, is offering to do all of the upstream sales/negotiating work as well as arrange data collection and incentive processing. Hydro-Québec merely commits and pays for actual savings.
- > *No risk:* Hydro-Québec would assume no risk in joining this program – all payments, fixed and variable, are *conditional* on the program achieving actual, short-term energy savings in Hydro-Québec's service territory. To the extent the program does not succeed, Hydro-Québec bears no cost and can redirect the allotted budget to other program areas. Since this is scheduled as a very short-term program with a near-term exit, there is no risk of tying up budgets unnecessarily for significant periods of time.
- > *Low-cost:* Finally, if the program does succeed, it will prove a tremendously cost-effective program for Hydro-Québec. Program costs are divided into fixed and variable fees. For fixed fees, Hydro-Québec's share would be approximately \$35,000 USD.⁸³ The variable fees, as mentioned previously, are comprised solely of incentives to upstream manufacturers and administration fees. Total variable fees would amount to \$8.50/desktop and \$13.50/server.

Given these fees, assuming the program achieves 3% penetration in its first year in Québec, it would cost Hydro-Québec roughly 3¢/kWh for the first year's savings. However, far more important is the market transformative effect it could have at the level of redefining the Energy Star specs. Recall that after this first year, the program ends and market transformation picks up. If we assume for example that the program influences the Energy Star specs upwards by 30 kWh/year/unit (desktops) and 130 kWh/yr/unit (servers), we estimate that the resulting market transformation would provide Hydro-Québec with recurring savings of 300 GWh/year thereafter. *These savings are free.*

In other words, there are by and large three scenarios for this program:

- > **Scenario 1:** Program fails, no savings are achieved and the cost to Hydro-Québec is nil.
- > **Scenario 2:** Program succeeds in first year, but fails at achieving transformative effects on the market. As a result, Hydro-Québec pays 3¢/kWh for minimal savings spread over 4 years.

⁸² Ecos Consulting, *80 Plus Program Utility Prospectus*, November 2004 and follow-up discussions.

⁸³ This is based on a flat \$5k fee and an additional fee of 1¢/meter served.

- > **Scenario 3:** Program succeeds in first year *and* transforms the market by influencing Energy Star specs. As a result, Hydro-Québec acquires some 300 GWh/year savings at infinitesimal cost (~0.00005¢/kWh lifetime).

This is a win-win, turnkey project that offers both the *possibility* of significant savings and *protection* in case such savings fail to materialize. Hydro-Québec should immediately commit to it.

Recommendation: Immediately commit to the 80+ efficient computer power supply program.

ix. Discussion – Other opportunities

It is important to note that the breadth of energy efficient equipment is not limited to *Energy Star* approved products, nor is the *Mieux Consommer* label comprehensive in its coverage.

The market for energy efficient products is a dynamic one, with a fairly regular stream of new entrants. These are the results of ongoing technological innovations and developments, either stand-alone, or encouraged by upstream efficiency programs (like the IDEÉ and PISTE programs Hydro-Québec has proposed – see page 137). In addition to products discussed previously, one particularly valuable energy efficient product not listed in Hydro-Québec's testimony is greywater heat recovery systems (commonly known as GFX). GFX systems are now being commercially produced at competitive prices, and offer the potential for considerable, cost-effective energy savings. Other products not listed include passive solar hot water systems, infrared halogens, solar/LED-based outdoor lighting, snap ducts, spray-in duct sealers, efficient hotel card keys and low-watt standby power systems for appliances, to name but these. As technological improvements continue, new opportunities will also appear.

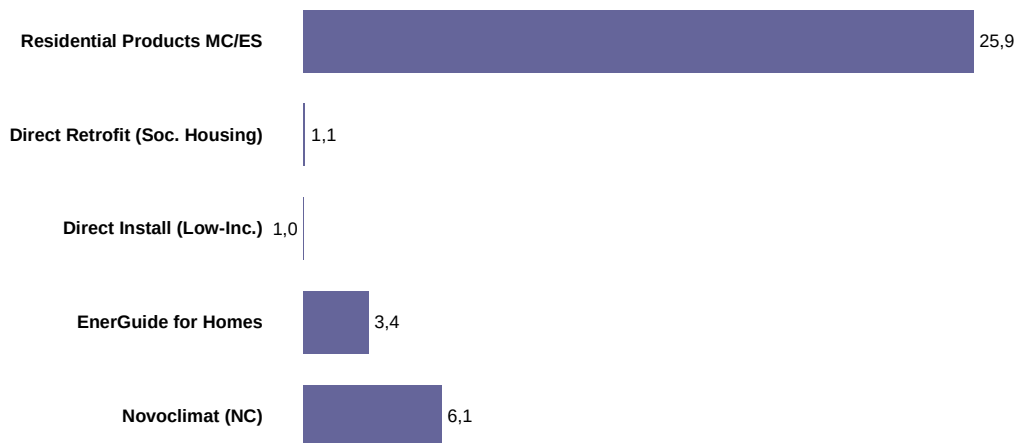
The introduction of new efficiency products into the market is a dynamic process. It cannot be expected of Hydro-Québec that every single energy efficient product be integrated immediately into its MC/ES program. However, the utility will need to develop internal processes able to ensure continuous watch and updating of the full list of products eligible for its MC/ES program. This process will require staff to keep abreast of ongoing developments and regularly revamp its labelling and incentive components as a result.

Recommendation: Integrate a continuous labelling and incentive update process with an aim to capturing opportunities from new efficient products as they arise.

x. Conclusions and Recommendations

Hydro-Québec's decision to add the MC/ES Products Promotion program to its portfolio of residential programs should be commended. Indeed, many of these products offer very high efficiency opportunities at very low cost and, furthermore, can be acquired with relative ease. Figure 4 illustrates the extent of the cost-effectiveness of this program, as measured by the ratio of societal energy benefits to non-participant costs.

Figure 4. TRC/NP Ratios for Hydro-Québec's "Hard" Residential Programs



Note: TRC (TCTR in French) stands for Total Resource Cost test, and is the time-discounted sum of benefits minus costs over the program's life. It is an imperfect representation of society's interest in the program (it neglects many benefits including environmental and, often, non-energy economic benefits). The NP (TNT in French) stands for Non-Participant test (or "RIM" test), and is the net cost to non-participants only. This ratio does not in and of itself indicate the value of a program, but illustrates the relative value of a series of programs by comparing the extent of their benefit to consumers as a whole (notwithstanding environmental and other benefits) to their cost to certain individual consumers. In economic terms, it may be considered the ratio of economic efficiency benefits / equity concerns.

It is precisely because of these characteristics that Hydro-Québec needs to be more affirmative and aggressive in its approach to this market. Specifically, this means moving away from its stated position that this program is primarily an "awareness" program and instead, adopting a suite of measures, including rebates, temporary joint promotions and salesperson incentives, aimed at maximizing acquired energy savings. This needs to be made explicit, including for lighting and clothes washer opportunities.

Furthermore, while we did not set out to review Hydro-Québec's market penetration and savings forecasts, we are concerned that targets set for CFLs and clothes washers, at least, are so excessively low as to undermine the program's chance of success. More reasonable targets need to be defined so that the Régie, intervenors and program managers are able to measure performance and adjust strategies

appropriately. Also, Hydro-Québec should investigate opportunities for bringing appliances to a higher efficiency level, based on the CEE's SEHA Tier-2 standards.

The program's coverage needs to be adjusted. On the one hand, an efficient products program in Québec cannot be complete without addressing the *replacement* market for efficient, Energy Star windows. And on the other hand, geothermal heat pumps, which face completely different market players and barriers, should be separated out from this program and dealt with distinctly.

Finally, Hydro-Québec should capitalize on a turnkey, risk-free North American program aimed at transforming the computer power supply market by immediately joining the program.

We believe these changes will improve the program's chance at success and, furthermore, produce far greater savings than those projected by Hydro-Québec, at limited cost.

7. Super-Efficient Heat Pumps Program (new)

i. Introduction

Heat pumps have long offered the promise of significant energy savings. Whether air-source or ground-source (“geothermal”), heat pumps can capture “free” energy to supplement or replace conventional heating and cooling systems. As such, heat pump systems serve heating and cooling loads far more efficiently than baseboard or other electric heating units.

ii. Geothermal heat pumps

In Canada, certified geothermal systems achieve coefficients of performance (COP) of between 2.8 and 4.0, meaning that they are roughly 3-4 times more efficient than electric baseboard heating. With these efficiencies, geothermal heat pumps can be considered the “gold standard” of heat pumps from an efficiency standpoint.

Concomitantly, geothermal heat pump systems are costly. Total system costs for a residential unit may fall in the range of \$15,000 or more, with incremental costs falling in the range of \$7,000 to \$12,000. From a TRC perspective, this results in energy saving costs in the range of 5¢ to 9¢/kWh, as compared with 10¢ avoided costs.⁸⁴

In North America, recent years have seen a surge in interest for geothermal systems, largely in step with the resurgent interest in energy efficiency as a whole. This has led to a variety of programs aimed at both the demand and supply sides of the industry. In the U.S. alone, incentives for geothermal power are offered by Alabama, Connecticut, Delaware, Florida, Hawaii, Idaho, Illinois, Indiana, Iowa, Maryland, Massachusetts, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Dakota, Oregon, South Carolina, South Dakota and Wyoming. In Canada, Manitoba Hydro has developed a sophisticated and particularly successful program.

Given its high capital cost, geothermal energy is unlikely to achieve significant market penetration in the coming years. However, it can be attractive to a subset of the population, especially given its environmental and home comfort advantages. If designed properly, it can also provide relatively low-cost efficiency savings to Hydro-Québec.

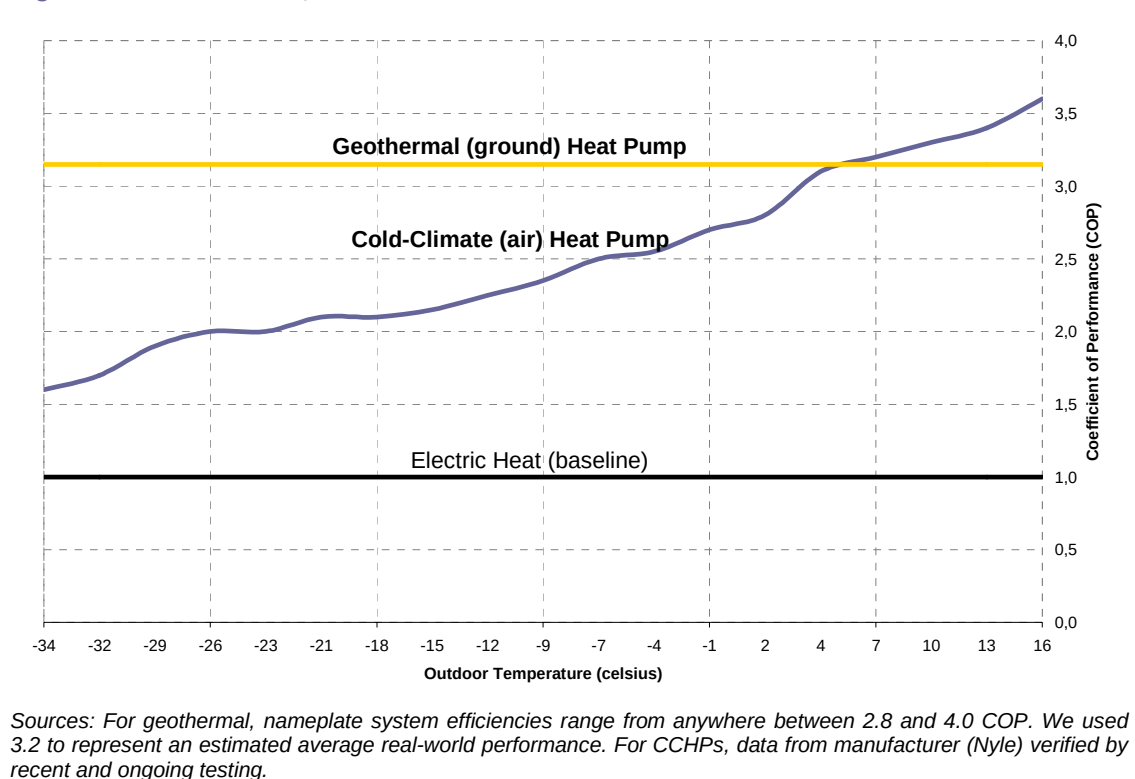
⁸⁴ Avoided cost based on Hydro-Québec’s latest update for heating end-use (9.97¢/kWh for a 30-year measure), as presented to the R-3519-2003 phase 2 working group on energy efficiency potential and submitted in this docket as part of HQD-5, doc. 8.1.

iii. Cold-climate (air) heat pumps

Standard air-source heat pumps have historically been designed for the cooling markets available in hot climates. In fact, they have been designed less as heating units than as reverse cycle cooling units, using a reversing valve to extract whatever residual heat they could. As a result, air-air heat pumps have demonstrated dismal performance at lower temperatures. In fact, most heat pumps cease to provide heat at outdoor air temperatures below -7°C .

Recently, however, new cold-climate heat pump (CCHP) technology has emerged. Designed specifically for climates like Québec, the CCHP integrates a four-stage system that enables extremely high efficiencies in typical winter conditions. In fact, the CCHP boasts a Heating Seasonal Performance Factor (HSPF) of at least 9.6 and a Seasonal Energy Efficiency Rating (SEER) of 16.⁸⁵ Contrary to previous heat pumps, heating efficiencies are significant even at the coolest temperatures, as illustrated below in Figure 5.

Figure 5. Geothermal, CCHP and Electric Heat Performance



⁸⁵ For comparison purposes, Energy Star units in Canada require a SEER rating of 13.

As seen in the previous graph, the CCHP achieves a coefficient of performance (COP) of 2.0 at -25°C. It achieves a COP of 2.5 at -8°C and a COP of 3.0 at 3°C. The system's COP increases to 3.6 at 16°C. Discussions with independent agencies involved in ongoing testing confirm these performance ratings. Furthermore, the CCHP is undergoing continuous improvements. Work being done in conjunction with *Oak Ridge National Laboratories* should further improve system efficiencies within the coming year.

The cold climate heat pump is currently being priced at \$3,625 USD for a 2.5 tonne unit and \$4,600 USD for a 5-tonne unit.⁸⁶ This is comparable with standard heat pump units and very competitive with other non-baseboard electric systems. Because of its much lower capital costs, the CCHP could open up a significantly greater share of the market than is currently available to geothermal heat pumps.

The cold climate heat pump is currently available in limited stock as it undergoes final testing. However, we anticipate it could be available on the Québec market within one or two years depending on Hydro-Québec's interest and strategic approach.

iv. Strategies

Given these developments, we believe Hydro-Québec should launch a "Super-Efficient Heat Pump" program combining advanced air-source heat pumps with geothermal heat pump technology. While the latter is ready immediately and can provide significant *per unit* savings, the former can be brought to market in minimal time and can offer far greater market penetration at far lower cost. As such, the geothermal and air-source heat pumps are complementary options – one providing a high-cost but "gold-standard" efficiency gain, the other a low-cost but still superior efficiency opportunity.

The Super-Efficient Heat Pump program would need to combine both supply- and demand-side efforts, as Hydro-Québec recognizes in its own discussion of the geothermal measure.⁸⁷ Furthermore, a differentiated strategy will be required at the outset in order to account for the different development stages of each technology. Below we address the broad strategies Hydro-Québec should adopt for each technology type.

⁸⁶ Discussion with Dwayne Haloval, Nyle Specialty Products, February 2005.

⁸⁷ See HQD-1, doc. 1, p. 50, where Hydro-Québec suggests a two-tiered strategy rooted in (a) incentives to customers (demand-side) and (b) training, awareness and other efforts to build the supply infrastructure. This is indeed one of the lessons to be learned from Manitoba's highly successful ongoing strategy.

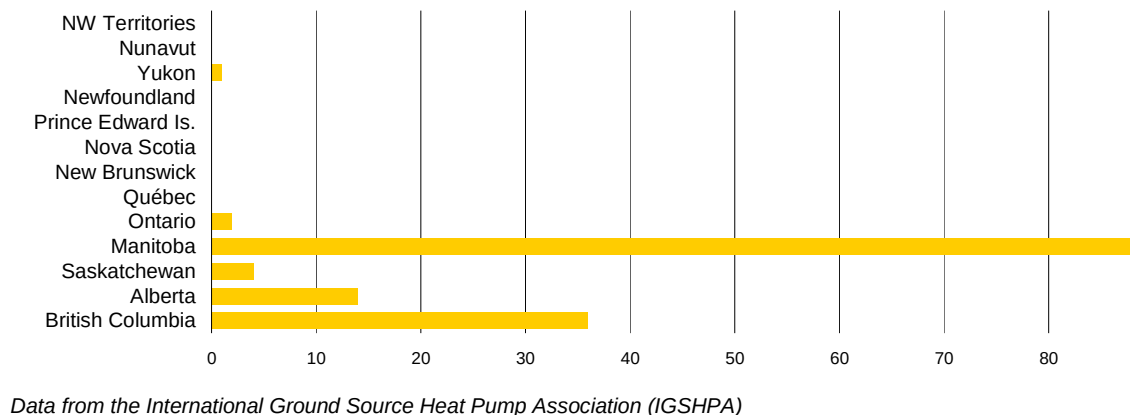
Geothermal strategy

The market for geothermal systems faces a number of significant market barriers. These include high first costs, access to capital, lack of understanding of the long-run savings, the hassle of seeking and finding contractors with the technical knowhow to install geothermal systems and lack of commonly used installation standards.

We support Hydro-Québec's suggestion that an important effort be made at building the supply infrastructure. Indeed, building an ample and qualified supply infrastructure is essential not only to meeting demand but to ensuring quality installations and achievement of rated energy efficiency gains. Failure to develop this infrastructure will impede market development and, ultimately, harm the technology's integrity.⁸⁸

Currently, we understand that Québec has a very weak supply infrastructure. As we show in Figure 6, this contrasts sharply with Manitoba, where serious supply and demand-building efforts have proven very successful.⁸⁹

Figure 6. IGSHPA-Accredited Canadian Geothermal Heat Pump Installers



Clearly, Manitoba's efforts at building the supply infrastructure have borne fruit. Manitoba's strategy, in place since 2001, includes extensive outreach, training (both IGSHPA and HRAI courses), conferences and initial demand-building. Hydro-Québec should examine and model its own effort on the Manitoba example.

⁸⁸ Poor quality installations can reduce real-world efficiency savings dramatically.

⁸⁹ Manitoba is now home to roughly a third of the total Canadian geothermal heat pump market. Interestingly, an effort is currently underway to have geothermal adopted in a 10,000-13,000 home development project, an undertaking that would dramatically increase this province's leadership position in the geothermal market. (*Discussion with Ken Klassen, Natural Resources Canada, February 2005*).

Recommendation: Support Hydro-Québec's proposal to work toward building the geothermal supply infrastructure, and pay particular attention to quality issues.

In tandem with building supply, Hydro-Québec needs to build demand. In the case of geothermal systems, the three primary barriers are first cost, access to capital and performance uncertainty.

Hydro-Québec has proposed to provide capital incentives to reduce the first cost of geothermal systems.⁹⁰ Given the lack of qualified supply infrastructure in Québec, we believe Hydro-Québec should learn from past experience and take a measured approach to this market. Regions that have previously announced significant incentives prior to building up a qualified supply base have experienced a high rate of “fly-by-night” installers, resulting in poor installation, lower than expected savings and lost technical credibility. Those programs tend to boom and bust.

Furthermore, while cash incentives can be useful for addressing the barrier of higher first cost, they do not (unless they cover a significant share of incremental cost) address the important capital barrier.

Addressing the capital barrier in the geothermal market can best be done by offering attractive financing. Furthermore, to the extent bill savings from geothermal systems outweigh their incremental cost, financing can offer consumers a positive cash flow throughout the financing term. Offering positive cash flow can be a significant incentive to customer participation.

it is premature to assess with any certainty actual geothermal market costs. Nonetheless, we have analyzed the potential for using financing based on three current cost estimates: the first is used by *Manitoba Hydro* in its own marketing efforts and the second by *Natural Resources Canada*. The third is based on an estimate currently being considered in the context of Hydro-Québec's efficiency potential working group (draft only). These scenarios are supported by real-world costs reported in Manitoba.⁹¹

Table 13 illustrates the resulting customer cash flow assuming a sample 15-year loan approach using Hydro-Québec's average weighted cost of capital.

⁹⁰ This is clarified in HQD-5, doc. 2, page 9: “*Le Distributeur envisage (...) privilégier l’aide financière sous forme de subvention plutôt que sous forme de financement*”.

⁹¹ Average full system purchase and installation cost for four 3-bedroom, 2-storey, 1100 ft² new construction in-fill bungalows: \$12,640 (UNIES, *Residential Ground Source Heat Pumps on Urban Lots – Performance and Cost Effectiveness*, October 2003). Typical cost for large, >2000 ft² homes: approximately \$17,000 (discussion with Ken Klassen, February 2005).

Table 13. Geothermal 15-year Loan: Cash Flow Analysis for Three Scenarios								
	Size of home (ft ²)	Geo-thermal system	Baseline electric furnace	Net loan amount	Monthly payment	Energy savings (kWh/yr)	Avg. monthly bill savings	Monthly cash flow
Scenario A	2000	17 000 \$	6 700 \$	10 300 \$	(91 \$)	10125	71 \$	(20 \$)
Scenario B	1440	12 800 \$	5 900 \$	6 900 \$	(61 \$)	9450	66 \$	5 \$
Scenario C	1500	15 000 \$	8 000 \$	7 000 \$	(62 \$)	9311	65 \$	3 \$
Scenario A: Manitoba Hydro 2000 ft ² new construction two-storey (cost of baseline and geothermal systems). ⁹² Scenario B: Natural Resources Canada scenario for 1440 ft ² new suburban home. ⁹³ Scenario C: Current estimate for Québec (cost of baseline and geothermal systems). ⁹⁴ All scenarios: Baseline system is forced-air furnace. Hydro-Québec residential electric rate (second tier) growing at 3%/annum. Hydro-Québec financing offered at current WACC of 6.75%. Financing over 15 years.								

Based on these scenarios, we can see that Hydro-Québec financing at its current weighted average cost of capital (WACC) of 6.6% would result in slightly positive cash flow for participants under two of three scenarios, and significant negative cashflow under the high-cost scenario. An interest buy-down could be considered to improve the net cash flow across scenarios.

We also simulated the results, presented in Table 14, of a leasing strategy.

Table 14. Geothermal 30-year Lease: Cash Flow Analysis for Three Scenarios								
	Size of home (ft ²)	Geo-thermal system	Baseline electric furnace	Net lease amount	Monthly payment	Energy savings (kWh/yr)	Avg. monthly bill savings	Monthly cash flow
Scenario A	2000	17 000 \$	6 700 \$	10 300 \$	(67 \$)	10125	71 \$	4 \$
Scenario B	1440	12 800 \$	5 900 \$	6 900 \$	(45 \$)	9450	66 \$	21 \$
Scenario C	1500	15 000 \$	8 000 \$	7 000 \$	(45 \$)	9311	65 \$	20 \$
Notes: Same assumptions as the loan analysis, except 30-year timeframe. This assumes Hydro-Québec financing offered at current WACC of 6.75%. Financing over 30 years.								

This analysis illustrates the tremendous advantage a leasing option could bring to customers interested in geothermal systems. Positive cash flow can be achieved at current Hydro-Québec costs, while interest buy-downs could further increase the system's attractiveness.

While only approximations, these analyses suggest that Hydro-Québec should develop a financing-based approach. Marketing of the financing option should be

⁹² Manitoba Hydro geothermal promotional leaflet.

⁹³ Natural Resources Canada, *Residential Earth Energy Systems: A Buyer's Guide*, 2002, p. 22.

⁹⁴ Based on discussions in the energy efficiency potential working group formed under R-3519-2003.

focused on the combination of positive cash flow for consumers *and* non-energy benefits such as improved comfort, noise reduction and environmental benefit.⁹⁵

We further suggest that while Hydro-Québec could begin by offering financing in the form of a loan, it should ultimately move toward a leasing strategy in order to directly address the third barrier noted above, customer uncertainty regarding the performance of a new technology. Under lease-to-own, Hydro-Québec would assume responsibility for ensuring maintenance. To the extent the lease applies to the loop only, costs to Hydro-Québec would be negligible, and certainly far less than whatever direct incentive the utility is already prepared to offer its customers. In general, the financing approach can offer a better value proposition to customers while allowing the supply infrastructure to be built up. In the short-run, this will minimize the risk of boom-and-bust *and* reduce Hydro-Québec's own program costs.

We note that Manitoba Hydro is also considering moving its current loan strategy to a lease. In fact, at the time of finalizing this report, the utility was on the verge of launching an RFP to examine costing details.⁹⁶

A good lease-based program aims at ensuring that customers net cash flow provides at least 25% of actual energy bill savings. Depending on the results of Manitoba Hydro's cost analysis, Hydro-Québec's loan or lease rate could be at or less than its WACC. Once a quality supply infrastructure is built up, Hydro-Québec could improve its offer by introducing incentives, depending on real-world experience.

Recommendation: Reject Hydro-Québec's proposal to offer direct customer incentives for geothermal systems, and direct it instead to develop financing options – ideally under long-term leases – aimed at positive net cash flow. Reserve the incentive option for future years.

Cold-climate heat pump (CCHP) strategy

Cold-climate heat pumps were launched in 2001 and are only in the process of entering the commercial marketplace. Indeed, sales begun just this past year, including many to utilities interested in monitoring results. Follow-up orders have just recently begun, and the company involved (Nyle Specialty Products) still needs to scale up to deliver units for a mass market.⁹⁷

CCHPs face a number of distinct market barriers. In addition to information and hassle-related barriers, an eventual CCHP market also faces:

⁹⁵ The program's marketing could be focused on a compelling theme such as "*Natural heating and improved comfort... at no additional cost*".

⁹⁶ Discussion with Kristen Pearson, Manitoba Hydro, February 2005.

⁹⁷ Based on discussions with Dwayne Haloval of Nyle Specialty Products (January and February, 2005) and with independent third-party agencies involved in product testing.

- > *Heat pump track record.* Customer experience with heat pumps has not been positive, so there is a lack of trust with a new heat pump product. Trust regarding its cold-climate design must be built.
- > *Installation quality and consistency.* Refrigeration-based system performance is strongly dependent upon successful installation. The new CCHP uses a different refrigerant than most HVAC installers are accustomed to.
- > *Lack of standard testing methodology.* There is no current standard rating system for a quad-compression heat pump, so apples-to-apples comparison with other technologies is difficult, although there are efforts underway to bypass this problem.
- > *Product performance difference.* Customers are not used to lower delivery temperatures. A furnace provides 66°C supply air, while the CCHP provides a constant temperature with slower recovery.

Given the CCHP's current development stage, it would be inappropriate for Hydro-Québec to rush into a full-scale program at this time. However, given the extent of potential savings (on the order of 10,000 kWh/year/household) and the very low costs involved, Hydro-Québec should immediately enter into discussions with manufacturers with a view to developing a full-fledged program within 2-3 years. Doing so should be made a priority for Hydro-Québec.

In the interim, we believe Hydro-Québec should adopt a multi-pronged strategy:

- > **Join with other interested utilities**, including B.C. Hydro and N.B. Power, in obtaining monitoring data from current cold-climate installations.
- > **Provide R&D support** aimed at continuous product improvement (current efforts are aimed at zero defrost coils, enhanced fan efficiency and increasing size variability).
- > **Launch a contractor enrollment and training program** aimed at HVAC installers. This is particularly important because the CCHP units use a new CFC-free refrigerant that most HVAC installers are not accustomed to, and because performance is highly dependent on proper unit installation. Getting HVAC installer buy-in and quality control will be essential to the program's – and technology's – success.
- > **Launch a pilot project** with the goal of installing 1,000-2,000 units in various locations throughout Québec. This volume can be manufactured quickly and will help both to prepare the market (establish a proven track record) and to generate interest among HVAC installers. A relatively small coop in Idaho recently purchased 1,000 units for a pilot. Other utilities have shown similar interest.

- > **Enable discussions with Québec manufacturers** to facilitate technology transfer to Québec for mass market manufacturing within a three year timeframe.

A cold-climate heat pump initiative could provide Hydro-Québec with considerably more savings than all of its current residential sector programs combined.⁹⁸ Furthermore, it can prove to be a far more attractive value proposition than geothermal heat pumps themselves. We urge Hydro-Québec to aggressively address this efficiency opportunity with a view to launching a full-scale market deployment program by 2007/08.

Recommendation: Adopt the five-pronged strategy indicated above with a view to launching a full-scale cold-climate heat pump deployment program by 2007/08.

Quality control

Finally, it is worth repeating that heat pump performance can vary greatly depending on proper installation. In fact, studies have shown that heat pump installation problems can be rampant. This applies both to geothermal and cold climate heat pumps.

A proper strategic approach to generating savings from advanced heat pump technologies is to focus on quality. While we indicated earlier the need for an HVAC contractor enrollment and training program for the CCHP, we further believe that Hydro-Québec should integrate a quality control component to *both* its heat pump initiatives.

This quality control component should involve new tools available on the market to verify proper installation. Several firms now offer such tools, including Honeywell and Proctor Engineering. These tools typically link gages into Palm Pilots in order to measure live pressures and temperatures immediately following installation. The tools immediate results in terms of actual versus nameplate operating efficiency. They further propose a list of adjustments the contractor can make to correct detected problems and ensure installation is up to standard.

Recommendation: Integrate a quality control component using new diagnostic tools to ensure proper heat pump installation, and make incentives conditional upon diagnostic results.

⁹⁸ As a rough calculation, assuming cold-climate heat pumps achieve a 5% market penetration in Québec, energy savings would be on the order of 1.5 TWh/year, or 50% more than Hydro-Québec's targets for the sum of its residential sector programs.

v. Conclusions and Recommendations

Geothermal and cold-climate heat pumps both offer significant opportunities for energy savings in a region like Québec. Furthermore, because of their different cost and efficiency characteristics, they combine to form a complementary set of options for different customer situations.

In order to acquire these savings, Hydro-Québec should launch a “Super-Efficient Heat Pumps” program comprised of:

- > A contractor enrollment and training program aimed at building a solid and quality supply infrastructure for both geothermal and CCHP systems;
- > A lease-to-own program for geothermal systems structured to provide positive cash flow and marketed based on cash flow and non-energy benefits, with capital grants reserved for future years;
- > A pilot project aimed at installing between 1,000 and 2,000 CCHP units in various regions of Québec;
- > A quality control component using new hand-held diagnostic tools and linking incentives to results; and
- > Additional measures (see text) aimed at facilitating production of CCHP units in Québec and launching of a full-scale CCHP deployment program as of 2007.

We believe this dual-technology approach will harness maximum efficiency gains while minimizing overall program costs.

| e | Program Review – CI & SMI

1. CI Buildings Initiatives

i. Introduction

Commercial and institutional buildings present significant energy efficiency opportunities. A variety of C&I energy efficiency programs have been implemented over the past decades, with varying degrees of success. However, the most successful programs are rooted in an understanding not only of the sector's efficiency opportunities, but equally of its inherent barriers and decision-making processes.

Programs aimed at this sector can include infrastructure support (information and training, for example, or use of circuit riders), measure-based approaches (including direct installation or prescriptive incentives), and comprehensive approaches (financing, standard offers, competitive solicitations). A combination of the above strategies is usually required to reach the full breadth of market actors in this very diverse “sector”.

ii. Hydro-Québec's previous version

Hydro-Québec's previous PGEÉ included a standard offer *Initiatives* program that included much lower incentive levels. Specifically, existing buildings could apply for incentives of 10¢ per annual kWh for the first 10% of energy savings, and 25¢ for subsequent savings. In new construction, the same incentives applied but the interim threshold was 15% instead of 10%. The initial program also included total incentive caps and a small grant to cover 10% of the cost of preparing an incentive request.

In the Spring of 2004, we reviewed this program and expressed serious doubt as to its efficacy in encouraging comprehensive efficiency gains. Specifically, we indicated that the program failed to address pervasive market barriers (vendor stocking, engineer/architect/building operator training, etc.). We also indicated that the incentive levels were far too low to encourage meaningful changes, and that in addition to leading to cream skimming, this would also result in unnecessarily high free ridership. Finally, we made clear that the program neglected lost opportunity markets as well as small commercial customers.

We therefore proposed increasing incentives considerably, adopting a broader range of strategies to overcome market barriers and adding a prescriptive rebate program.

iii. Hydro-Québec's current proposal

In Hydro-Québec's latest plan, great strides have been made toward recognizing many of the barriers and intervention strategies necessary in the commercial and institutional market. The guidelines put forth in the plan include graduated incentives that aim at rewarding customers for increased levels of efficiency. Hydro-Québec is also proposing to increase its second-tier incentives from 25¢/kWh_a to 30¢/kWh_a for most buildings and 45¢/kWh_a for provincial and municipal sector buildings. Furthermore, a third tier is added, providing, respectively 55¢/kWh_a and 85¢/kWh_a at the margin for "regular" and provincial/municipal sector customers. The higher levels offered to the public sector (non-Federal) are aimed at enabling governments to assume a leadership role.

In addition to the increased levels of the standard incentive offer, the total that any one project can receive has increased from \$150,000 to \$500,000 for both existing buildings and new construction, providing that the incentive for existing buildings be no more than 40% of the eligible costs (50% for public sector). Hydro-Québec has also increased its grant for preparing an incentive request from 10% to 50% of the cost. Finally, Hydro-Québec is offering to pay 50% of the cost of feasibility studies up to a maximum of \$7,500.

As a result of these changes, Hydro-Québec is forecasting program-related savings of 464 GWh/year, up from last year's target of 325 GWh/year.

iv. Discussion – Overview

These program changes represent a good faith response to the concerns we presented in the Spring. Indeed, a number of these changes either succeed or go in the right direction toward correcting initial problems and ensuring improved program performance. Nonetheless, our analysis of Hydro-Québec's incentives suggests there remains considerable room for improvement.

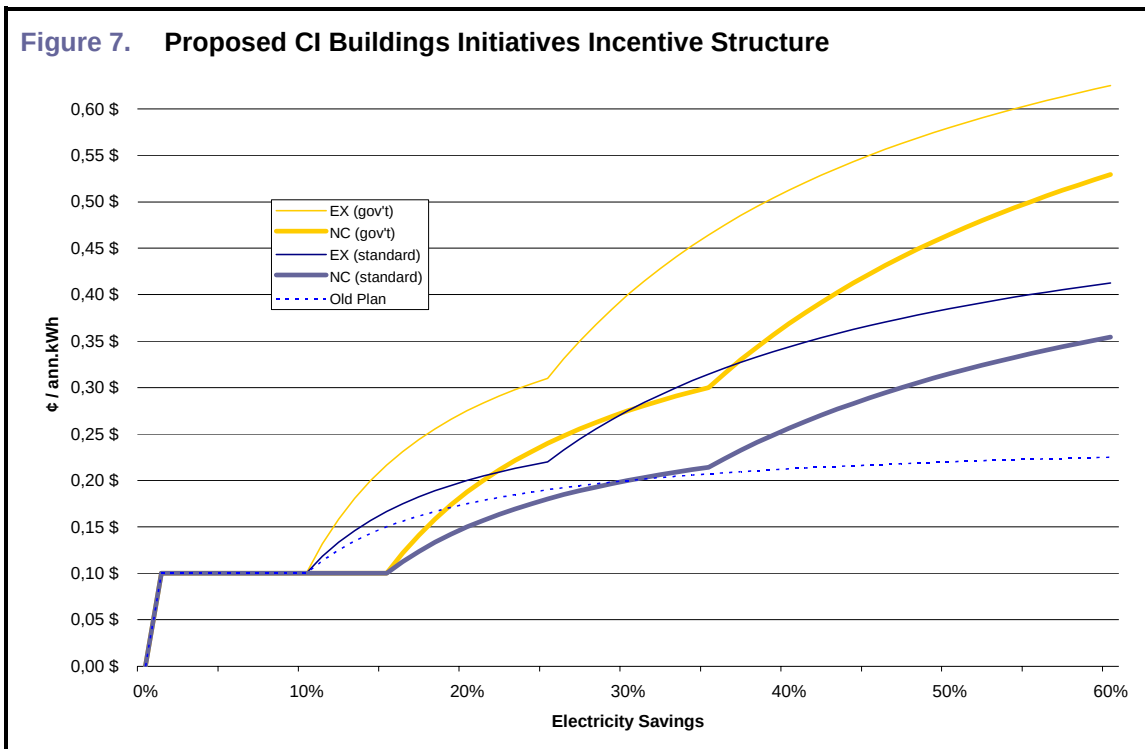
In this section we recommend strategies that Hydro-Québec should consider to strengthen its current offering by interacting more seamlessly with all market segments. Interacting more seamlessly means removing the barriers that customers have in reaching the program or qualifying for program incentives. It means making sure incentive structures send the right message to push customers toward increasing their investment in energy efficiency and making programs inviting to not only large, but small customers as well. We explore each of these program design issues below.

v. Discussion – Mass market incentives

In the latest edition of its C&I Initiatives program, Hydro-Québec has increased the level of incentive offered to all potential participants. The incentive levels have been raised in each of the four building categories: Government – new construction, Government – Existing, Other – New Construction and Other - Existing.

The result is a sliding scale that appears, at first glance, to strongly encourage “deep” efficiency gains, as can be seen in Figure 7.

Figure 7. Proposed CI Buildings Initiatives Incentive Structure



Incentive levels

We understand that Hydro-Québec’s stated goal is to enable clients to achieve 25% savings on new construction projects and 10% on retrofits relative to the *Model National Energy Code for Buildings* (MNECB) standards.⁹⁹ We also understand that Hydro-Québec has designed its incentive levels and structure with an aim to covering

⁹⁹ See HQD-1, doc. 1, p. 56.

roughly 50% of incremental costs for “regular” customers and 75% of incremental costs for public sector customers.¹⁰⁰

We believe that covering 50%-75% of incremental costs for comprehensive projects constitutes a reasonable target. We also agree with Hydro-Québec's aim of encouraging projects at the LEED level, i.e. respectively 25% and 10% above the MNECB for new construction and retrofit projects, at least as a minimum.

However, translating Hydro-Québec's percent of costs *principle* into a ¢/kWh incentive structure is easier said than done. This is because incremental costs can differ tremendously from project to project. The result is likely to be overpayment to some customer projects, and underpayment (or more likely, non-participation) by others.

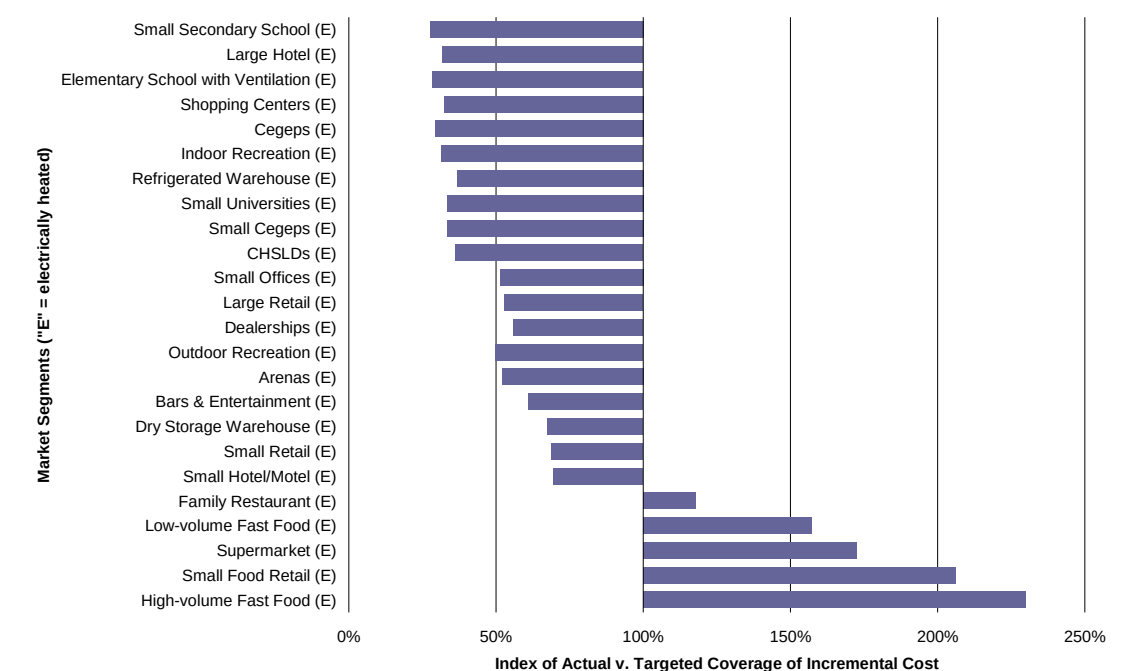
Using Hydro-Québec's data, we assessed the ability of the current incentive structure to achieve Hydro-Québec's own stated goals of covering 50% and 75% of incremental costs for bringing the new construction market to twenty-five percent above the Model National Energy Code for Buildings. However, instead of applying the principle to Hydro-Québec's customers *in aggregate*, we applied it to individual market segments, thus to the type of real-world projects that Hydro-Québec's PGEÉ will be attempting to influence.¹⁰¹

Figure 8 presents the results of this segmented analysis. The horizontal axis shows the ratio of Hydro-Québec's actual share of incremental costs, under its proposed incentive, to its targeted share. For example, if Hydro-Québec's principle is to cover 50% of incremental costs, and instead its incentive covers 100% of incremental costs, the result is a 2:1 – or “200%” – ratio. A 100% ratio indicates that their incentive structure achieves precisely their stated principle.

¹⁰⁰ See HQD-5, doc. 8, pages 34-35.

¹⁰¹ We excluded market segments for which the measure has not been deemed cost-effective (by Hydro-Québec's own consultants) from a TRC standpoint.

Figure 8. Buildings Initiatives Incentives: Actual vs. Target Share of Incremental Cost



100% = Hydro-Québec's stated target.

Based on the incremental costs of achieving MNECB+25% in each market segment.

As can be seen, what seemed like a progressive incentive structure aimed at a reasonable goal of covering half or three-quarters of incremental costs, in fact proves to be a blunt instrument that either over- or under-shoots its target considerably.

For example, whereas Hydro-Québec is aiming to cover 75% of the incremental costs of ensuring that new schools are built to MNECB+25% standards, the incentive levels and structure adopted would actually see Hydro-Québec cover only 28-33% of these costs depending on whether the projects involve elementary schools, small secondary schools, CEGEPs or universities. In fact, Hydro-Québec's actual incentive would cover barely a third of what it is meant to cover. As a result, these schools would be far less likely to participate.

Conversely, let us examine the other end of the spectrum. Here, we see that while Hydro-Québec's stated goal is to cover 50% of the project's incremental costs, its incentives are in fact much higher. Take for example a McDonald's (high-volume fast-food outlets): in this case, Hydro-Québec's incentive could pay for 115% of the project's incremental efficiency cost, thus paying the full amount *and* providing the company a bonus, non-energy related subsidy.

By and large the majority of market segments would be offered incentives that are more or less 50% lower than Hydro-Québec's stated goal.

The point of this analysis is to illustrate the extreme difficulty in attempting to translate the valid goal of covering a set share of incremental costs, into a ¢/kWh incentive structure. While Hydro-Québec's proposed incentives may, in the aggregate, achieve their target, in practice the aggregate doesn't matter – only individual projects do.

It is also important to understand that *offering* an industry-wide average incentive will not lead to *providing* that same average. Because the actual share of incremental costs varies so tremendously, one can assume that most customers on the lower end of the *relative* incentive scale will not participate, whereas a significant share of those on the higher end will. In practice, this will result in both less savings than anticipated *and* wasted financial resources.

We believe that Hydro-Québec has made an honest effort at improving its incentive level to cover a reasonable share of incremental costs, and we further support the underlying principle. However, we believe that its proposed structure will in practice be incapable of meeting that principle, and should therefore be reformed. We will address our proposed reform further in this discussion.

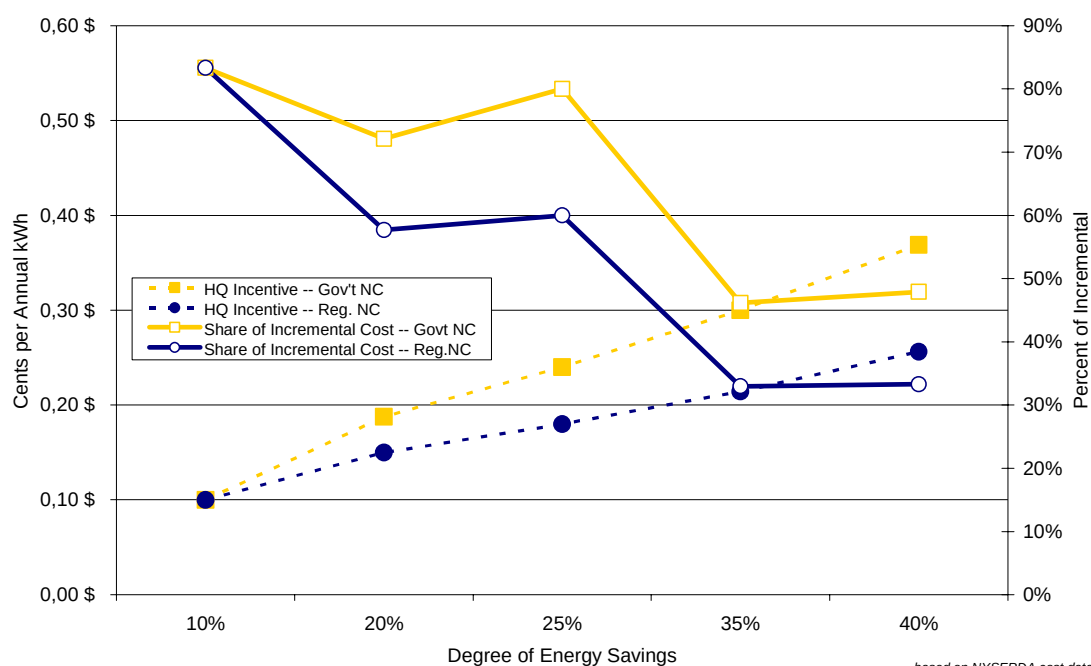
Incentive structure

In addition to aiming for average coverage of 50% and 75% of incremental costs, Hydro-Québec's structure is also aimed at encouraging “deeper” efficiency measures. Again, a cursory look at the incentive structure presented in Figure 7 suggests that indeed, the structure would encourage high levels of efficiency.

In an effort to better understand how Hydro-Québec's incentive structure may encourage deeper savings, we examined incremental cost data for a variety of different degrees of energy savings available to the commercial and institutional markets in New York State.¹⁰² Specifically, we set Hydro-Québec's proposed incentives against the incremental costs of achieving 10%, 20%, 25%, 35% and 40% savings.

¹⁰² Québec data may differ and as such, this is only illustrative of the *nature*, not the extent of the problem.

Figure 9. HQ Incentives in ¢/kWh_a and Share of Incremental Cost (New Construction)



Note: The dashed lines shown here correspond to the same cumulative incentive levels as the thick lines in Figure 7 on page 103.

Like the previous analysis, this too suggests that perceptions may be different from reality. Concretely, we found that if a customer brings a new government building design to Hydro-Québec with modeled savings of 25%, Hydro-Québec's incentives will cover 80% of incremental cost (60% for non-government buildings). However, at the 35% savings level, the share of incremental costs covered by the incentive drops dramatically, to less than 50% (33% for non-government buildings).

The charts show that Hydro-Québec's incentive structure does not push the market toward comprehensiveness, but rather rewards those who achieve savings of 25% or less. In other words, Hydro-Québec's incentive structure, while pointing in the right direction, does not sufficiently take into account the increasing slope of the efficiency supply curve.¹⁰³

¹⁰³ Of course, this analysis is based on non-Québec data and, as such, may differ slightly (though probably not much) from the situation here. Nonetheless, this analysis illustrates once again the difficulty in translating a % of incremental cost goal into an entirely different – in this case ¢/kWh – base for calculating efficiency incentives.

vi. Discussion – Optimizing the incentive structure

Introduction

We have seen that Hydro-Québec's incentive structure as currently proposed is unlikely to achieve its stated goals.

It can be tempting to try to “tinker” with the current proposed structure in order to align it more closely with real-world costs. Unfortunately, this is not possible. Costs vary greatly in the CI sector not only by measure, but by customer segment. The same MNECB+25% measure that costs 1¢/kWh (levelized) in the high-volume fast food segment, costs 9¢/kWh to implement in small high schools, 7¢ in golden age centers (CHSLDs), 5¢ in bars and 2¢ in supermarkets.¹⁰⁴ In other words, we could not improve on Hydro-Québec's attempt to mimic *average* costs; the average simply does not apply.

There are two possible solutions to this problem: (i) incentives based on incremental cost and (ii) customized incentives.¹⁰⁵

Option 1: Base incentives on incremental costs

One solution to this problem is to base the incentive on actual incremental costs, thus directly matching structure and goal. In its simplest form, Hydro-Québec could offer to cover 50% of incremental costs for non-government buildings – and 75% for government – independent of projected savings.

A preferable variation on this theme would be for Hydro-Québec to base its share of cost on the *nature* of the efficiency measure, specifically whether it is a lost opportunity or retrofit measure. This is the approach taken in Massachusetts, where utilities provide an incentive equal to 50% of the installed cost of retrofits or 75% of incremental costs for lost opportunities. To further encourage “deep” measures, 90% of incremental costs are covered for comprehensive new construction projects.

Keeping in line with Hydro-Québec's principle of minimizing cream skimming, the Massachusetts approach could be enhanced by increasing or decreasing the percent of incremental cost paid depending on the percent of savings attained. For example, Hydro-Québec could cover 50% of incremental costs for 10% savings up to 100% for over 45% savings. This approach would ensure that Hydro-Québec's incentive

¹⁰⁴ Based on initial Hydro-Québec technico-economic potential work developed by Technosim in the Fall of 2004 and filed in appendix to HQD-5, doc. 8, p. 32.

¹⁰⁵ Both of these options need to be accompanied by a screening process to make sure funded measures are cost-effective. Use of such screening tools is common practice elsewhere.

perfectly matches its underlying principles: cover a set share of incremental costs and constantly encourage deeper savings measures and more comprehensive designs.

Adopting this approach will be somewhat more labour-intensive than the automated ¢/kWh savings approach. This is because it requires the use of cost-effectiveness analysis to ensure that Hydro-Québec is never paying more than its own avoided costs. Nonetheless, the financial savings in terms of wasted resources from oversized incentive payments, combined with the increased participation rates, will likely far outweigh the additional labour, thus resulting in cheaper ¢/kWh costs for Hydro-Québec and its ratepayers.

Option 2: Customize incentives

The other approach is to not use a published incentive schedule at all, but instead to offer incentives as needed to ensure project completions.

There is no reason that incentives need to be published. In our markets and barriers discussions, we mentioned that multiple barriers require multiple intervention strategies. There is no better way to overcome a customer's barriers than to find out what their particular barriers are, and design a customized strategy to overcome them. The amount of money offered is not always the deciding factor. Customers have different criteria for investing in energy efficiency.

An example of this approach can be seen in the Long Island Power Authority (LIPA). In 2004, LIPA's Commercial and Industrial New Construction Program managers realized that customers did not always need all the money that their incremental cost approach dictated – in many cases they were overpaying. LIPA decided to remove incentive criteria from its website and program marketing materials, and work with customers individually to overcome their barriers. They call this approach, informally, "Customer Solutions".

Before the launch, LIPA developed a screening/financing tool that calculates a variety of incentive levels to specifically address customer hurdles. It gives the program staff the ability to look at incentives from different perspectives. The tool first calculates whether the proposed project or measure is cost effective. If it is, the cost and savings information are used to run a cash flow analysis. The tool uses the implementation costs, and the energy, demand, water, and fossil fuel savings to create the stream of costs and benefits to create the measure or project cash flow. From the interest rate input, and cash flow output, the software suggests six separate incentive calculations, the last of which, the maximum, is the lesser of a two-year payback or 70% of incremental - the program maximum.¹⁰⁶

¹⁰⁶ LIPA sets its criteria as the lesser of the following: 70% of incremental cost, 90% when the whole building is considered, two year payback, or total utility electric benefits. The project cap is \$300,000; an additional customer cap of \$750,000/year applies.

The following are the outputs that program staff uses to negotiate:

- > Return on investment (ROI) of 25%
- > Return on investment (ROI) of 50%
- > Return on investment (ROI) of 100%
- > Net Positive Cash Flow
- > Zero Interest Rate Equivalent
- > Maximum Calculated Incentive (lesser of 2-year payback or 70% incremental costs)

The maximum calculated incentive is equal to what the program incentive would have been in years past. The program staff knows that, ideally, they would like to be under this amount. What these calculations give them is the ability to explore the needs of the customer. Customer needs do not always equal more money. When LIPA offered a maximum incentive based on the screening outputs they used to use, their incentive was often out of context with customer needs. Many customers saw this incentive as LIPA's first offer and simply asked for more. LIPA seemed unyielding when they informed that customer that based on LIPA's, not the customer's criteria, there was no more to offer. What made this scenario even worse was that LIPA realized they were often overspending, *and still not satisfying the customer.*

It is hard for customers who are looking at the positive cash flow that their project produces, or an ROI of 25%, to make a case for why they need a larger incentive. Efficiency Vermont, which also uses this approach, is seeing program incentive savings of 25% – i.e. spending 25% less money for the same energy efficiency gains. While there is more staff time required to understand and negotiate the incentives, it is more than covered by the incentive savings. Negotiated incentives come with other program investments. Software is necessary, and staff training for the vital customer interactions is critical.

With their new process, LIPA staff uses customer information to tailor their strategy – no more “one size fits all”. At the time of the customer interaction, whether on site, which is desirable, or by other means, program staff have the opportunity to look more deeply into the project. They discover customer investment strategies, additional opportunities for comprehensiveness, and customer-specific barriers that a targeted strategy can incorporate and overcome.

Some utilities have commented that if they don't publish their incentive structure customers will complain – customers need to know what to expect, they fear incentives will not be enough, and this will lead to enrollment decline. This process requires that the utility approaches the market like any other business would. Airlines and auto dealers do not publish one price for all and yet still achieve customer satisfaction. Utilities can too.

In practice, it would be unwise for Hydro-Québec to immediately apply this approach, both because of the time it will take to transition to such a different implementation

strategy, and because of oversight issues. On the latter point, we believe adopting this approach in Québec should be done in conjunction with a utility performance incentive component (similar to the one under which Gaz Métropolitain currently operates).

Nonetheless, while this approach represents a significant departure from past practice – and one that may want to be eased in over time – emerging experience suggests that customized incentives are a preferred strategy to ensure such least-cost savings are achieved. As such, we believe both Hydro-Québec and the Régie de l'énergie should begin considering a transition towards a custom incentive strategy for servicing the business sector.

Recommendation: Approve Hydro-Québec's underlying principles of covering the majority of costs and encouraging deep efficiency measures.

Recommendation: Reject Hydro-Québec's proposed incentive structure.

Recommendation: Adopt a replacement structure based directly on incremental costs, and modulate the incentive levels to encourage comprehensive projects and to account for differences between lost opportunity and retrofit needs.

Recommendation: Encourage Hydro-Québec to transition toward the use of customized incentives to match customer needs, and tie this approach to an eventual utility DSM incentive structure.

Incentive caps and feasibility studies

Hydro-Québec has proposed to increase the cap on its incentives from \$150k to \$500k per project or 40% of eligible expenses (50% for government buildings). Lifting this cap is an important and reasonable improvement to the program's design, and one which we fully support.

Hydro-Québec has also proposed to increase its assistance for preparing feasibility studies to 50% of study costs (up to a maximum of \$7.5k or, for large industrials, \$15k). This, too, is an important improvement that, along with matching federal government funds, will fully remove one of the barriers to participation.

Recommendation: Approve Hydro-Québec's proposed new project caps.

Recommendation: Approve Hydro-Québec's proposed feasibility study incentives.

New construction design incentive

Hydro-Québec does not currently provide incentives directly to the design community. The Initiatives program description states that Hydro-Québec intends to “augment customer activities”, and “step up and target training of key influencers”. These goals are important and it is significant that Hydro-Québec recognizes them. Nonetheless, they can be hard to implement.

Experience in New York, Massachusetts and Vermont suggests that architects and engineers, and indeed most design professionals or key influencers, need to know why they are being asked to spend more time, and incur more cost, trying to persuade owners and contractors to install more efficient equipment. Education and training are not the only barriers that designers face. Indeed, another key barrier is that they generally don't get reimbursed for their additional time spent on design of efficient systems. While seemingly minor in scope, this barrier can have serious consequences for program success.

Hydro-Québec has recently increased funding for feasibility studies. This is a very positive improvement, and should facilitate the process of bringing projects to Hydro-Québec's attention. However, feasibility studies are mainly used to determine the costs and savings for retrofit projects; new construction project designers are not likely to have access to these funds.

Hydro-Québec is therefore missing an intervention strategy for the design professional group who work on and in fact are key influencers of new construction projects. Design professionals are not always willing to take on the added burden/risk of learning about and including advanced efficiency technologies when they are neither being asked nor required to do so. This is especially important when the design is already underway and changes can mean additional delays. If design professionals are compensated for their time, they are more willing to look for design improvements.

The incentive can be a simple reimbursement for actual time spent on the added design elements. This can be offered with a project cap, like the feasibility studies incentive. The amount offered can be based on typical costs in the local market, or tiered incentives based on the percent of energy saved.

Recommendation: Provide an incentive for design professionals to encourage their participation in the program and facilitate savings from new construction projects, as outlined in the text.

vii. Discussion – Small CI customers segment

The “small” CI market generally consists of customers who fall under 100 kW-145 kW in demand. It is comprised of small grocery and convenience stores, retail, and rental office space. Small customers can often account for one-third to one-half of the commercial and institutional load¹⁰⁷. The dominant end-uses, as well as savings potential, are lighting, HVAC and refrigeration.

Small CI customers are in many ways analogous to low-income residential customers. As with the latter, small CI customers face more acute market barriers (and similar ones, as with split incentives) and are thus unlikely to participate in standard programs. Increasingly, leading utilities understand the importance of designing programs that target this customer segment specifically. New small CI programs are being implemented in many regions throughout the continent.

There is little evidence in Hydro-Québec's current program plan that significant attention has been given to working with this market segment. Hydro-Québec's portfolio of CI programs offer incentives through the *Initiatives* and *MC/ES for Business* programs but, as we will see from the list of barriers, these types of programs only succeed in getting a limited number of small customers to enroll.

Hydro-Québec also has a web-based audit for small businesses, but experience suggests that these programs have been very ineffective in getting customers to implement energy efficiency projects. While some people enter sites with this type of material, implementation rates are in the low single digits. Some utilities have found that non-web-based audit programs, which provide checklists to customers for future implementation, result in making customers feel worse about their facilities than they did before the audit, and thus provide only negative reinforcement.

Direct-install retrofit programs with a “small business” focus, delivered directly or through third parties, are the best way to tap the rich reserves of savings this group has to offer.

Given the importance of this customer segment and the need for a different incentive approach, we address this in an entirely separate section. See “*Section 2 - CI Small Customer Program (new)*” starting on page 122 below.

¹⁰⁷ Small business customers constitute approximately 90% of Hydro-Québec's non-residential customer base.

viii. Discussion – Municipal segment

Municipal barriers

Municipal entities do not necessarily have more barriers than do other commercial and institutional customers; as in the small business sector, some are just more pronounced. This market segment requires the same hand-holding and individual attention as the CI market as a whole. The following list of barriers is applicable to almost all commercial construction processes, but as municipal entities begin to consider new construction or renovation projects they can have new meaning.

- > Lack of awareness of the multiple economic and non-economic benefits of energy efficiency.
- > Lack of expertise to identify, hire and supervise quality technical design professionals.
- > Lack of awareness of the importance of procuring expert technical energy-related assistance early in the design process.
- > First-cost bias.

The municipal sector relies heavily on bond funding. Bond funding is usually done only one time and at the beginning of the project cycle. Unfortunately, much of the project design must be done before bond money is available to pay the design team. The first and second barriers mentioned above can come into play as bid documents and RFPs are designed by local select boards or city governments. With only the bonded amount to go by, and indeterminate periods of time between the bid and start of construction, select boards get anxious as costs trend higher. When the building is in final design, any cost differential is usually “value engineered” to fit the latest budget. Any change to the final documents impacts the budget and is avoided or taken on with caution. Energy efficiency is not at the top of the list of requirements and is often taken out for first-cost reasons.

Utility programs that intervene in the municipal market must have staying power and incentive commitments that extend far into the future. To properly interact with this market means keeping abreast of developments as the “hurry up and wait” process meanders its way toward the start of construction. This long time horizon is not what most utility representatives are used to dealing with.

Design professionals

One key ally in the fight to persuade municipal clients to install energy efficiency are design professionals. As noted earlier, many municipalities use general employees – not professionals – to write up their bid documents. As such, requests for proposals

tend to neglect energy efficiency opportunities, focusing instead on seeking the lowest possible first cost. Once RFPs are tendered with first-cost in mind, it becomes extremely difficult to reverse the process as bonds are approved and contractors chosen.

The most effective way to overcome this barrier is for Hydro-Québec to pay design professionals to help municipalities draw up bid documents. These design professionals would need to participate in municipal meetings to explain the value of efficiency-related reduced operating costs, and then aid in drawing up bid documents. Because of the particular characteristics of municipal decision-making, this design incentive would need to be somewhat different from the general CI sector incentive we proposed previously. While this may be more costly, we believe it would be a far more cost-effective way of enabling municipalities to play a leadership role than the bonus ¢/kWh incentives Hydro-Québec is proposing to offer. We note that this simple upstream work can pay tremendous downstream dividends as energy efficiency gets written into the entire bidding process, and efficiency gains are “locked in”.

Recommendation: Pay design professionals to assist municipalities early in their capital process by integrating efficiency goals and criteria upstream in construction bid documents.

Municipal leasing companies

As with any program, achieving 100% participation is next to impossible. Although the municipal design incentive proposed above aims to integrate efficiency upstream in the decision-making process, many projects will still proceed through the bid and bonding process without initial consideration of efficiency opportunities.

For those projects, the barriers described earlier make it very difficult to intervene to change winning bid designs. Nonetheless, one key ally that can enable such midstream changes are municipal leasing companies. This group of market actors has specific products designed for the municipal market. They specialize in lending money based on the annual budget cycles that most municipalities use.

Many municipalities already lease things like police cars, school buses and other equipment. Leasing companies add energy efficiency equipment to this list of financing options. For example, in a project for the State of Vermont's Bennington State Office Building, Efficiency Vermont used a municipal lease to finance the cost of just the energy efficiency additions to the building. The lease payments were taken out of money originally allocated for operating costs. Since the operation costs were reduced by more than the lease payments, the project did not require additional appropriations from the State general fund.

Recommendation: Facilitate and encourage municipal leasing companies to offer energy efficiency financing when efficiency improvements need to be brought mid-stream in project development.

ix. Discussion – Staffing and sales approach

Hydro-Québec gives very little detail on its methods of interacting with customers. For example, it is unclear whether the utility will rely on mass marketing outreach, or will hire circuit riders and other intermediaries for direct sales efforts. We provide the following discussion because of the tremendous importance of adopting a very proactive approach to this market.

Commercial sector businesses are inundated every day with products and services designed to help save money or time. In order to compete, Hydro-Québec must approach these businesses directly. General advertising and bill stuffers are an important means of legal notification and energy efficiency program changes, but business customers are not usually swayed by them.¹⁰⁸

National Grid Transco, in its energy efficiency programs, requires that account executives visit a certain number of sites as part of their every day job responsibilities. Efficiency Vermont takes this one step further, requiring all project managers to perform site visits of projects over a certain size. Efficiency Vermont, Long Island Power Authority (LIPA), NYSEERDA, NGrid, NStar and Efficiency Maine all use circuit riders to make sure that trade allies, vendors and other market actors are visited on a regular basis. When the latest program materials and prescriptive applications are no longer on the counter tops of the local motor vendor, application numbers plummet – “out of sight, out of mind”.

What all of these examples have in common are customer interaction. Customers remember better and are persuaded easier when introduced to a concept by a person they have a relationship with. Most sales training stresses “relationship” selling: in order to persuade people, we must first get to know them. And in order to get to know them, we must meet with them. At Efficiency Vermont, when customers are visited, the percentage of projects that are completed increases by nearly 50%. In a world where customers are so busy that sales presentations must make an initial impression in minutes if not seconds, the need for on-site focused customer interaction is increasingly critical to program success.

¹⁰⁸ In a direct mailing to 50,000 business customers in Long Island touting the attributes of a new program with direct benefits to the recipients, *Long Island Power Authority* received around 80 responses. Many of the eighty returning the self-addressed stamped envelope asked questions about their electric service and not about the efficiency program being offered. Websites are not much better. A recent review of LIPA’s website showed that almost all hits went to the frequently-asked questions section and concerned bills. Project leads coming into the utility’s *Clean Energy Initiative* were estimated at “12 to 20” in two years, against roughly 400,000 C&I hits in the same period.

Knowing the customer, and knowing the criteria they use to make investments, is critical to formulating the arguments used to persuade them to invest in energy efficiency. For example, new information from the green building industry indicates that many energy efficiency investments are made for reasons that have little to do with energy savings.¹⁰⁹ For instance, a large ski area in the Northeastern United States was interested in upgrading the heat in its equipment repair facility. The energy savings of under-slab heat distribution were not enough to trigger the investment, but the energy savings combined with the employee retention improvement, resulting from the warm floor where mechanics often lay to repair snow grooming machines, put the project on the fast track. Knowing the customer had employee retention problems with mechanics made all the difference.

This is but one example of the real-world considerations that affect energy efficiency decision-making. Far from simplified rate-of-return or payback period criteria, customers apply a vast array of criteria in determining their decisions. Understanding these criteria is critical to “making the sell”, and making the sell is the only objective of an energy efficiency program.

We note that Hydro-Québec is proposing to create four permanent sectoral consultative committees in early 2005.¹¹⁰ We applaud this initiative, since it will enable Hydro-Québec to get constant feedback from sectoral representatives. However, we caution that sector-wide consultation cannot replace the need for one-on-one relationships, and that Hydro-Québec's programs should have such relationships built into implementation strategies. This should include:

- > Stress site visits for outreach staff;
- > Provide staff training on the non-energy benefits of efficiency technologies;
- > Provide enough outreach staff to properly implement program, including customer site visits and trade ally outreach and training, as well as ensure extensive use of circuit riders.

Ensuring a market-based “sales” strategy rooted in building and maintaining relationships will vastly improve Hydro-Québec's ability to maximize participation in its CI programs.

Recommendation: Approve Hydro-Québec's proposed permanent sectoral consultative committees.

Recommendation: Adopt a relationship-building, one-on-one, sales-oriented approach to marketing CI programs, including extensive use of circuit riders.

¹⁰⁹ Greg Kats, L. Alevantis, A. Berman, E. Mills, J. Perlman, *The Costs and Financial Benefits of Green Buildings – A Report to California's Sustainable Building Task Force*, October 2003.

¹¹⁰ HQD-1, doc. 1, p. 85.

x. Discussion – Segmentation and markets approach

Concerns with segmentation

In Hydro-Québec's *CI Buildings Initiatives* program there is an effort to segment customers by size, rate class or demand. This segmentation can be useful in creating clear lines for program staff but has little meaning to people outside of the utility. Indeed, many businesses are structured in ways that do not fit into these established segments.

Hydro-Québec's latest filing mentions internal administrative barriers that may be keeping customers away from the programs. Indeed, multiple administrative procedures create barriers to program participation by creating a confusing process for program applicants. For instance, the owner-occupant of an apartment building may see himself classified as commercial whereas Hydro-Québec may classify him as residential.

Markets are inherently messy. They are not neatly bound by definitions such as residential or business – a multifamily property is typically operated as a business, by a business entity, yet is occupied by residents who may have individual residential utility accounts. They may include commercial grade mechanical equipment, residential appliances and both commercial *and* residential grade lighting. Certain market segments cut across any boundaries one might attempt to establish to compartmentalize market services. For example contractors, whether HVAC contractors or electricians, typically work in both the residential and commercial markets; they work in new construction and in existing facilities; they do retrofit and lost opportunity projects. Clearly the dynamic nature of the marketplace calls for the responsive development and delivery of services that recognize its complexity.

Hydro-Québec's approach to addressing customers, to the extent it remains rooted in this segmentation, has been common practice for some time in the utility energy efficiency industry. However, leading utilities are now increasingly recognizing the inherent faults in this approach, and attempting to revamp their strategies. Since Hydro-Québec is still relatively early in its CI energy efficiency strategy, it should immediately begin moving to what is known as a markets approach. Doing so now will minimize costs and maximize the utility's program success.

The “markets approach”

An alternative to Hydro-Québec's approach to addressing customers' needs is to look at the customer's market characteristics, a “markets approach”. This markets approach attempts to look at the market as a whole rather than as a series of programs administered by the utility. Program staff are trained to address all

customers' needs, not just the ones that can be attributed to the program they may be assigned to. The current Hydro-Québec *Initiatives* programs could require a large manufacturer to go down one program path to address efficiency upgrades in its small administrative buildings, and another to address efficiency upgrades in its manufacturing facility.

Take for example a four-story apartment building in Montréal, with the building owner living on the top floor, two rental units on the second and third floors and a McDonald's restaurant on the first floor. How should this building be classified? Is it residential or commercial? Large - MacDonalds is multinational, or small - the building uses under 100kW? Using the markets approach, the owner would not be forced to navigate a complex labyrinth of program requirements (administrative barriers), but would be treated as a single customer in search of program outreach.

Experience with best practices elsewhere indicates that a markets approach is a good way to handle the questions of how to best deliver efficiency programs. A markets approach to structuring the delivery of energy efficiency programs integrates internal development and delivery of services to produce a seamless set of messages and services in the market. Customers come to their utility for solutions to all of their efficiency needs.

Many programs around North America are struggling with the issue of how to make their programs more user friendly. In a recent presentation at the *Midwest Energy Efficiency Alliance*, Steve McCarty of Pacific Gas & Electric Company, mentioned his company's search for those program changes that will remove barriers to participation. In one slide, McCarty mentions ways to integrate program design and delivery, hallmarks of a markets approach. He offers the following four indicators necessary for a successful program.¹¹¹

- > Offerings designed to complement one another and be integrated across programs
- > Movement away from "à la carte" program marketing to a more strategic approach
- > An assessment of each customer's needs (not which program they should enter)
- > Helping the customer optimize his/her energy management plan

McCarty points out that the program ideal is to "help the customer optimize their energy plan." In the case of the four-story mixed-use building, this means breaking down the utility's internal barriers to allow the customer to optimize their plan. An important point is the move away from unrelated, "à la carte" programs. For example,

¹¹¹ Steve McCarty, "Demand-Side Portfolio Management", Presentation to the Midwest Energy Efficiency Alliance Conference, September 27, 2004.

residential and commercial programs do not share integrated incentive design for an owner-occupied multi-use building.

To fully implement the markets approach there needs to be internal integration that transcends program boundaries, applying the best ideas across markets and customizing services and approaches to meet specific customer or trade ally needs. This approach is beneficial for the following reasons:

- ✓ *It is customer–friendly*, since it eliminates confusion about which program has the best offer or which one applies, and provides a single point of contact, simplifying customer participation.
- ✓ *It increases partnership opportunities* by enabling the utility to work effectively on a business-to-business basis, aligning energy efficiency objectives with the business objectives of partners to capture the greatest mutual benefit.
- ✓ *It improves internal efficiency and effectiveness* by removing competition between programs, establishing a set of common goals and a mandate for integration, increasing internal collaboration and reducing the cost of serving customers.
- ✓ *It eliminates conflicting messages* both internally and externally¹¹².

These benefits result in higher participation rates both by customers and strategic partners, yielding deeper savings and enabling long-term changes. The elimination of program boundaries includes a complete shift from the operating and communication departments as well as the language established under the program paradigm. Marketing materials no longer refer to "programs" at all.

Direct outreach to customers and partners must be comprehensive. When a utility staff member is in the field, they should be ready to respond to questions or requests outside of their area of specialty. For example, if a business development specialist who focuses primarily on commercial and industrial work is meeting with a lighting vendor, she must be able to speak knowledgeably about the residential services that overlap with that vendor's market as well as the business services.

This comprehensive approach to delivering services enables program staff to interact with clients in a consistent and pervasive manner, increasing the opportunity for energy efficiency to be considered in each market transaction. Interactions with customers should be viewed as an opportunity to increase understanding of the market barriers and drivers. Increasing understanding enables continuous feedback on, and improvement of, service design and delivery. This feedback increases the utility's influence in the market place, and supports long-term increases in the pursuit and adoption of high levels of energy efficiency.

¹¹²For more on this subject see Jennifer L. Chiodo, Blair Hamilton,, –“Taking a Holistic Approach to Markets: How Efficiency Vermont's Transition From Programs to Markets Is Changing the Way Energy Efficiency Services Are Developed and Delivered”, ACEEE 2004 Summer Study, August 2004.

Hydro-Québec is currently segmenting its markets in a variety of ways. This segmentation acts as a barrier to customers attempting to optimize their energy plan. Rather, Hydro-Québec should immediately begin working towards adopting a markets approach. Approaches should be developed to optimize opportunities for energy efficiency following the markets approach including:

- > Cross training staff to be knowledgeable about all market needs;
- > Eliminating internal barriers; and
- > Establishing internal markets integration.

Adopting a markets approach will not only allow Hydro-Québec to capture a greater share of the cost-effective energy efficiency potential, but will allow it to leapfrog to the forefront of utility best practices in energy efficiency program delivery.

Recommendation: Adopt a markets approach rooted in cross-training staff, increasing market outreach, eliminating internal barriers and establishing internal markets integration.

xi. Conclusions and Recommendations

Hydro-Québec's new CI Building Initiatives program represents a good faith effort to improve its efficiency offering. Unfortunately, this new proposal is flawed in that it is incapable of achieving its own stated goals of covering a set share of incremental costs and leading to deep savings. Correcting this flaw requires revamping the incentive structure so that it is based directly on incremental costs. In the medium term, Hydro-Québec would do best to move toward a customized approach as outlined in the text.

In addition to revamping the incentive structure, this program could benefit from several additional improvements. These include development of design incentives, and specific strategies for both the municipal and small business market segments (the latter is treated separately as section 2 on page 122). Finally, we strongly urge the utility to leapfrog to the forefront of energy efficiency best practices by adopting a markets approach and an aggressive, on-the-ground sales strategy.

2. CI Small Customer Program (new)

i. Introduction

We explained previously that small commercial customers are in many ways analogous to low-income residential customers: because they face far more acute barriers than their larger counterparts, they are unlikely to fully participate in standard programs. As with the low-income customers, small CI customers require a distinct market intervention strategy to be effective.

Specifically, small CI customers require a direct-install approach, meaning that contractors solicit customers directly, determine the optimal mix of measures to install, and install the measures, ideally in one visit. The customer does not have to find, price, finance, and find contractors to install efficiency measures.

In analyzing Hydro-Québec's program designs, we reviewed the programs for small businesses that are currently being conducted by utilities in Massachusetts – NGrid and NStar – as well as the Retrofit Energy and Capacity Program currently being launched by the Long Island Power Authority (LIPA).

ii. Opportunities and barriers

Opportunities

The small business sector is complex. There are an endless variety of business types, but the end uses are less varied. Programs can offer relatively few measure packages and cover most of the small business market. These packages include the following measures:

- > *High efficiency lighting retrofits.* Comprehensive, whole building lighting improvements, including T-8 fluorescents, or better yet Super T-8 lighting, replacing T12; specular reflectors and delamping of fluorescent fixtures; compact fluorescent lamps and fixtures replacing incandescent; metal halide and high pressure sodium fixtures replacing incandescent or mercury vapor; LED exit signs replacing incandescent or fluorescent; occupancy sensors; and optimized design (e.g., reduced fixtures, task lighting, daylighting systems);
- > *Hot water tank and pipe insulation.* Directly installed water-heating measures on individual hot water tanks and immediate piping.

- > *Refrigeration retrofits.* Cost effective refrigeration control strategies including direct digital control of walk-in and reach-in refrigerators, economizers and door heaters.
- > *Heating, Ventilation and Air Conditioning (HVAC).* Limited to cost effective tune ups and replacement of older inefficient units.

Small CI barriers

The barriers that small CI establishments experience often are not different from other market segments, just more pronounced. Small businesses are very sensitive to costs and risks, whether they are associated with energy efficiency technologies or any new product or service. In the case of small business at least six barriers must be addressed:

- > Transaction costs
- > Higher first cost
- > Missing information
- > Misplaced or split incentives
- > Performance uncertainties
- > Access to financing

We will first discuss the barriers in more depth and then frame the strategies to overcome them.

Barrier - Transaction Costs

The first barrier to overcome for the small business market is transaction costs. As we discussed in the barriers discussion (beginning at page 16), this barrier exists because integrating efficiency technologies and design takes more effort by multiple market participants. Small businesses have less time to arrange contractors to specify, price and install measures. One of the reasons why small businesses do not participate in utility programs, in general, is that filling out prescriptive forms or program applications add to the transaction cost.

Barrier - Higher first cost

Higher first cost can affect the small business market in two ways: higher first cost for projects directly undertaken by small commercial tenants in a building, and those undertaken by the landlord that affect the tenant. For either the tenant or the landlord, undertaking a retrofit project requires significantly larger capital outlay than either end-of-life replacement or periodic overhaul of existing equipment.

Barrier - Missing information

Missing information refers to a smaller customer's lack of ready access to engineers, utility staff and larger contractors for clear, unbiased information about costs and benefits of more efficient equipment. Small businesses are not always aware of the trade-offs of high-efficiency early replacement of existing equipment or the potential for integrating comprehensive lighting and other cooling- or heating-load efficiency investments.

Barrier – Misplaced or Split Incentives

Misplaced incentives occur when owners incur capital costs for high-efficiency and tenants realize the bill savings. The highly competitive nature of the commercial real estate market limits the cost recovery for such investment since tenant investment payback horizon is limited to the lease term. Another factor blocking efficiency investment in this market is that the customer usually controls the lighting equipment and electric bills, while landlords control the HVAC equipment and costs. The inability to bring the parties together in a common understanding is exacerbated by first cost.

Barrier - Performance Uncertainties

Small businesses are extremely sensitive to change and acutely aware of and averse to risks. They have difficulties in evaluating claims about future benefits from efficiency. Performance uncertainties also affect the smaller contractors with whom small businesses interact. Small contractors, themselves small businesses, are unwilling to assume the risk of changing their standard practice by installing equipment they are unfamiliar with and will likely be asked to warrantee and maintain.

Barrier - Access to Financing

Small businesses have traditionally had a hard time accessing financing and thus capital. In the case of efficiency investments, this stems, in part, from the lending industry's historic inability to account for the unique features of loans for energy-efficiency savings in its underwriting procedures. The other facet of the access barrier is that small customers take out smaller loans which can fall under lending minimums. Smaller loans trigger the higher interest rates banks use to recoup the cost of smaller transactions. Compounding the bank underwriting issue is that many small businesses are prone to bad credit histories or high debt-to-equity ratios that make lenders leery.

All of these barriers combine to make small CI customer participation in standard efficiency programs extremely difficult.

iii. Intervention strategies

The feasibility studies, standard offers and tiered incentives that Hydro-Québec is proposing are geared toward the larger, more sophisticated customer. Hydro-Québec's *Initiatives* program asks that customers bring their project designs to the utility for review.

Small customers need Hydro-Québec to come to them. Small customers need more attention, involve more transactions and require more persuasion. They are hard to reach, but to ignore the cost-effective potential this group possesses would be a mistake. Increasingly, utilities are realizing the need to have a relationship with this group of customers. One could argue that this is all the more important for a state-owned utility: to ignore small businesses is to neglect the economic engines of growth, the engines through which most new jobs are created, few are exported and profits tend to remain within the provincial economy. Ultimately, successful market strategies aimed at small businesses offer considerable, cost-effective energy savings for the utility, and can also prove to be an investment in Québec's future economic growth.

We reviewed best practices for small CI programs from a number of utilities. This review resulted in a list of interventions that have overcome the barriers we listed previously. These include (i) information and technical assistance, (ii) financing strategies, including early replacement incentives and (iii) ESCO involvement or outsourcing.

Information and technical assistance services

Good programs provide, free of charge, technical assistance to customers through staff or program contractors. Hydro-Québec could provide the services of lighting, refrigeration, and HVAC design experts directly to customers to assist in identifying and recommending opportunities, design specifications, and measure costs they need to make informed decisions.

This service is performed primarily in conjunction with other market actors such as manufacturers, designers, installers or energy service companies (ESCOs). Utility staff or contractors serve as the customer's efficiency advisor and advocate. In addition to assistance with identifying and analyzing opportunities, the utility staff may provide assistance soliciting third-party contractors, reviewing their proposals, and negotiating performance contracts. The more the proposed project can be "turnkey", the better likelihood it has of being completed.¹¹³

¹¹³ "Turnkey" projects are defined as requiring only a customer signature to move to implementation. All cost, savings, contractors, installation procedures and financing are complete.

The information and technical assistance services aim at overcoming the following barriers:

- > *First cost* – Cost are put in context and appear less risky;
- > *Transaction costs* – Utility staff acting as advisors help customers sort through costs and savings, design specs and installation contractors;
- > *Missing Information* – Program supplies technical advice/information through contractors directly to the customer; and
- > *Performance Uncertainties* – Technical advice and education through program staff.

Financial Strategies

In most cases, there will not be a market event bringing the customer to a small business program. Instead, customers are solicited by program staff or a set of affiliated contractors for participation. The staff and/or contractor are responsible for describing the program, auditing the facility and suggesting potential energy saving projects from the list of program eligible measures. Hydro-Québec could offer customers a financial service designed to eliminate the need for a large initial cash outlay.

Ideally structured financing programs make the barrier to program entry very low by removing the first cost barrier. Hydro-Québec could offer low- or zero-interest financing, with a term and repayment schedule designed to ensure the customer an immediate and significant positive cash flow. Such financing is designed, whenever possible, to provide positive cash flow to the customer of at least 25% of the estimated bill savings (i.e., monthly debt service no more than 75% of estimated monthly bill reductions).

One of the most effective strategies is to provide on-the-bill financing – the practice of putting the actual payment for energy efficiency improvements on the same document as the electric charges. Having the bill savings and payment on the same document allows the customer to see the net cost of the investment.¹¹⁴ Northeast Utilities and Massachusetts Electric use this method of accounting, as does Manitoba Hydro for a number of its own programs. As with incremental-cost-based incentives, utility financing may be packaged into a third party (ESCO or other contractor) offer to the customer.

Offering low-cost financing aims at overcoming the following barriers:

¹¹⁴ We are not aware of the programming issues this might entail for Hydro-Québec, and therefore refrain from recommending the on-bill approach outright.

- > *Access to financing* – Utility either provides on bank financing which ameliorates bank uncertainties, or lends the money directly, providing small customers direct access to capital.
- > *Performance uncertainty* – Ready financing with interest buy-down or positive cash flow overcomes customer discount of future performance.

Energy Service Companies (ESCOs)

The number of interactions needed to supply the requisite energy savings from small customers, as opposed to large customers, can be a drain on utility staff. Telemarketing call centers and on-site sales for retail energy services are beyond the human resource means of most utilities, but tailoring programs, through RFP (request for proposals) processes to the ESCO market, are not.

National Grid and Long Island Power Authority (LIPA) both have recently adopted programs aimed at small customers and delivered by ESCO contractors. The utility spells out the areas they would like to target, and by writing these requirements into the RFP, make sure small customers and their unique barriers are addressed.

One such program, run by LIPA, is known as “RECAP”. RECAP requested contractors to respond to an RFP that required them to target customers under 145kW, located in certain load pockets, and offering comprehensive energy efficiency savings. Comprehensive energy efficiency means that ESCO contractors must look at all systems and recommend all cost-effective measures.

The respondents to the RFP were judged on a variety of criteria including their cost to deliver energy savings.¹¹⁵ This represented a significant change from past experience with demand-side bidding. In this case, the ESCO decided the price to bid for their efforts rather than responding to standard offer pricing supplied by the utility. Each contractor determined the portion of the market they would pursue, the quantity of energy savings they would deliver and the mix of measures they would install. The contractors were paid separately for energy and capacity savings, the payments for which were factored into the incentives they themselves offered the end-use customer. In many cases, the customer received a directly installed set of measures at little or no cost; one of the most effective strategies to overcome the small customers’ barriers.

LIPA’s RECAP program was introduced in conjunction with an RFP for new generation, which provided the utility with clear avoided costs against which to compare the cost of the energy efficiency bid. This comparison made clear that the

¹¹⁵ Areas rated included cost effectiveness, rate impacts, technical feasibility and reliability of energy savings, marketing plan, economic development and support of local businesses, customer service, environmental impacts, quality control, coordination with other LIPA programs, and firm capabilities.

small CI approach cost far less than the cost of generation¹¹⁶. Therefore, it was less expensive for LIPA to contract for the program than to buy more supply.

This group of successful energy service contractors can be the perfect partner in the fight to penetrate the small business market. Properly motivated ESCOs have worked out the value proposition necessary to go after any retrofit opportunity including small business. In the RECAP solicitation ESCOs came forward with well-developed plans to provide energy efficiency measure sets specifically designed for small business (and multi-family housing as well).

A properly-designed process through which Hydro-Québec outsources the small CI market to ESCOs would enable them to help overcome the following barriers:

- > *Transaction Costs* – direct install requires customer make fewer decisions.
- > *Higher First Cost* – ESCO contractors provide little, or no, up-front cost installation
- > *Missing information* – program staff or ESCO supply any information necessary to make decisions
- > *Misplaced Incentives* – low or no cost, combined with financing, make cash flow implications for landlords and/or tenants negligible.
- > *Performance uncertainties* – ESCO warrants and maintains equipment and guarantees savings to customer
- > *Access to Financing* – ESCO supplies financing.

iv. Conclusions and Recommendations

The recommendations from this section are contingent on the implementation path: Hydro-Québec can staff and deliver the program, or they can outsource it to an ESCO. If Hydro-Québec undertakes the responsibility to interact with the small business sector directly, we would recommend that they institute the following strategies:

- > Provide technical assistance at no cost to the customer;
- > Dedicate staff to sector-specific marketing and outreach; and

¹¹⁶ E. Belliveau, G. Krieger, D. Zaweski and C. McDonald. “Another Look at Demand-Side Bidding – Long Island Power Authority’s 75 MW Efficiency RFP”. ACEEE Summer Study, 2004.

- > Provide financial assistance in one of two forms: (i) financing at as close to zero-cost as possible (through partnering with local banks with an incentive to buy down the interest or by using program funds to establish a revolving loan fund), or (ii) provide the equivalent amount of incentive to replicate the interest buy down of bank financing, for businesses that do not want financing.

Alternatively, if Hydro-Québec were to outsource the program, they will still have the same barriers to overcome but the strategy in this case is to pay outside contractors (ESCOs) to deliver the program. In this case we recommend that Hydro-Québec implement the following strategies:

- > Prepare an RFP that targets the small CI market. RFP design could dictate the targeted markets, geography, measures and implementation strategies.
- > Selected contractors provide technical assistance, proposed measures, and with customer agreement, directly install measures at little or no cost to the customer.
- > ESCO payment should be based on energy and/or capacity savings delivered over a ten-year time frame. Program funds are used to pay the ESCO directly after a series of pre- and post-inspections by a separate measurement and verification contractor, based on the International Performance and Verification Protocols¹¹⁷.

We believe either of these two broad strategies offer Hydro-Québec a proven approach to reaching otherwise neglected small CI customers.

Recommendation: Adopt a distinct program for the small CI market segment. This program could be run in-house or be outsourced to the ESCO community. In both cases, adopt the multi-pronged strategies listed in the text above.

¹¹⁷ For more information, see www.ipmvp.org.

3. MC/ES Efficient Products for Business

i. Introduction

Prescriptive programs are essential complements to standard offer and other more comprehensive energy efficiency programs like Hydro-Québec's *Initiatives* approaches. Whereas standard offers aim for achieving comprehensive efficiency improvements in new construction or retrofit markets, many additional opportunities for efficiency upgrades are available on a one-off basis. This typically occurs when customers choose to replace aging and failed equipment.

ii. Hydro-Québec previous version

Hydro-Québec's previous plan did not contain a prescriptive program. In our testimony last Spring, we pinpointed this deficiency and strongly encouraged the utility to develop a prescriptive program as a complement to its standard offer strategy.

iii. Hydro-Québec current proposal

HQ's MC/ES for Business program is a prescriptive financial assistance program designed to reach business customers when they replace lighting, HVAC equipment and motors.

While specific measures and measure incentives are not yet known, Hydro-Québec has budgeted an *average* of 5¢ per annual kWh for commercial buildings, 8¢ for government buildings and 28¢ for street lighting. The utility intends to work with other market actors to spread the word about the program and to educate and train trade allies with an eye toward market transformation.

iv. Discussion

This new program is a valuable addition to the Initiatives Program. This prescriptive program will provide immediate results while Hydro-Québec waits for the *Initiatives* program to realize savings from completed projects¹¹⁸. Prescriptive incentives offer an

¹¹⁸ Project application to completion time frames can be between 6 and 18 months.

alternative to the administratively complex Initiatives program for the customer with failed equipment seeking immediate replacement.

Incentive levels

That being said, we are concerned the incentive amounts may be insufficient. While Hydro-Québec has indicated that it has not yet determined the precise incentives for specific measures, it has provided overall incentive targets that seem low compared with other utilities. It is important to recall that in the prescriptive market, costs (and incremental costs) are by and large similar throughout North America. As such, it is easier to make direct comparisons with neighbouring regions.

Of course, the *average* 5¢ per annual kWh incentive level can be expected to be an aggregate of a variety of incentives for a variety of measures. This is normal since measures themselves have varying incremental costs and savings. For example, a lighting measure needn't nearly the same level of incentive as an air conditioning measure.

The provision of an aggregate average incentive to a program designed for disaggregated measure incentives renders any serious analysis extremely difficult. To properly assess Hydro-Québec's program, we would need to know the full list of measures to be eligible and the precise incentives being offered. However, in the absence of this information, we decided to compare the average incentive with the average incentive provided by Efficiency Vermont for its commercial and institutional customers.

As indicated in Table 15 below, Efficiency Vermont's prescriptive measure incentives are determined for each measure and are revised annually based on market changes and experience.

The average EVT incentive – designed to cover 75% of incremental cost – is 14 cents (CAD) per annual kWh saved. Given that these 14¢ are designed to achieve 75% of incremental costs, we can assume that measures on average will cost approximately 19¢/ann.kWh saved. Assuming similar costs and measure weights, this suggests that Hydro-Québec intends to cover approximately 25% of the incremental costs on average.

Table 15. Efficiency Vermont's Prescriptive Incentives (\$CAD/ann.kWh)								
	2000	2001	2002	2003	2004	Weighted Avg.	End Use Weights	Weighted Average
Air Conditioning	0.324	0.365	0.360	0.322	0.365	0.352	19%	0.144
Lighting	0.052	0.099	0.098	0.094	0.083	0.086	39%	
Motors	0.098	0.126	0.082	0.120	0.073	0.095	19%	
Commercial Refrigeration	0.000	0.000	0.038	0.053	0.118	0.109	23%	

This comparison shows a major gap between what Hydro-Québec's incentives will pay and what efficiency measures will cost. Unless Hydro-Québec bridges this gap, simple cost effective efficiency upgrades will not be completed because the incentives will be far too low to affect significant change. In fact, one of North American's leading energy efficiency experts has suggested that incentives that provide anything less than 50% of incremental costs are largely ineffective.¹¹⁹

While it is not yet possible to know precisely to which measures Hydro-Québec's 5¢/ann.kWh incentive will apply, it is possible to make some assumptions about the value of those savings. Conservatively assuming an average measure lifetime of 10 years, we know that the value to Hydro-Québec of these savings ranges between 7.3 – 8.8 ¢/kWh on a levelized lifetime basis.¹²⁰ Still assuming the 10-year lifespan, the value of the 5¢/ann.kWh incentive is a mere 0.7¢/kWh levelized.

In other words, Hydro-Québec's proposed incentive, beyond merely covering only a quarter of incremental costs, is actually worth less than 10% of avoided costs (value to Hydro-Québec). Clearly, there is significant room to increase the prescriptive incentive while maintaining substantial cost savings for Hydro-Québec and its ratepayers. Furthermore, experience shows that excessively low incentives not only lead to lost energy efficiency opportunities, but also to unnecessarily high cream skimming and free ridership. The result is wasted financial resources and low energy efficiency savings.

Clearly, we believe Hydro-Québec needs to increase its prescriptive incentive substantially. We believe a reasonable incentive would be designed to cover approximately 75% of incremental measure costs. Our analysis suggests this would cost Hydro-Québec approximately 2¢/kWh (levelized), for savings (avoided costs) of roughly 8¢/kWh.

Recommendation: Increase the prescriptive incentive to cover roughly 75% of incremental costs.

¹¹⁹ S. Nadel, M. Pye, J. Jordan, 1994, *Achieving High Participation Rates: Lessons Taught By Successful DSM Programs*, American Council for an Energy Efficient Economy.

¹²⁰ 10-year CI sector avoided costs as reported in HQD-5, doc. 8, p. 32 (adjoined XL file).

Super T8s

Our only other concern with the prescriptive program is the list of measures to be included.

The program write-up mentions incentives for T-8 but not Super T8 lighting. Super T-8s are the latest in technology and are the only T8 lighting that makes a significant step up from present building code.

Despite somewhat higher initial cost, the Super T8 is extremely cost-effective. In fact, compared with T8s, Super T8 lighting provides 100% more energy savings relative to efficient T12s. Furthermore, Super T8s last 50% longer, provide 17% more light and provide better light quality.

Standard T8 lights have reached such saturations around the northeastern US that utility programs have begun to remove incentives for all but the smallest retrofit customers, replacing them with incentives for Super T8s only.¹²¹

We strongly encourage Hydro-Québec to include Super T8s, not standard T8s, in its MC/ES for Business list of eligible measures. Our only qualifier to this recommendation regards small commercial clients for whom the move to standard T8s from T12s may be more realistic.

Recommendation: Focus the MC/ES for Business prescriptive lighting incentives on Super T8s for all but the smallest business customers.

¹²¹ In an evaluation of the LIPA New Construction program conducted by RLW Analytics, saturation of T-8 lighting was 81.8% for newly constructed buildings over 10,000 ft² and 73.6% for newly constructed under 10,000 ft². For renovation the numbers were 97.2% over 10,000 ft² and 85.5% under 10,000 ft².

4. SMI Industrial Process Initiatives

i. Introduction

Small and medium sized industries use a large variety of equipment in their output processes. Significant technological improvements offer efficiency savings when replacing aging or failed equipment, or for new process lines. Utility energy efficiency programs can encourage customers to adopt these energy saving technologies.

ii. Hydro-Québec's previous version

Hydro-Québec's previous SMI Industrial Process Initiatives program offered 10¢ per annual kWh saved, up to a maximum of \$150k or the incentive necessary to reduce payback to 18 months.

iii. Hydro-Québec's current proposal

Hydro-Québec's current plan proposes to increase the savings incentive to 15¢/ann.kWh. It is also proposing to reduce the payback floor to 12 months and double the total incentive cap to \$300k.

iv. Discussion

As with its CI Buildings Initiative program, we believe these changes represent a good faith effort at improving Hydro-Québec's SMI offering. However, the program itself also suffers from similar flaws.

We understand that Hydro-Québec believes the SMI industrial process sector presents a narrower range of measures and incremental costs, and that this narrower range thereby justifies a single plateau ¢/ann.kWh incentive. In fact, industrial systems are complex and varied. Bringing efficiency improvements entails vastly different costs and savings depending on whether the target is injection molding machines, humidification for printing presses or conveyor belts on a cosmetics manufacturing line. In each case, a blunt 15¢/ann.kWh incentive will not be the most efficient means of achieving cost-effective energy savings.

We recognize that in its SMI program, Hydro-Québec has added an additional safeguard – a floor payback period – meant to avoid wasted financial resources. This is an improvement over the CI Buildings Initiative program.

Nonetheless, much of the concern presented previously in the CI Buildings Initiatives section (see pages 103 through 113) applies here. Furthermore, following our previous discussion on the value of an integrated, markets approach (see page 118), we are concerned that a distinct process-related program will merely raise additional administrative barriers to program participation – those same administrative barriers Hydro-Québec is seeking to overcome elsewhere in its plan.

There may be valid reasons for having two programs to serve different markets, and there can be reasons for which the advantages outweigh the inconvenience. However, if Hydro-Québec were to adopt our recommendations for the CI Buildings Initiative, the SMI process could simply and effectively be folded into that same program. As a result, there would be one single program – call it the Business Initiatives program – that would serve building and industrial process loads simultaneously. Both could begin by adopting a percent-of-incremental-cost incentive structure, thereby ensuring consistency with Hydro-Québec's own goals *and* reducing administrative barriers to clients. Ultimately, they should move in tandem to a customized incentive strategy, as detailed previously.

We are aware of no obvious reason for Hydro-Québec *not* to adopt this streamlined approach, which would both better protect the utility *and* better serve its clients.

Recommendation: Consider integrating process- and buildings-related efforts into a single Initiatives program using incentives based on percent-of-incremental-cost. In the long run, transition toward a customized incentive approach, as discussed in the Buildings initiatives section.

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The large industrial market is comprised of a small number of highly specialized operations. These operations present energy efficiency opportunities at both the building and process levels.

While large energy-intensive industries tend to be far more aware of energy costs and savings opportunities than their smaller counterparts, actual operating efficiencies are often far lower than what is cost-effectively possible. This is because an industrial plant may view cost-effectiveness from a different perspective than Hydro-Québec or society as a whole. Indeed, each plant may have its own complex investment rules. These may be rooted in payback periods, return on investment or other criteria. These criteria can be very different from the net present value criterion that guides or should guide most utility energy efficiency programs.

Energy efficiency programs can and should acquire savings in this market. In Québec, opportunities exist for enabling the hiring of professional energy efficiency staff within large industrial plants; for buying down the payback period on certain equipment (as Hydro-Québec proposes); and for facilitating development of a private-sector revolving loan fund through interest buydowns and capital guarantees, among other strategies.

Beyond these broad strategies, however, we recognize that technologies and techniques may be far too plant-specific to enable any form of in-depth review in the context of this report. Furthermore, we recognize that new piggybacking opportunities may arise following the launching of the federal government's Kyoto-related rules, expected to be announced in the coming weeks.

For these reasons, we refrain from making specific recommendations for this sector.

| g | Program Review – Upstream

1. Introduction

Energy efficiency is similar to renewable energy in that it is a constantly replenished resource. While programs enable current technological advances to gain market share, technological improvements provide new efficiency opportunities to bring to market. As such, markets for specific efficiency products may be saturated or transformed, but opportunities for continued efficiency improvements are constantly available.

Unlike renewable energy, the rate of replenishment is decided not by nature but by human ingenuity. Innovation determines the speed with which the efficiency resource is replenished and, therefore, with which it can be consumed. As with rainfall for hydropower, the higher the rate of innovation, the more efficiency gains are available to serve the market and bring equilibrium to supply and demand.

Many utilities neglect or seriously underfund the “supply” side of energy efficiency. In some cases, these utilities are free riders – they profit from others’ innovation efforts, though they often lose many years of opportunities as a result. In other cases, they simply miss out entirely on locally-developed ideas that, in the absence of upstream support, are never brought to fruition. In fact, the market for energy efficiency is rife with examples of products and services that had first been conceived of decades earlier, but that were lost by the wayside in the absence of upstream RDDC funding.¹²² When they are finally “re-discovered”, market actors express surprise and regret that the product was not developed earlier.

While R&D efforts may lead to the development of new products, once developed they face a number of barriers on the road to commercialization.¹²³ For example, banks are reluctant to provide product development loans until performance has been proven, yet proving performance can require injection of outside capital. Similarly, once performance has been established, real-world costs and market acceptance have to be tested. Again, developers often have a difficult time convincing conventional lenders to provide financing for market testing new products or services, and venture capitalists are few and far between. Additionally, engineering-oriented developers often lack sufficient knowledge of the market for their products. Finally, to the extent the product’s value is primarily related to energy savings, the “market” itself

¹²² RDDEC refers to research, development, demonstration and commercialization.

¹²³ This is in fact analogous to the market barriers faced by commercially-available efficiency products, and which “regular” energy efficiency programs aim to overcome.

may be first and foremost the utility's energy efficiency program, thereby adding an additional monopoly barrier to commercialization.

2. The IDEÉ and PISTE program concepts

Hydro-Québec is proposing two programs aimed at encouraging innovation and bringing valuable ideas and concepts to market. Specifically, it is proposing a demonstration and experimentation fund ("IDEÉ") and a pilot project fund ("PISTE").

The IDEÉ fund will provide the opportunity for the performance of new technologies to be assessed in both controlled and limited real-world environments. Meanwhile, the PISTE program will provide opportunities for performance-proven technologies to prove themselves in the marketplace.

By and large, these programs are properly aimed at enabling innovations to overcome the performance, financial and monopoly barriers discussed previously. Furthermore, to the extent they are directly linked into the PGEÉ itself, they can not only leverage Hydro-Québec's knowledge of market opportunities, but further provide the PGEÉ's managers with valuable information for their own program development and implementation efforts.

Finally, and most importantly, they can provide a continuous stream of new efficiency opportunities on which Hydro-Québec's PGEÉ can capitalize. Doing so will ensure ongoing replenishment not only of the theoretical efficiency resource, but of commercially-available efficiency opportunities to balance supply and demand cost-effectively.

For disclosure's sake, we note that one of the authors of this report, Philippe Dunsky, was mandated by Hydro-Québec in July of 2004 to review similar upstream programs operating in New York State and the Pacific Northwest. Because Hydro-Québec's PISTE program is partly inspired by these programs¹²⁴, we have chosen to refrain from providing more detailed commentary on the program's specific parameters.

Nonetheless, to the extent Hydro-Québec develops and publishes clear selection criteria, we strongly support both of these program *concepts*.

¹²⁴ See HQD-1, doc. 1, p. 84.

| h | Benchmarking: Overall Effort

1. Introduction

Benchmarking is a tool for improving performance by comparing one's self to those of comparable peers and by learning from others' best practices.

Throughout this report, we have focused qualitatively on learning from best practices in the design of individual programs. In this section, we conduct a more straightforward, quantitative analysis of the *effort* implicit in Hydro-Québec's PGEÉ, as measured by the utility's relative financial commitment. To do so, we set Hydro-Québec's effort against those of a select set of peers, chosen for their comparability with or pertinence to Hydro-Québec.

We should note that the following stems from – but is not the direct result of – initial work undertaken last year. Here we have updated both Hydro-Québec's and peer data and, more importantly, developed a clear and consistent methodology. Below we present the methodology adopted and the results obtained.

2. Methodology

In benchmarking Hydro-Québec's DSM efforts, three methodological questions arise:

- > Which regions serve as valuable points of comparison for Hydro-Québec?
- > Which indicators are most appropriate for measuring DSM efforts? *and*
- > What data sources should be used?

i. Choice of Benchmark Regions

In order to benchmark Hydro-Québec's DSM efforts with those of its peers, we chose three selection criteria:

1. *Geography*: We chose comparison States and Provinces that are Hydro-Québec's immediate neighbours and electricity trading partners. By default, this criterion also tends to retain regions with similarly cold climates.

2. *Hydropower*: We further selected comparison States and Provinces in which, like Hydro-Québec, hydropower has a substantive share of the generation market. By default, this criterion also retains regions with similarly low rates.
3. *Other*: For comparison purposes, we chose to include the historic leader in energy efficiency programs, California. We also excluded New Brunswick because that Province is currently revamping its efficiency efforts and reliable data is therefore not yet available.

Table 16 below outlines our selection criteria, their pertinence to Québec and the resulting peer regions.

Table 16. Criteria for Selecting Benchmark Regions			
Issue	Criteria	Advantages	Regions retained
Location	Retain regions that are Hydro-Québec's immediate electricity trading partners	✓ Primary trading partners ✓ Heating loads ✓ Competitors / potential collaboration	<i>Canada: Ontario, New Brunswick</i> <i>U.S.: NEPOOL members (New York, Vermont, Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island)</i>
Power generation	Retain regions with significant hydropower market share	✓ Hydropower regions ✓ Low rates ✓ Culture of renewables	<i>Canada: Manitoba, British Columbia</i> <i>U.S.: NPPC region (Oregon, Washington, Montana, Idaho)</i>
Leadership	Retain the traditional efficiency leader	✓ Compare with the "best"	<i>California</i>
Information	Exclude regions for which data is not currently available	✓ Practical requirement	<i>* exclude New Brunswick</i>

These criteria generate a pool of 15 comparable regions for benchmarking purposes:

- | | | |
|---------------------|------------------|------------------|
| 1. British Columbia | 6. Manitoba | 11. Ontario |
| 2. California | 7. Massachusetts | 12. Oregon |
| 3. Connecticut | 8. Montana | 13. Rhode Island |
| 4. Idaho | 9. New Hampshire | 14. Vermont |
| 5. Maine | 10. New York | 15. Washington |

We compare these peers against both Hydro-Québec's current and previous energy efficiency plans.

ii. Choice of Indicator

In order to assess relative DSM efforts, a number of indicators can be chosen, including spending per capita, spending per kWh sales and spending per sales revenue.¹²⁵

We find that **spending per capita** is the least adequate measure of DSM effort, since the denominator reflects only the number of residential customers, to the exclusion of all other customer accounts. Using this measurement could result in significant bias in favour of regions with a high proportion of non-residential load, and in any case ignores consumption – the focus of energy efficiency efforts – altogether.

Spending per sales revenue corrects this problem. However, it introduces bias of its own, namely undue bias in favour of low-rate regions. In practice, rates should have no bearing whatsoever on the potential for cost-effective energy efficiency. Indeed, such potential is based on marginal costs, which in practice have no relation to rates. Furthermore, one could argue that to the extent that low rates have led to inefficient decisions in the past, such regions offer even *greater* opportunities and could thus be expected to invest even more than those with higher rates (assuming similar marginal costs). Similarly, one would also expect that the primary effect of low rates would be to increase the level of DSM incentives required to achieve a given customer payback, thus again justifying higher, not lower, utility spending for low-rate regions. We therefore find that spending per sales revenue, while preferable to a per capita indicator, imposes undue bias of its own and is not the preferred option.

Spending per electricity sales may offer the fairest picture of DSM efforts. Indeed, spending per kWh sales accounts for *all* sales, not just those to residential customers, and does so without introducing undue rate-related bias. Assuming that marginal costs are similar across regions, kWh sales is therefore an appropriate measure of a region's cost-effective DSM opportunities, all else being equal.

Given the above, we believe that **spending per kWh sales** is the preferable indicator of DSM efforts. However, we will also provide results in spending per sales revenue for information purposes.

iii. Data sources

Given the tremendous year-to-year changes that have occurred in the past five years (and continue to take place today), accurate benchmarking for utility energy efficiency programs is challenging. Data several years old can quickly become so out of date as

¹²⁵ This exercise focuses on effort. We chose not to conduct a savings-based approach for two reasons: First, it is excessively difficult to achieve a reasonable comparative base given ongoing results of past efficiency efforts and second, data are unreliable since limited to forecasts, not actual results.

to have little bearing to reality. Since this is the case for the industry as a whole and not the odd region, it is all the more important to ensure data are regularly updated.

For the purposes of this exercise, we have attempted to ensure use of the most up-to-date data sources available. Specifically:

- > For 2 States, we relied on data from the American Council for an Energy Efficient Economy's 2002 State Scorecard (data for Y2000), the same source used by Hydro-Québec in its responses to interrogatories.¹²⁶
- > For 7 States, we relied on more recent ACEEE data published in 2004 (data for Y2002-03).¹²⁷
- > For 3 States, we used current-year data obtained directly in 2004, primarily from annual reports and regulatory filings.
- > For the 4 Canadian provinces (including Québec), data were obtained directly from Y2004 approved regulatory filings, with the exception of Ontario, where a Y2004 government-approved budget applies in aggregate to all LDCs.

In all cases, we made every possible effort to ensure comparability with Hydro-Québec's PGEÉ. For example, we subtracted budgets related to cogeneration or fuel switching programs sometimes included in utility efficiency plans.

One discrepancy that we were not able to correct for was the use of historical versus forward-looking data. Specifically, while U.S. data is for annual budgets of *recent* years, data for Canadian utilities covers the coming years of their new plans. Thus, Manitoba Hydro's data represents the average for the period 2005-2011, for example, while Hydro-Québec's covers the period 2005-2010. Given current growth of interest in energy efficiency, this discrepancy likely overstates Québec's effort relative to its U.S. counterparts.

Finally, to ensure consistency, all data are reported in U.S. dollars (at \$1.24C/USD).

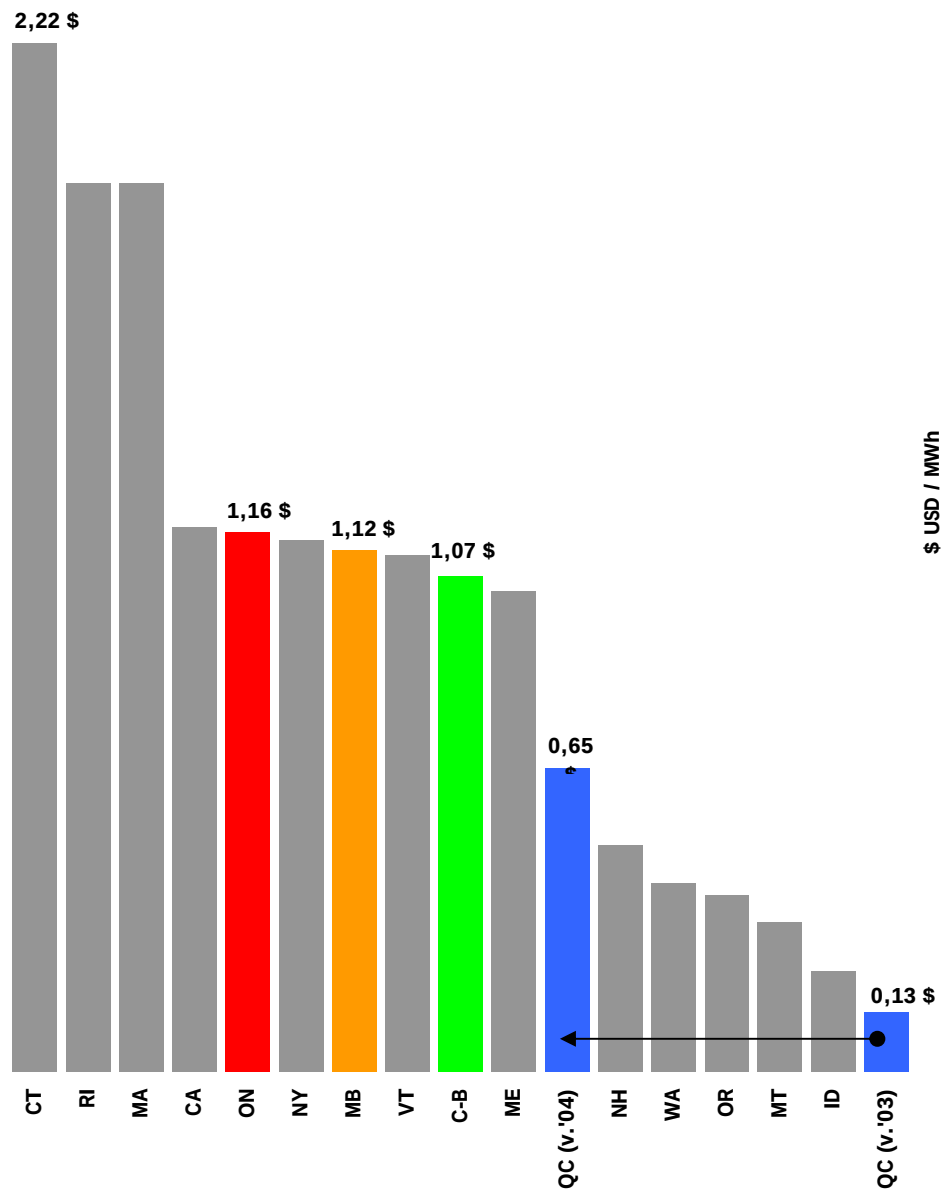
3. Results

As can be seen in Figure 10 below, when measured against kWh sales, Hydro-Québec's current effort ranks 11th out of the 16 test regions (including itself). This represents a concrete improvement from its previous plan, which ranked 16th of 16.

¹²⁶ ACEEE, *State Scorecard on Utility and Public Benefits Energy Efficiency Programs: An Update*. D. York and M. Kushler, December 2002.

¹²⁷ ACEEE, *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies*. D. York, M. Kushler and P. Witte, March 2004.

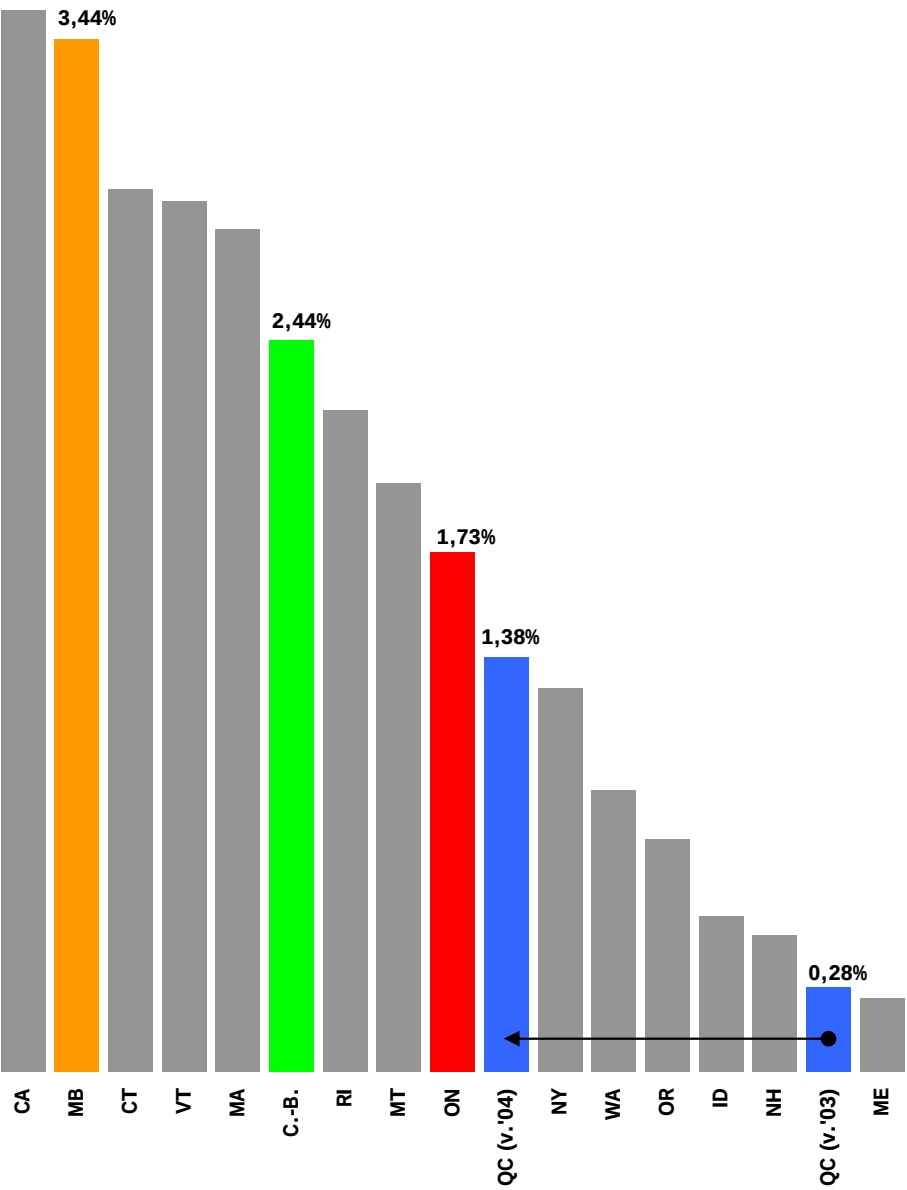
Figure 10. Québec and 15 Benchmark Regions: DSM Investment / Sales Volume (\$/MWh)



Examining the results further, it is also apparent that, among the test regions, there are broadly speaking three levels of investment: those that invest between 10¢ and 60¢/MWh, those between \$1 and \$1.20/MWh and those in the \$2/MWh range. Despite significant improvement, Hydro-Québec's current effort still remains among (though leading) those with the lowest measured efforts.

Figure 11 presents Hydro-Québec's effort measured by the less preferred indicator, investment/revenue. Here, the picture appears slightly better, with a placement of 10th out of 16. Again, this represents an improvement over its previous plan's 15th place ranking. We also note that while the preferred indicator presented three distinct investment levels, results from this indicator present a smoother differentiation.

Figure 11. Québec and 15 Benchmark Regions: DSM Investment / Sales Revenue (%)



However, we again caution against use of this indicator, which overstates the efforts of low-rate regions (Manitoba, B.C., Québec, Washington, Oregon, Idaho and Montana) at the expense of high-rate ones. As indicated previously, low rates, as opposed to marginal costs, have either no or negative relationship to opportunities for cost-effective energy efficiency investments. As such, these results are presented for information purposes only.

4. Discussion

Hydro-Québec's new plan represents an important improvement in terms of overall financial effort. This improvement should be commended.

That being said, this new effort remains considerably weaker than those of Hydro-Québec's peers, including those operating in the same regional markets and those with similarly high hydroelectric dominance and low rates.

Furthermore, it is important to recognize that peer DSM efforts are generally growing. Indeed, while the latter half of the 1990s brought a lull in energy efficiency efforts (due largely to focus on electricity industry restructuring), the new decade has seen a return to more significant investments. As such, the goalposts by which Hydro-Québec's efforts can be measured are in constant flux.

One example of "moving goalposts" is Manitoba Hydro. Its 2003 Power Smart plan represented considerable investment – double its previous plan – and resulted in a measured effort 5 times greater than Hydro-Québec's 2003 plan (5¢/MWh investment over sales as compared to Hydro-Québec's 1¢/MWh). Yet while Hydro-Québec was preparing to quadruple its own effort, bringing it in line with Manitoba Hydro, MH was in the process of increasing its effort by another 50%. Thus, the Prairie utility continues to put nearly twice as much resources into its DSM plan, on a per-MWh sales basis, than Hydro-Québec (and nearly 3 times as much as a percent of sales revenue).

The fact of moving goalposts is not limited to Manitoba Hydro. Utilities throughout North America have recently reawakened to opportunities for resource procurement through energy efficiency. All of which means that without absolute increases in investment effort, Hydro-Québec's relative performance will likely fall in coming years.

Given the significance of additional cost-effective DSM opportunities, we believe the Energy Board should signal to Hydro-Québec its expectation of continued, substantial increases in financial commitment over the coming years. Concretely, this could take the form of setting forth a target of Hydro-Québec moving into the top 5 ranking within 3 years. At current rates, this translates to a more than doubling of current commitments.

Past experience with programs throughout North America suggest that greater increases are feasible. Furthermore, given our knowledge of the ongoing work on

technico-economic DSM potential, we are convinced this would be desirable in that it would maximize *economical* energy efficiency gains. Nonetheless, this goal could be subject to the results of the ongoing economic potential analysis (R-3519-2003), in order to ensure that increased investments are limited to cost-effective energy efficiency opportunities.

Recommendation: Establish as a formal goal that Hydro-Québec's energy efficiency efforts rank among the top 5 of its 15 closest peers within 3 years.

| i | List of Recommendations

The following is a complete list of the recommendations contained in this report. These include both suggested improvements to existing strategies, and more fundamental changes and choices. The latter are highlighted by bold text.

General

1. Undertake a comprehensive review of market barriers in order to inform future program design and ensure maximum effectiveness
2. Facilitate flexibility and dynamism by proving Hydro-Québec with guidelines for retroactively judging unilateral program changes, based on “good faith” principles.
3. Support recovery of additional costs incurred over the past year.

Automated Diagnostic Program

4. Approve Hydro-Québec’s current automated on-line/mail-in diagnostic program approach.
5. If results of the ongoing evaluation of the *Negawatts* pilot project are positive, consider supplementing the current automated diagnostic approach with targeted on-site home visits. Specifically, consider using the on-site visits to target communities with above-average residential consumption.
6. Approve the CFL giveaway approach.
7. Relocate the audit program link to a prominent place on Hydro-Québec’ web home page.
8. Encourage Hydro-Québec to integrate the operational flexibility required to leverage unanticipated, externally-generated opportunities by intensifying marketing efforts during periods of peak interest in energy / environmental issues.
9. Modify the audit template in order to provide seamless linkages to promotional and incentive programs. Also categorize recommended measures, offer links, promote non-energy measure benefits and explain technical terms, as explained in the text above.

10. Review the approach to linguistic minorities and examine the option of providing direct-mail minority-language questionnaires.
11. Install a continuous data verification/update process for revamping key information inputs to template recommendations and ensuring consistency with both market conditions and Hydro-Québec's own promotions. Ensure that the process targets new technology measures subject to rapid improvements/changes.

Novoclimat Program

12. **Shift a share of the proposed customer incentive upstream to builders, subject to adoption of the full suite of complementary strategies discussed below.**
13. Link a part of the customer incentives to installation of additional efficient lighting or appliance measures.
14. Supplement the (reduced) incentives with an aggressive co-marketing effort in conjunction with participating builders.
15. Engage the real estate industry in discussions aimed at providing education to realtors regarding energy efficiency benefits, in particular through curriculum development.
16. Integrate the new CMHC (SCHL) incentive into the Novoclimat marketing effort with a focus on its dual cost and resale value benefits.
17. Renew efforts aimed at having financial institutions offer energy efficient mortgages, wherein mortgage limits are raised in accordance with lower operating costs of efficient homes.
18. **Incorporate new EnerGuide for New Homes rating in the Novoclimat program design.**
19. Support the Novoclimat's marketing of non-energy benefits.
20. Increase the builder's incentive, and focus additional resources to ongoing recruitment, marketing and sales training.
21. Develop an aggressive co-marketing effort with participating builders, along the lines of the TXU Electric Delivery's approach.
22. Offer Hydro-Québec the flexibility to finance builder training fees should participation prove insufficient.

23. Approve Hydro-Québec's proposal to cover the full cost of efficiency inspections.
24. On an interim basis, increase the proposed incentive to the social housing segment in order to cover the full incremental costs.
25. Engage the SHQ toward integrating energy savings into subsidy cap calculations. Once achieved, reduce the direct incentive accordingly.
26. Investigate opportunities for bulk efficient appliance purchasing to acquire additional cost-effective savings.
27. Develop a distinct program strategy for the manufactured homes segment, focused on non-energy quality assurance and innovation benefits.
28. Reject Hydro-Québec's target market penetration and adopt a target market share of 25% on average during the period 2005-2010.
29. Approve Hydro-Québec's budget request relative to the building code review committee.

EnerGuide for Houses Program

30. Approve Hydro-Québec's proposal to piggyback on the *EnerGuide for Houses* program by building on the OEE's incentive structure.
31. Launch a limited-scale (500 household) pilot project aimed at assessing the merits of buying down 'A' audit costs to \$50.
32. Evaluate the free drivership and free ridership impacts of the EnerGuide for Houses program.
33. Implement an aggressive *EnerGuide for Houses* target marketing effort aimed at high use customers, while maintaining the same incentive level.
34. Ensure systematic integration of the new CMHC incentive into Hydro-Québec's EnerGuide for Houses marketing efforts.
35. Consider the option of eliminating its minimum contribution requirement for all or a subset of low-income customers, and report back to the *Régie* on this option following results of the initial test phase.

Low-Income Direct Install Program

- 36. Immediately reconsider the delivery agency payment approach with a view to isolating material costs from agency fees in time for the next contract season.
- 37. Adopt an annual revision of the fee schedule paid to delivery agencies and index them to inflation for budgetary purposes.
- 38. Institute a permanent consultative committee to enable ongoing discussion and consultation with delivery agencies.

SHQ Affordable Housing Program

- 39. Integrate lighting retrofits into the Affordable Housing program design, including implementation of Super T8s and pin-based CFLs.
- 40. Consider integrating an appliance replacement component where economics warrant.
- 41. Ensure comprehensive and integrated renovation designs that account for the interactive effects of measures, including on HVAC capacity sizing.

MC/ES Efficient Products Program

- 42. **Remove geothermal heat pumps from the MC/ES program and create a distinct heat pump initiative.**
- 43. Adopt a temporary joint promotions strategy, using best practices developed and applied by the Northeast Energy Efficiency Partnerships as a guide.
- 44. **Offer a standard, year-round rebate of roughly \$3 per CFL (starting higher, declining with time) in addition to temporary joint promotions with large retail outlets.**
- 45. Reject Hydro-Québec's targets for CFL sales and savings, and adopt net targets of 0.8 CFL sales/home/year by 2007 and 1.05 by 2010, and a total energy savings target of 600 GWh/year by 2010 for this measure.
- 46. At a minimum, limit any and all CFL promotions, including incentives, to Energy Star certified models.

47. Purchase access to PEARL testing results, ensure continuous revision of qualified products as new test rounds are completed and, wherever reasonable, further limit promotion-eligible CFLs to those that have passed PEARL or other independent testing.
48. Reject Hydro-Québec's targets for net *Energy Star* clothes washer sales, and adopt targets of at least 10% attributable market share (above baseline sales) by 2007 and 16.5% by 2010.
49. Investigate opportunities for encouraging market adoption of SEHA Tier-2 appliances, and provide analysis of these opportunities in next year's regulatory filing.
50. Build the efficient appliances effort around a combination of standard rebates, joint promotions and salesperson incentives.
51. **Immediately develop an efficient windows initiative as part of the MC/ES programme. This initiative should focus simultaneously on upstream collaboration with – and incentives to – the windows manufacturing industry, and sales-end promotions at the retail level.**
52. **Immediately commit to the 80+ efficient computer power supply program.**
53. Integrate a continuous labelling and incentive update process with an aim to capturing opportunities from new efficient products as they arise.

Super-Efficient Heat Pumps Program (new)

54. Support Hydro-Québec's proposal to work toward building the geothermal supply infrastructure, and pay particular attention to quality issues.
55. **Reject Hydro-Québec's proposal to offer direct customer incentives for geothermal systems, and direct it instead to develop financing options – ideally under long-term leases – aimed at positive net cash flow. Reserve the incentive option for future years.**
56. **Adopt the five-pronged strategy indicated above with a view to launching a full-scale cold-climate heat pump deployment program by 2007/08.**
57. Integrate a quality control component using new diagnostic tools to ensure proper heat pump installation, and make incentives conditional upon diagnostic results.

CI Buildings Initiatives Program

58. Approve Hydro-Québec's underlying principles of covering the majority of costs and encouraging deep efficiency measures.
59. **Reject Hydro-Québec's proposed incentive structure.**
60. **Adopt a replacement structure based directly on incremental costs, and modulate the incentive levels to encourage comprehensive projects and to account for differences between lost opportunity and retrofit needs.**
61. Encourage Hydro-Québec to transition toward the use of customized incentives to match customer needs, and tie this approach to an eventual utility DSM incentive structure.
62. Approve Hydro-Québec's proposed new project caps.
63. Approve Hydro-Québec's proposed feasibility study incentives.
64. **Provide an incentive for design professionals to encourage their participation in the program and facilitate savings from new construction projects, as outlined in the text.**
65. **Pay design professionals to assist municipalities early in their capital process by integrating efficiency goals and criteria upstream in construction bid documents.**
66. Facilitate and encourage municipal leasing companies to offer energy efficiency financing when efficiency improvements need to be brought mid-stream in project development.
67. Approve Hydro-Québec's proposed permanent sectoral consultative committees.
68. **Adopt a relationship-building, one-on-one, sales-oriented approach to marketing CI programs, including extensive use of circuit riders.**
69. **Adopt a markets approach rooted in cross-training staff, increasing market outreach, eliminating internal barriers and establishing internal markets integration.**

Small CI Customers Program (new)

70. **Adopt a distinct program for the small CI market segment. This program could be run in-house or be outsourced to the ESCO community. In both cases, adopt the multi-pronged strategies listed in the text above.**

MC/ES Efficient Products for Business Program

71. **Increase the prescriptive incentive to cover roughly 75% of incremental costs.**
72. Focus the MC/ES for Business prescriptive lighting incentives on Super T8s for all but the smallest business customers.

SMI Industrial Process Initiatives Program

73. **Consider integrating process- and buildings-related efforts into a single Initiatives program using incentives based on percent-of-incremental-cost. In the long run, transition toward a customized incentive approach, as discussed in the Buildings initiatives section.**

Overall Financial Effort

74. **Establish as a formal goal that Hydro-Québec's energy efficiency efforts rank among the top 5 of its 15 closest peers within 3 years.**