



LEADERSHIP IN ENERGY EFFICIENCY

Comparing Manitoba Hydro's *Power Smart* with Leading North American Strategies

A **DUNSKY ENERGY CONSULTING** report,
in collaboration with Optimal Energy Inc.

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COMPLETE REPORT – October 1st, 2009

About Dunsky Energy Consulting

Dunsky Energy Consulting (DEC) is a Montreal-based firm specialized in the design of leading energy efficiency and renewable energy strategies, aimed at maximizing energy savings and minimizing costs. DEC's services include program and policy design, assessing markets and measures, conducting savings potential studies and cost-effectiveness analyses, and otherwise advising clients on key issues related to energy efficiency and renewable energy. DEC's clientele spans Canada and the U.S., and includes a host of utilities, government agencies, non-profit organizations and private sector firms. For more information, please visit us at www.dunsky.ca.

Acknowledgements

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We would equally like to thank the many program managers and local stakeholders, throughout Canada and the U.S., who provided information and analysis for our case studies.

Any errors or omissions are the sole responsibility of Dunsky Energy Consulting and its contractors.

Note to the Reader

This report examines the Power Smart portfolio of programs as it stood in December, 2008. We have not accounted for any changes – including improvements and additions – to the Power Smart portfolio that may have arisen since then.

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Executive Summary

MANDATE

Manitoba Hydro has long been considered among Canada's leaders in energy efficiency incentive programs, thanks in large part to both a strong corporate commitment and a stable, long-term planning perspective. Yet the goalposts of energy efficiency are shifting: throughout North America, utilities and government agencies, including longstanding leaders, are being tasked with significantly increasing their energy efficiency goals and budgets, often doubling or tripling what were previously considered leading savings targets.

Manitoba Hydro today is committed to maintaining its position among the continent's leaders. To this end, it commissioned Dunsky Energy Consulting to conduct a strategic review and comparison of its Power Smart portfolio of programs with those of other leading regions, with a view to identifying not only successes, but also opportunities for continued improvement. Ultimately, this report is meant to assist the Corporation in maintaining and/or reinforcing its position as a North American energy efficiency leader.

More specifically, this project is focused on five key objectives, namely:

1. **Comprehensiveness:** Assessing Manitoba Hydro's overall energy efficiency effort.
2. **Success:** Assessing Manitoba Hydro's energy efficiency achievements.
3. **Gaps:** Identifying further areas for energy savings opportunities.
4. **Design:** Assessing the design of Manitoba Hydro's primary efficiency programs.
5. **Operations:** Evaluating Manitoba Hydro's administrative efficiency at the portfolio level.

The final result of this analysis is designed to provide Manitoba Hydro with both a clear sense of how it compares to leading North American promoters of energy efficiency, and how it can continue to improve its performance, generate additional energy savings and secure or strengthen its position among North American leaders in energy efficiency.

METHODOLOGY

We have reviewed Manitoba Hydro's energy efficiency efforts from a number of different angles:

PORTFOLIO LEVEL COMPARISONS

Our "portfolio-level" analysis focuses on the sum total of all of the utility's programs and processes. We assessed Manitoba Hydro's overall portfolio in three ways:

- Quantitative benchmarking: We compared Manitoba Hydro's Power Smart with ten leading jurisdictions using key metrics for achieved savings, current efforts and future goals.
- Qualitative Comparison: We conducted two qualitative comparisons with three leading regions:
 - Gap Analysis: We have mapped out and compared the program offerings of Manitoba Hydro and the three case studies by market segment and program strategy.
 - Policy Analysis: We contrast Manitoba Hydro and case studies according to key policies, including regulatory, goal setting/funding, program design/screening, and evaluation.

PROGRAM-LEVEL COMPARISONS

We grouped Power Smart programs according to typical energy efficiency program areas and compared each program, or group of programs, with case studies. Programs were compared on program design, coverage of relevant efficiency measures and effectiveness at addressing market barriers. We also compared them, whenever possible and relevant, on quantitative metrics, using a variety of indicators. Finally, we considered how Manitoba Hydro compared with exemplary programs beyond our case studies. Manitoba Hydro's programs were then rated using five categories: "leaders", "advanced" programs, "standard" programs, "basic" and "weak" programs.

LOW INCOME RENTAL MARKET STUDY

As part of its ongoing design work in this area, Manitoba Hydro was particularly interested in a review of strategies used by other jurisdictions to reach the low-income rental market. In addition to our overall analysis of the Lower Income Energy Efficiency Program, we interviewed program managers and industry experts and provide an overview of issues and options for dealing with the unique barriers faced by this market. In particular, we consider the issue of split incentives and how to ensure that program benefits accrue to low-income tenants. As requested, we also addressed the opportunity for market transformation within this segment of rental housing.

The tables on the following page summarize our categorization of Manitoba Hydro programs. See our program area gap analysis on page 42 for more details.

RESIDENTIAL PROGRAM AREAS		
	Program Area <i>(See page 44 for definitions).</i>	Manitoba Hydro Programs
MARKET DRIVEN / NATURAL REPLACEMENT	New Construction Comprehensive	PS New Homes Earth Power Loan R-2000
	Lighting, Appliances and Plug Load	Appliance program Lighting program Furnace and Boiler Replacement program
	Standalone HVAC and DHW equipment	Furnace and Boiler Replacement Program
RETROFIT / EARLY RETIREMENT	Comprehensive Retrofit	ecoENERGY (federal) Residential Loan Home Insulation Program Earth Power Loan Furnace and Boiler Misc. audits, workshops Replacement program
	Low Income Comprehensive Retrofit	Lower Income Energy Efficiency Program ecoENERGY (federal program)
OTHER / NICHE	Appliance Retirement (general and low-income)	No programs
	Geothermal Systems	Earth Power program
COMMERCIAL AND INDUSTRIAL PROGRAM AREAS		
	Program Area <i>(See page 45 for definitions)</i>	Manitoba Hydro Programs
MARKET-DRIVEN / NATURAL REPLACEMENT	New Construction	No programs.
	Prescriptive – Products	Kitchen Equipment Building Envelope, Refrigeration HVAC, Rinse and Save Clothes Washers Refrigeration, Parking Controllers
	Prescriptive - Lighting	Lighting
MARKET DRIVEN AND RETROFIT	Commercial Custom	Commercial optimization Commercial Custom Energy Manager schools All prescriptive products PS Design Standards programs
	Industrial Processes Custom	Performance Optimization Gas Optimization
RETROFIT/ EARLY RETIREMENT	Small Commercial Retrofit	No programs.
NICHE	I/T Savings	Network Energy Manager.
	Geothermal Systems	Earth Power
	Agricultural Programs	Heat Pads All relevant prescriptive and custom programs.

PORTFOLIO-LEVEL RESULTS

QUANTITATIVE BENCHMARKING

We compared Manitoba Hydro with 10 leading jurisdictions on six metrics, summarized below.*

Overall Perspective	Metric	Electric	Gas
Relative recent success (achieved savings)	Achieved energy savings/ total demand	✓	✓
	Achieved energy savings/ demand growth	✓	
Relative current effort (efficiency budgets)	Recent efficiency spending / total revenues	✓	✓
	Recent efficiency spending /total energy sales	✓	✓
Relative future goals (required or targeted savings)	Future energy savings goals / future demand	✓	✓
	Future energy savings goals/ future demand growth	✓	

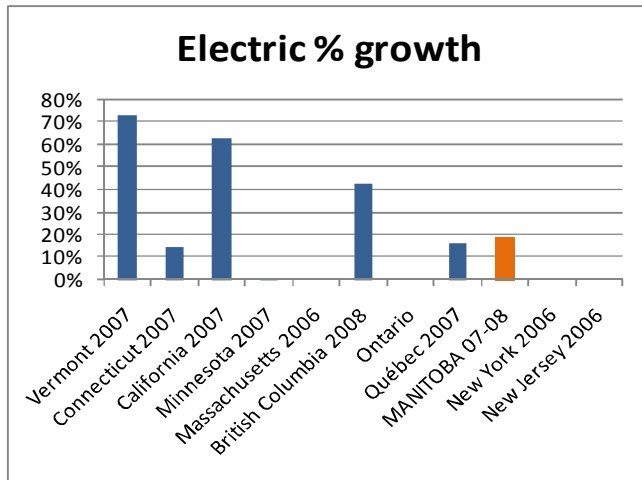
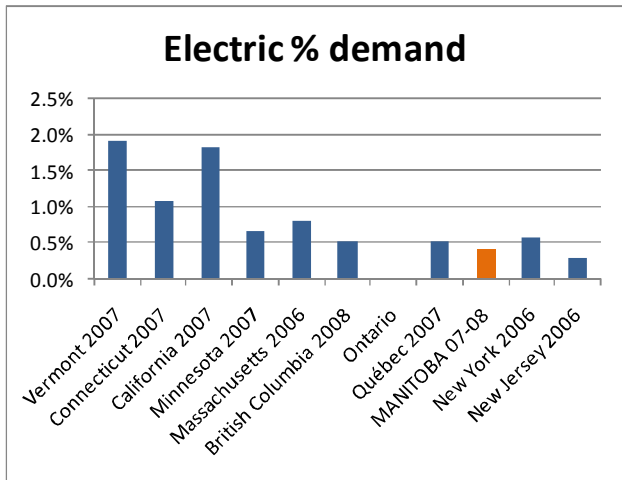
Our results are illustrated in the graphs on the following two pages (for a discussion of caveats, see page 35). Based on this evaluation, Manitoba Hydro can rightly claim to be among – though not at the top of – North America’s leaders in energy efficiency. Indeed, whether measured on achieved savings or current efforts, its performance in 2007/08 was roughly comparable to that of many of our test leaders. While several leading regions were either significantly further ahead (electricity) or further behind (natural gas), on the whole the provincial utility could be considered, with some notable exceptions, relatively competitive among its leading peers.

The same cannot be said, however, on a forward-looking basis, at least insofar as electricity savings targets are concerned. Indeed, whether measured on the basis of total forecast load or projected load growth, Manitoba Hydro’s energy efficiency targets are considerably lower than those of our leading North American regions. This is even more telling when we consider that our “leaders” were chosen based on past and present performance, not future goals.

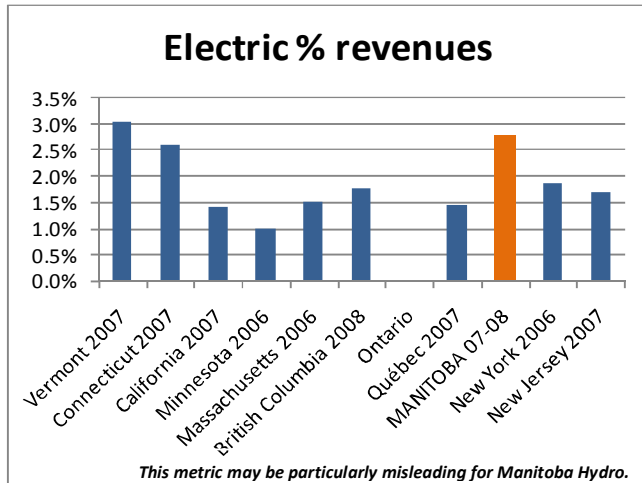
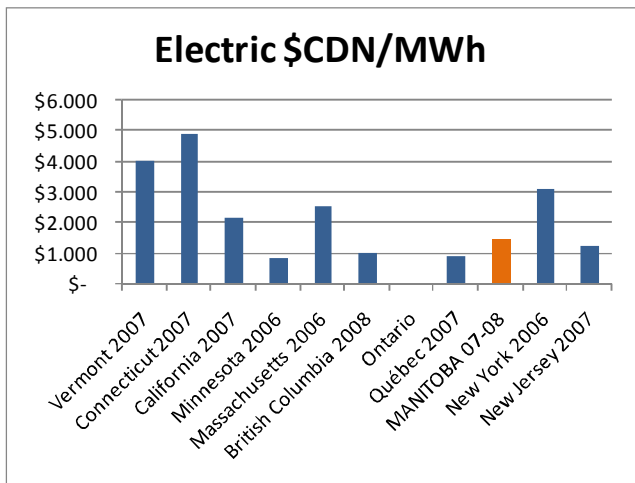
* As we note in the report, metrics often fail to account for contextual differences among regions (rates, industrial loads, electric space heat, weather, and deemed savings practices are all worthy examples). As a result, we caution the reader to consider these results with care. For example, in the first graph of results (achieved electric savings as a percent of demand), Manitoba Hydro’s 0.4%/yr should be seen as roughly equivalent to New York’s, Quebec’s and B.C. Hydro’s 0.5%/yr, given the noise of contextual differences, though not at all equivalent to Massachusetts’ 0.8%, Connecticut’s 1.1%, California’s 1.8% or Vermont’s 1.9%/yr. **We are confident that, taken on the whole, the results provide an accurate reflection of Manitoba Hydro’s relative position in terms of achieved savings, current effort and future goals.**

As we can see, leadership in energy efficiency – especially in recent times – is a moving target; a leader today may be a laggard tomorrow. Over the past couple of years, and still today despite the current economic downturn, regions throughout the continent are adopting increasingly aggressive savings goals, typically in the range of 1-2% of sales annually (at least insofar as electricity is concerned). In this respect, Manitoba Hydro's continued leadership in energy efficiency will require new, more ambitious electricity savings goals, as well as reconsideration of its current portfolio of programs and strategies.

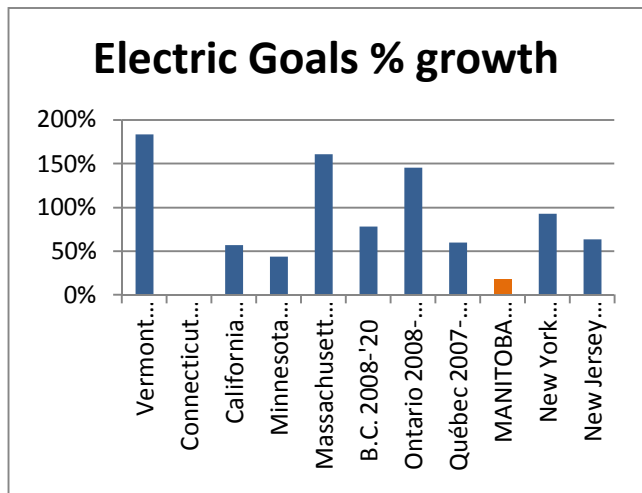
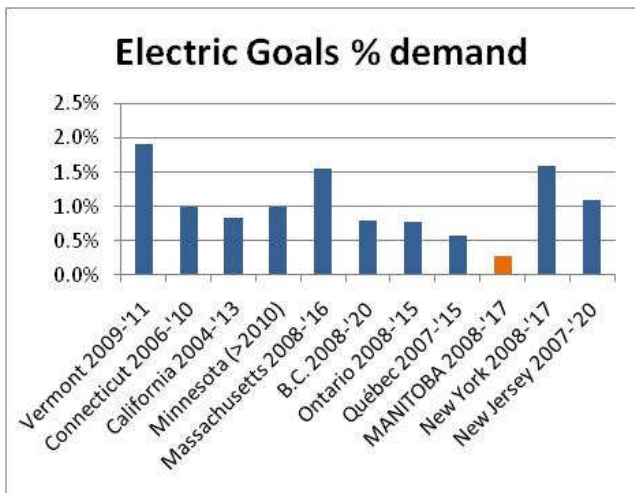
Electric: Achieved Savings



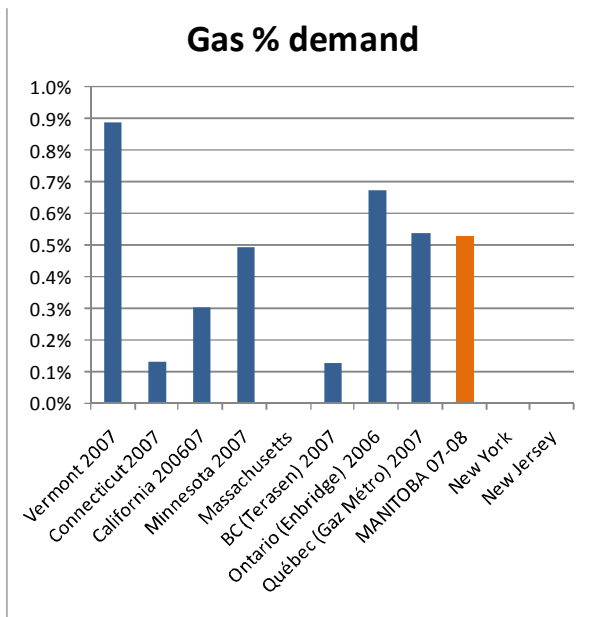
Electric: Efficiency Budgets



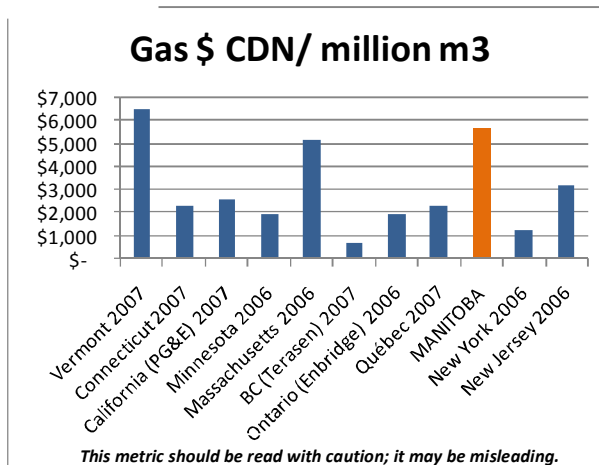
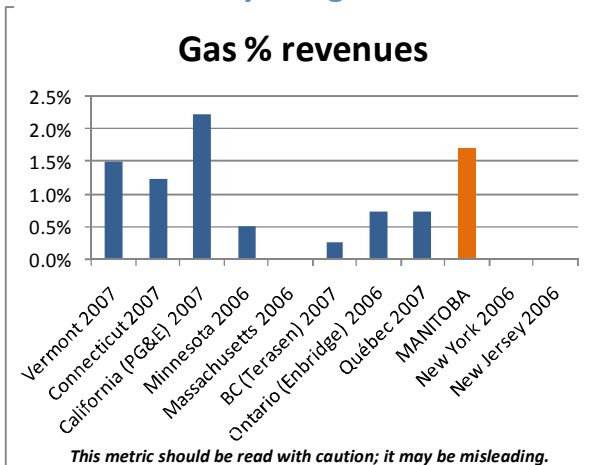
Electric: Future Goals



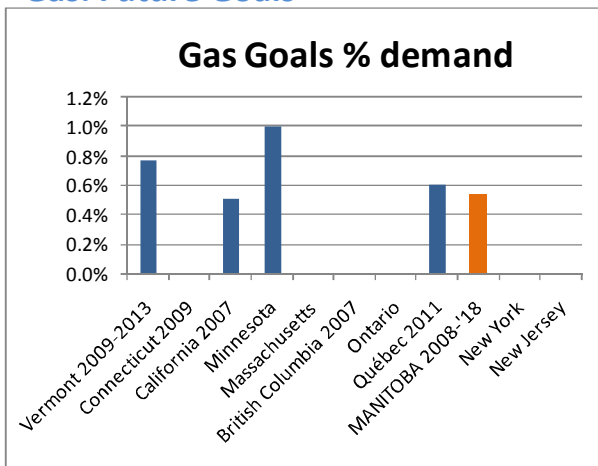
Gas: Achieved Savings



Gas: Efficiency Budgets



Gas: Future Goals



QUALITATIVE COMPARISON

Case Studies

For our gap analysis and policy analysis, we compared Manitoba Hydro with three leading efficiency program administrators: Pacific Gas & Electric (California), Efficiency Vermont (combined with Vermont Gas Systems), and Xcel Energy (Minnesota).

Program Coverage

Manitoba Hydro has a broad suite of programs covering almost all residential program areas and most commercial and industrial program areas. Some gaps in coverage do appear, but mostly in program areas that many other utilities – though rarely the leaders – fail to address as well: multifamily residential buildings, small commercial retrofit, and commercial custom retrofit opportunities. Other Manitoba Hydro gaps are for relatively narrow or niche program areas: residential appliance retirement, low-income residential appliance replacement, and agricultural programs. One significant exception is commercial new construction, a major program area for which Manitoba Hydro had no distinct strategy as of December 2008.* Our revision did not take into account programs currently in the planning states at Manitoba Hydro.

Like Manitoba Hydro, our case studies also have gaps in coverage, particularly for some niche areas (for example, geothermal energy and residential appliance replacement). However, two of our three leaders (Vermont and PG&E) have almost no gaps for major program areas, and Xcel Energy has more extensive coverage than Manitoba.

Overall, we find that Manitoba Hydro is more comprehensive than many typical utilities in addressing most program areas, but still has significant gaps relative to leading jurisdictions.

Use of Program Strategies

We compared Manitoba Hydro with the three case studies on their use of eleven key program strategies.

Manitoba Hydro and the three case studies all make extensive use of many 'downstream' or end-user strategies – customer incentives, subsidized audits and studies, technical support and education. Manitoba Hydro compares well with the case studies in this area, and is notable for its use of on-bill

* We should note that Power Smart staff have in the past worked with interested customers to adapt and bundle existing programs for new construction projects they have been made aware of. Examples include the Health Sciences Centre, Winnipeg Airport, the University of Winnipeg and the new Post Office. Though this flexibility is welcome, a more proactive strategy is still required in order to reach the majority of new construction projects that may not come to the utility's attention in time for design changes.

financing, an important but generally underused strategy that is a significant improvement over third-party financing. However, Manitoba Hydro, along with Xcel Energy, differs from PG&E and Vermont in that they generally make limited use of upstream strategies such as market actor training, incentives, and co-marketing funds (although we should note that Manitoba does provide some training to market actors and has a strong upstream strategy for the geothermal market in particular).

Upstream strategies are increasingly used by jurisdictions as they aim for deeper savings to complement more traditional, customer-focused incentives. In some cases, such as residential new construction and market-driven lighting and appliance programs, incentives to builders, manufacturers and distributors can complement and/or be more effective than end-user incentives. In other cases, such as residential retrofit programs, upstream strategies complement customer services by driving market actors to generate leads and develop quality infrastructure. PG&E and Efficiency Vermont are excellent examples of jurisdictions using complementary upstream and downstream strategies in this way. It is worth noting that Xcel, until recently formally constrained by its regulator to focus exclusively on downstream strategies, is now exploring upstream services in order to reach its more ambitious future efficiency targets.

PROGRAM STRATEGIES

(see page 49 for definitions)

- ✓ Customer education
- ✓ Market actor training / certification
- ✓ Free / subsidized audits / studies
- ✓ Technical support (customer or contractor)
- ✓ Customer incentives
- ✓ Upstream incentives
- ✓ On-bill financing
- ✓ 3rd party financing
- ✓ Turnkey (direct installation)
- ✓ Co-marketing with market actors
- ✓ Market outreach / expertise

Finally, Manitoba Hydro can improve its performance and increase its savings by taking fuller advantage of two significant strategies: turnkey installation and market outreach. Turnkey installation is particularly effective for retrofit opportunities in “hard-to-reach” markets such as low-income homes and small commercial existing buildings, the latter representing an important opportunity for Manitoba Hydro. Like all utilities, Manitoba Hydro conducts market outreach and has developed in-house expertise for some markets, but in the most relevant program area for this strategy – commercial custom programs – it could make greater use of proactive account management and dedicated market segment services.

Overall, we find that Manitoba Hydro makes good use of a wide range of downstream strategies, but has room to improve, in particular through more active upstream strategies and expansion of its direct install approach to the small commercial retrofit market.

Policy Gap Analysis

Our comparison of Manitoba Hydro with the three case study jurisdictions considered a total of 19 policy elements, grouped together into three categories: regulatory environment, program design and screening, and evaluation.

Regulatory Context: Manitoba Hydro is not required to seek regulatory approval of specific program designs (though its programs are reviewed by the Public Utilities Board), sets its own savings targets and funding levels for efficiency programs, and determines its own cost effectiveness policies. This has given

the utility greater freedom and flexibility than many other jurisdictions. Furthermore, Manitoba Hydro has strong internal drivers for efficiency programming: senior management has established efficiency as a core goal for the utility, and power resource planners encourage deeper savings due to potential export revenues.

On the other hand, as we have seen in our benchmarking exercise and our qualitative review, the most ambitious utility goals throughout the continent are being set by external parties, whether government or utilities commissions. In many cases, these goals have pushed or are pushing utilities to go far beyond what they have previously considered achievable, leading them to discover new savings opportunities and, most importantly, strategies to reach and “sell” efficiency to more customers.*

Ultimately, in order to maintain leadership in energy efficiency, we believe it is essential that Manitoba Hydro set competitive savings goals (e.g., 1-2%/yr).† Cost effectiveness policies, as well as appropriate reporting, oversight and stakeholder input mechanisms, should also be reviewed.

Program Design and Screening: Manitoba Hydro’s program design process is similar to our case studies and most leading jurisdictions, with one key caveat: its unusual choice of cost-benefit tests for screening program designs. On the one hand, Manitoba Hydro is similar to many leading utilities in that it requires its programs to be cost-effective according to the Total Resource Cost (TRC) test, which assesses programs from a societal perspective. On the other hand, Manitoba also uses the Ratepayer Impact Measure (RIM) test to informally screen program designs. By reflecting only the perspective of non participants, the RIM test virtually ensures that cost-effective energy savings opportunities will be missed. The RIM test was used as a primary screen by a number of utilities in the late 1980s and early 1990s, but its role has since largely been relegated to one of information, not screening per se. Indeed, Manitoba is the only region we are aware of that formally strives for energy efficiency leadership while still giving an important role to the RIM. We therefore suggest that Manitoba Hydro focus on screening programs using one or a combination of the Program Administrator Cost (PAC) test and either the Total Resource Cost (TRC) or the Societal Cost (SCT) tests.

Evaluation: Manitoba Hydro largely focuses on impact evaluations, which measure program savings and costs, and does rigorous work in this area. Unlike our case studies, however, it does not conduct process and market effects evaluations, and does not use external evaluators. We suggest that Manitoba consider periodic process and market effects evaluations and have occasional recourse to some external evaluation.

* Similarly, external program reviews by stakeholders (particularly when supported by expert counsel), as well as independent third-party evaluations, often help to spur innovation, improve utility program designs and support more ambitious savings targets.

† Target setting can be done externally or internally. While most leading regions have had their targets set externally, the critical issue for Manitoba Hydro is not who sets the targets, but that they be sufficiently aggressive so as to spur greater innovation and provide the internal drivers to achieve significantly greater electricity savings.

PROGRAM-LEVEL RESULTS

A NOTE ON RATINGS

We categorized existing Manitoba Hydro programs according to the program areas discussed above, and compared them with twenty-eight exemplary programs drawn from two Canadian provinces and eighteen states. Each program or group of programs was compared with case studies on its treatment of market barriers, inclusion of available efficiency measures, program design, and comparable results (where available). We also compared Manitoba Hydro more broadly with lessons learned from exemplary programs beyond the profiled case studies. We should note that, due to a lack of properly comparable data, we do not compare commercial and industrial programs on quantitative indicators.*

Based on our analysis of the five factors described above, we then identify the strongest elements of each Manitoba Hydro program, the greatest challenges facing the program, and pinpoint potential opportunities for improving program performance. Finally, we rate Manitoba's programs by one of the following five categories. The reader should note that we consider all of our case studies to be either "leaders" or "advanced" performers.

- **LEADER:** Manitoba Hydro programs perform as effectively as our case studies and other leaders in results, coverage of cost-effective opportunities, overcoming market barriers and use of effective program design.
- **ADVANCED:** Manitoba Hydro programs go beyond typical, non-leading programs, but either are not at the level of case studies or are not at the level of other strategies of which we are aware.
- **STANDARD:** Manitoba Hydro programs are typical for non-leading utility offerings in this area, though not as effective or comprehensive as our leading programs[†].
- **BASIC:** Manitoba Hydro programs do not cover the majority of opportunities, are narrower in scope and services than typical programs from other utilities, and/or are achieving low savings levels.
- **WEAK:** Very limited program in place, generally with low savings and participation levels.

The diagram on page 18 provides a snapshot of the results of our program level evaluations.

* See discussion on page 49.

[†] Note that we are considering only utilities that have at least limited energy efficiency programs in place.

RESIDENTIAL PROGRAMS

Overall, our review found that existing residential programs are by and large very strong – Manitoba Hydro is particularly adept at approaching the difficult, yet critical, building envelope retrofit market. Yet opportunities for additional residential energy savings exist, both through improving upon existing programs and by addressing new opportunities.

Among its existing programs, Manitoba Hydro could increase savings by revisiting its single-family new construction program, the only current program we rated as “standard” (due largely to its low market penetration compared with case studies and other leaders). Other opportunities could be harnessed in retrofit programs, which could benefit from a more turnkey approach and by a greater emphasis on upstream incentives and market actor services such as training and certification.

Beyond existing programs, Manitoba Hydro can increase savings by addressing important opportunities currently unexplored, in multifamily new construction, multifamily low-income retrofits and early retirement / replacement of old, inefficient appliances.

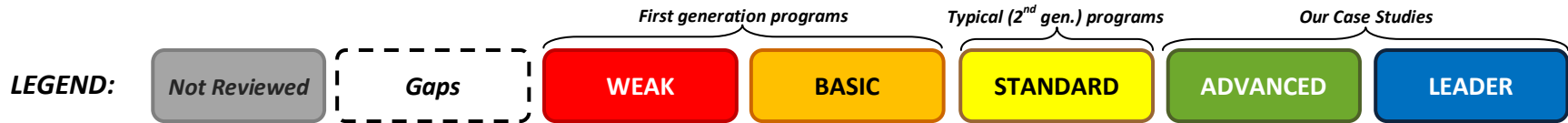
COMMERCIAL AND INDUSTRIAL PROGRAMS

Most of Manitoba Hydro's C&I programs are rated as “standard”, with the exception of the stronger lighting and Earth Power programs, Manitoba's exemplary C&I program. As in the residential sector, there are also substantial gaps, with no programs in place for new construction and small commercial retrofit.

The biggest opportunity for improving Manitoba's C&I programs lies in adopting a more proactive, holistic and customized program strategy. Program research has shown that all C&I customers, from the smallest to the largest, expect a customized approach that makes sense for their particular circumstances. This is best provided by a focus on account management, and incentives that are based on either a percentage of installed costs or negotiated case by case. Active account management allows programs to capture a customer's attention and help them understand the business case for efficiency measures, while flexible incentives ensure that this business case makes sense. Manitoba Hydro has a well-developed account management approach for its largest customers, but could secure significant additional savings by extending it sufficiently to smaller and midsize customers. For smaller customers, turnkey installation (“direct install” approaches) offer another important opportunity for additional savings, this time from the retrofit market. Finally, administrative barriers – due to a multiplicity of individual measure-based “programs” – can also be addressed.

Throughout this report, and in the Summary of Recommendations section, we indicate a series of opportunities – whether improvements to current programs or design of new ones – we believe warrant further consideration for improving Manitoba Hydro's Power Smart portfolio and helping to secure its position as a leader in energy efficiency.

ALL PROGRAM AREA RATINGS



		RESIDENTIAL		COMM. / INST. / IND.		
MARKET-DRIVEN		LIGHTING AND APPLIANCES	Standalone HVAC and DHW	LIGHTING	Small Commercial New Construction	Large Commercial New Construction
		SINGLE FAMILY NEW CONSTRUCTION	Multifamily New Construction	PRESCRIPTIVE PRODUCTS (Commercial Kitchens)*	COMMERCIAL CUSTOM	INDUSTRIAL PROCESSES ^o
RETROFIT		SINGLE-FAMILY RETROFIT	Multifamily Retrofit			
		LOW INCOME SINGLE-FAMILY RETROFIT †	Low Income Multifamily Retrofit	Small Commercial Retrofit		
NICHE / OTHER		Appliance retirement	Plug load / cons. electronics	GEOTHERMAL HEAT PUMPS	GEOTHERMAL HEAT PUMPS	I/T NETWORKS
						AGRICULTURAL

* Our review of the prescriptive products program area focuses on the food services industry. Other prescriptive incentive-based programs (Building Envelope, HVAC, etc.) are reviewed within the Commercial Custom sector. † This is a new program that was rapidly evolving while this review was being conducted, making analysis difficult. As a result, and contrary to other programs, our assessment here is based in part on projected performance (participation). ^o Our review of the industrial processes program found a significant difference in program design and implementation based on customer size.

LOW-INCOME RENTAL MARKETS

Finally, as a distinct piece of work, we were asked to explore issues and options for achieving energy savings in the low-income rental market. Our review of strategies to address this market found three key results:

- The most important dynamic for this program area is the tension between overcoming split incentives (and other barriers) and ensuring program benefits flow to low-income tenants. In other words, there is a potential conflict between ensuring landlord participation and ensuring the flow of benefits to tenants. Most utility programs limit participation to buildings where tenants pay at least one energy bill, to ensure that they are in fact targeting markets where split incentives are significant. Beyond this, most programs weigh in on the side of maximizing participation, providing full incentives and equal access to measures for landlords and tenants alike.
- The second tension in program design is the conflict between overcoming landlord reluctance and protecting tenants post-program. Landlords are naturally reluctant to participate in programs that place limitations on them, particularly where split incentives mean that benefits accrue mostly to tenants. On the other hand, programs managers want to make certain that the improvements they provide don't lead to eviction or raised rents. The most common compromise is for programs to require basic commitments regarding rent increases, but not to develop onerous liens or other such schemes.
- Finally, programs have to decide how to deal with multifamily buildings, where there is likely a mix of low-income and non-low-income tenants. The most common approach is to require that a minimum % of occupants meet income criteria: the disadvantage here is that many collecting proof of income can be onerous, and landlords may furthermore be excluded despite facing significant barriers. Alternative approaches include offering incentives by unit and using auditor judgment.

Separately, we address the potential for market transformation. Our review of strategies for permanently reducing or eliminating market barriers in this area suggests that voluntary programs alone cannot be expected to eliminate barriers and transform the low-income rental market. Rather, programs can focus primarily on achieving cost-effective energy savings; they can also collaborate with – and even encourage – legislative approaches with more opportunity for market transformation.

OVERALL CONCLUSIONS

Manitoba Hydro has historically been considered a leader in energy efficiency. Its recent efficiency achievements indeed compare reasonably well with many leading jurisdictions, particularly Canadian provinces. The utility has a broad suite of programs covering a majority of program areas, makes effective use of most downstream (customer focused) program strategies and uses upstream strategies for some programs. The majority of its residential programs can be considered “advanced”, it has a strong approach for the largest industrial customers, and it is leading the way in utility programs for geothermal heat pumps.

On the other hand, Manitoba Hydro's future savings goals are significantly lower than all ten leading jurisdictions we considered for electricity, and in the mid-range of goals for gas savings. Its portfolio of programs does not directly address several important opportunities, including residential multifamily buildings (both new construction and low-income retrofits), replacement of old, inefficient appliances (namely fridges), retrofits of existing small commercial buildings and construction of new commercial buildings. Additional opportunities can be found in potential improvements to some of its existing programs (streamlining the broad array of single-measure programs, working more upstream in the market, and adopting a more proactive approach to business sector customers as well as to residential new construction).

By acting on these opportunities, Manitoba Hydro could significantly increase its energy savings. Furthermore, the utility is operating from a position of strength, given its province-wide service territory, its integration of electricity and gas markets, support from government and stakeholders for expanding efficiency programs, and a solid foundation comprising some industry-leading strategies and tools.

Yet as regions throughout North America continue to adopt (and fund) ever-stronger goals, these strengths will not be enough to secure leadership into the future. To this end, we recommend that Manitoba Hydro:

- Adopt aggressive, mid- and long-term savings targets;
- Reconsider its program review and screening process, including its choice of cost-benefit tests;
- Expand its portfolio to cover the major gaps identified in this report;
- Adjust its current small and medium commercial and industrial programs to provide services similar to its large industry strategy;
- Explore greater use of upstream program strategies, especially in its residential programs;
- Streamline many of its single-measure programs; and
- Examine the use of turnkey installation for hard to reach markets, including small business.

These changes will be neither simple nor easy. However, we believe they will ensure Manitoba Hydro's continued leadership in energy efficiency into the future.

Introduction

DUNSKY ENERGY CONSULTING

Dunsky Energy Consulting is a small firm with a singular mission: to contribute to an efficient and sustainable energy future by providing top level consulting services to the full breadth of energy decision-makers and stakeholders. We pursue this mission by imbuing our work with three key values:

- > Quality – We work tirelessly to ensure that all work is conducted to the highest possible standards, and to ensure that we are abreast of (or leading) the latest developments and innovations in our field;
- > Integrity – We believe we are duty-bound to provide our clients at all times with consistent, honest and unbiased analysis and counsel;
- > Commitment – We treat our clients as partners, committing ourselves to their objectives, being responsive to needs as they arise and going the extra mile to help them achieve their goals.

DEC's energy efficiency and demand-side management practice is focused primarily on three areas of expertise:

- > Strategies & Policies: We advise clients on strategic planning for demand-side resources, including reviewing plans and portfolios, defining policy and regulatory frameworks, setting goals, determining first principles, choosing threshold criteria, measuring results and establishing effective management and delivery infrastructures. Of note to Manitoba Hydro, DEC has conducted large-scale strategic reviews of energy efficiency program portfolios for leading utilities and government agencies including, most recently, for Gaz Metro's Energy Efficiency Fund and Hydro-Quebec's Energy Efficiency Plan. We currently play a leadership role in the team selected to review and revamp the New Jersey Board of Public Utilities' suite of energy efficiency programs, and have previously played similar roles in reviewing programs in New York, Maine and Ontario.
- > Program Design: We design and assess energy efficiency and demand management programs, with an aim to achieving the maximum savings yield from a given efficiency investment. We do so by systematically identifying and addressing market barriers, by effectively characterizing target markets, by reaping lessons learned from proven best practices throughout North America and beyond, and by adapting these practices to local conditions. Our program design work spans all sectors (residential, commercial, institutional and industrial) and all segments (new construction, retrofit/early replacement, products and R&D).
- > Opportunities Analysis: We help clients identify and assess demand side opportunities, including determining savings potentials and conducting cost-benefit analyses for measures, programs and plans. We also advise clients on appropriate RDD&C efforts aimed at effectively harnessing innovation to replenish the pool of efficiency opportunities.

DEC's clientele covers the full breadth of energy decision-makers and stakeholders, including over seventy electric and gas utilities, government agencies, energy efficiency delivery organizations, environmental and consumer groups, and private firms. We take pride in their diversity – a testimony to our reputation for both quality and integrity. This diversity further allows us to build bridges between parties who come to energy issues with a variety of perspectives and interests.

Subcontractor: Optimal Energy Inc.

As its name suggests, Optimal Energy strives for economically optimal outcomes from the demand-side investment portfolios of all our clients. Optimal Energy is an eight-person consultancy concentrating on energy efficiency and renewable energy as resources for energy-service providers, and as competitive energy solutions for businesses and consumers. Optimal specializes in assessing, developing, planning, start-up, and management support for ratepayer-funded energy-efficiency programs and market-based energy products and services. Founded in 1996, its clientele includes utilities, consumer and environmental advocates, government and regulatory agencies, and energy-service providers.

Optimal's dedication to maximizing returns from demand-side portfolios carries through to implementation planning and management support. Optimal is adept at helping its clients set reasonable performance expectations for DSM programs and helping them manage resources to deliver on their performance commitments. They bring a practical approach to their work that is rooted in their vast experience with utility-run DSM efforts, independently administered programs, and real-world familiarity with a wide range of businesses. They are especially knowledgeable of the market barriers that prevent businesses from taking full advantage of cost-effective opportunities for energy-efficiency investment on their own, and they know how to overcome these barriers successfully under disparate business conditions.

OEI was one of the principle architects in planning, implementing and supporting - with on-the-ground resources – Efficiency Vermont, the U.S.'s first energy efficiency utility. They played a key role, with Dunsky Energy Consulting, in a recent strategic review of Hydro-Québec's programs, and were also involved in DEC's work assessing the Ontario Power Authority's draft CDM plan. OEI has worked extensively in all parts of North America and is currently engaged in two projects in China.

MANDATE

Manitoba Hydro has long been considered among Canada's leaders in energy efficiency incentive programs, thanks in large part to both a strong corporate commitment and a stable, long-term planning perspective. Yet the goalposts of energy efficiency are shifting: throughout North America, utilities and government agencies, including longstanding leaders, are being tasked with significantly increasing their energy efficiency goals and budgets, often doubling or tripling what were previously considered leading savings targets.

Manitoba Hydro today is committed to maintaining its position among the continent's leaders. To this end, it commissioned Dunsky Energy Consulting to conduct a strategic review and comparison of its Power Smart portfolio of programs with those of other leading regions, with a view to identifying not only successes, but also opportunities for continued improvement. Ultimately, this report is meant to assist the Corporation in maintaining and/or reinforcing its position as a North American energy efficiency leader.

This project is focused on five key objectives, namely:

1. **Comprehensiveness:** Comparing Manitoba Hydro's overall energy efficiency effort with those of leading North American counterparts.
2. **Success:** Comparing Manitoba Hydro's energy efficiency achievements with leading jurisdictions in North America.
3. **Gaps:** Identifying further areas for energy savings opportunities not currently addressed by the utility's plan and programs.
4. **Design:** Assessing Manitoba Hydro's primary efficiency programs against both theory (program design principles) and practice (best practices in the field) and, in so doing, pinpointing ways to improve efficiency and access greater savings.
5. **Operations:** Evaluating Manitoba Hydro's administrative efficiency at the plan and portfolio levels.

The final result of this analysis is designed to provide Manitoba Hydro with both a clear sense of how it compares to leading North American promoters of energy efficiency, and how it can continue to improve its performance, generate additional energy savings and secure or strengthen its position among North American leaders in energy efficiency.

METHODOLOGY

We have reviewed Manitoba Hydro's energy efficiency efforts from a number of different angles. In each case, we compare the utility with relevant leaders in ratepayer-funded^{*} energy efficiency programs from across North America. Our analysis is divided into portfolio-level and program-level efforts, and also includes a separate section analyzing issues around programs for the low income residential rental market.

THREE OBJECTIVES

Portfolio Level: By "portfolio" level we are referring here to the sum total of all of the utility's programs as well as its internal processes for designing and implementing programs. The first piece of this portfolio-level review is a quantitative benchmarking of Manitoba Hydro's overall effort (budget, savings achievements and savings goals) against eight leading jurisdictions from Canada and North America.

The second element of the portfolio-level review is a gap analysis. We compared Manitoba Hydro with three leading organizations in terms of its coverage of all key markets, energy efficiency opportunities, and of its use of program strategies. This gap analysis serves to evaluate the utility's comprehensiveness and identify opportunities to increase savings, either via new programs or new program strategies.

The final section of the portfolio-level review is a qualitative assessment of Manitoba Hydro's internal processes and the external context for its efficiency efforts. Comparing the utility with the three leading jurisdictions used for the gap analysis, we considered the regulatory context, how goals and targets are set, and how programs are designed and evaluated. This assessment was aimed at evaluating administrative efficiency and identifying factors contributing to the utility's overall performance.

Program Level: At the program level, we grouped Manitoba Hydro programs according to typical energy efficiency program areas and compared each program or group of programs with case studies from other jurisdictions. For each area, we compared programs qualitatively in terms of program design, coverage of relevant efficiency measures and how well they addressed market barriers. We also compared them, whenever possible and relevant[†], on quantitative results, using the most appropriate metrics for each program area. This effort led to a rating of Manitoba Hydro's efforts in each program area using five categories: leaders, advanced, standard, basic and weak programs.

The table below sums up how our portfolio and program-level assessments address the five objectives of our mandate.

* We also consider government-funded programs in a few cases where relevant, such as low-income residential programs.

† Note that appropriate metrics were largely not available for commercial and industrial programs – see discussion in the Programs Methodology section.

OBJECTIVE	ADDRESSED BY
Comprehensiveness <i>(overall energy efficiency effort)</i>	<ul style="list-style-type: none"> • Portfolio-level benchmarking • Portfolio gap analysis
Success <i>(energy efficiency achievements)</i>	<ul style="list-style-type: none"> • Portfolio-level benchmarking • Program level results
Gaps <i>(further areas for energy savings opportunities)</i>	<ul style="list-style-type: none"> • Portfolio gap analysis • Program level analysis
Design <i>(primary efficiency)</i>	<ul style="list-style-type: none"> • Portfolio-level qualitative review • Program level analysis
Operations <i>(administrative efficiency)</i>	<ul style="list-style-type: none"> • Portfolio-level qualitative review*

Low Income Rental Market Study: As part of its ongoing design work in this area, Manitoba Hydro was particularly interested in a review of strategies used by other jurisdictions to reach the low-income rental market. In addition to our overall analysis of the Lower Income Energy Efficiency Program, we interviewed program managers and industry experts and provide an overview of successful approaches to dealing with the unique barriers faced by the rental segment of this market. In particular, we consider the issue of split incentives and how to ensure that program benefits accrue to low-income tenants. We also addressed the opportunity for market transformation within this segment of rental housing.

We present more details on our methodology at the beginning of each major section.

* Ideally, a comparison of administrative efficiency would compare utility staff efforts or spending to savings achievements or other performance metrics. However, this is difficult to do in the case of energy efficiency program administration for two reasons. Firstly, it is difficult to obtain data on administrative effort. More importantly, each utility’s administrative effort depends on its overall strategy and its use of third-party implementers. For example, Efficiency Vermont both administers and implements its programs with in-house staff who perform functions such as energy audits and market actor training that other utilities largely contract out. Pacific Gas and Electric relies substantially on third-parties to design and implement programs constituting 20% of its budget, while our other case study jurisdictions do not. For these reasons, our comparison of administrative efficiency is limited to a qualitative review of Manitoba Hydro policies.

LIMITATIONS AND CAVEATS

LIMITATIONS

Relatively high-level analysis: We have assessed Manitoba Hydro's performance from multiple angles to gain a complete picture of how it compares to other leaders. In order to produce this analysis within the time and budget allotted, however, we have had to remain at a relatively high level. For example, case studies have been developed based on available documentation and extensive interviews with program managers, whereas a more comprehensive comparison would have included additional interviews with stakeholders (participants, market actors, non-governmental organizations).

Scope: This report focused on Manitoba Hydro's primary energy efficiency programs and strategies, as defined jointly at the project outset; some programs of lesser importance are not addressed. Furthermore, this report is limited to voluntary programs and does not directly address other instruments such as codes, standards and rates. Although these are clearly critical tools for overcoming market barriers, they do not fall under the purview of voluntary energy efficiency strategies.

Comparability of data: Comparing the quantitative results of energy efficiency programs is a difficult and often misleading process. At the portfolio level, jurisdictions vary widely in how they report program results, with some jurisdictions measuring only cumulative annual energy savings, others annual incremental savings and still others lifetime savings. The assumptions used by each jurisdiction also vary and can have significant impacts, in particular assumptions concerning program baselines (what would have occurred in the absence of efficiency programs), net-to-gross ratios (free-ridership, spillover and other market effects), and the valuation of non-energy benefits (including environmental externalities). Differences in weather, economic growth, industrial structures, state and age of housing stock, existing codes and standards, and other contextual factors can also have an important impact on results. These issues also exist at the program level, and are compounded by differences in program definitions of participants, measures and costs. These factors are particularly difficult for commercial and industrial programs, where common definitions of "participant" are rare.

Availability of data: Although the program managers we interviewed for our case studies were very forthcoming, it was still difficult in many cases to obtain comparable data at the program level. It is also particularly difficult to obtain data on gas energy efficiency programs at the state or provincial levels.

Despite these limitations, we feel confident that our analysis presents a relatively accurate and informative picture of how Manitoba Hydro compares, at a high level, with leading North American energy efficiency efforts.

CAVEAT: OPPORTUNITIES VS. RECOMMENDATIONS

In the process of comparing portfolios and programs, we have identified potential opportunities for increasing Power Smart's overall effectiveness, and ensuring or securing its leadership position among North American energy efficiency efforts.

That said, our mandate did not extend to performing benefit-cost or other opportunity analyses specific to Manitoba. For example, while California, Minnesota or Vermont may run very effective programs targeted at markets or barriers not covered by Manitoba Hydro, it may also be that myriad factors – different avoided costs, code/standard-influenced baselines, weather and rates, among others – preclude those same strategies from applying cost-effectively to Manitoba Hydro.

The reader will therefore note that, with rare exception, we do not recommend adoption of specific strategies; rather, we pinpoint opportunities worthy of further consideration. As always, opportunities are based on ensuring or securing Manitoba's leadership position in North American energy efficiency.

A summary of the opportunities we have identified is provided as part of our overall conclusion.

Portfolio-level Review

PORTFOLIO-LEVEL SUMMARY

The table below summarizes the results of our portfolio level analysis.

How does Manitoba compare?	
<p>METRICS: QUANTITATIVE BENCHMARKING</p> <ul style="list-style-type: none"> • Achieved Savings: While not in the top bracket, Manitoba Hydro compares reasonably well with other on electric savings, and is in the upper half of case studies for gas savings. • Current Efforts: Manitoba has low spending levels when compared on a \$/MWh or \$/m³ basis. • Forward-Looking Goals: Manitoba Hydro's electric savings goals are significantly lower than the mid- or long-range goals of all of our case studies but more or less comparable with those case studies for which gas data was available. <p>GAP ANALYSIS: PROGRAMS</p> <ul style="list-style-type: none"> • Program Area Coverage: Although Manitoba Hydro has a broad suite of programs targeting most program areas, it has significantly more gaps in coverage and incompletely covered program areas than the three case studies. It will, however, be addressing many of those gaps with new programs. • Use of program strategies: Manitoba Hydro compares reasonably well with case studies but does not make full use of market actor training, upstream incentives and turnkey installation. <p>GAP ANALYSIS: POLICIES</p> <ul style="list-style-type: none"> • Regulatory Environment: Unlike the three case study jurisdictions, Manitoba Hydro's programs undergo little regulatory oversight; this gives the utility more flexibility, but has protected it from the sort of aggressive targets that have been proven to spur innovation and improved performance. • Program Screening: Manitoba Hydro uses a similar process to other utilities, with two significant exceptions: it uses a more restrictive test (the RIM test), and further analyzes more aggressive program options through an incremental approach. • Evaluation: Manitoba Hydro conducts regular impact evaluations but could benefit from independent process evaluations as used by Xcel and PG&E. 	
What works?	What are the challenges?
<ul style="list-style-type: none"> • Great flexibility in responding to changing market conditions. • Internal incentive to achieve efficiency due to export opportunities and corporate goals. 	<ul style="list-style-type: none"> • Lack of aggressive savings targets. • Program screening via RIM test. • Incremental screening of program options.
Opportunities	
<p><i>Manitoba Hydro should explore the following options further:</i></p> <ul style="list-style-type: none"> • Adopt aggressive savings targets • Close program gaps by creating or expanding programs for: multifamily residential housing, manufactured new homes, consumer electronics and office equipment, appliance retirement, commercial new construction, commercial custom retrofits and small commercial retrofits. • Develop upstream strategies (market actor training and incentives) • Launch or consider an expert-supported public stakeholder review process • Consider strategies to facilitate market access for third-party initiatives and innovations. • Modify cost-benefit screening to focus on utility (UCT) or societal (SCT or TRC) perspectives. • Use comprehensive (not incremental) screening for alternative program designs • Consider independent evaluations for certain programs 	

QUANTITATIVE BENCHMARKING

METHODOLOGY

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 focus primarily on qualitative assessments and comparisons of Manitoba Hydro's Power Smart portfolio of programs. In this section, we perform a more straightforward, quantitative benchmarking exercise, in which we compare Manitoba Hydro's overall energy efficiency portfolio with a set of recognized, North American leaders.

Indicators and Metrics

No single indicator is in and of itself an adequate representation of a utility's effort or success in energy efficiency. For this reason, we chose to compare Manitoba Hydro with case studies based on three different factors, namely:

- Relative recent success (achieved savings)
- Relative current effort (efficiency budgets)
- Relative future goals (required or targeted savings)

In order to assess performance against each of these factors, a number of metrics can apply. Below we present each of these individually, and further discuss their inherent strengths, weaknesses and potential bias.

Metrics for Judging *Recent Success*

The purpose of energy efficiency programs is not to establish goals, nor to spend money, but to achieve energy savings. In this respect, success can be measured through two metrics: achieved savings as a percent of total sales (“%dem.”), or achieved savings as a percent of sales growth (“%Δdem.”). Neither metric provides a perfectly comparable picture.

For example, a percent-of-demand metric will tend to understate the relative success of a region with slow growth as opposed to one with rapid growth, since growth offers energy efficiency opportunities (natural replacement and new construction) that are far easier to secure than retrofits. On the other hand, a percent-of-growth metric will tend to overstate the relative success of regions with low or no

growth (indeed, this problem is particularly acute for some natural gas markets, where demand may drop in a given year, thus rendering a % of growth metric irrelevant).

For these reasons, we provide results using both % of total demand and % of demand growth metrics.

Metrics for Judging Current Efforts

Current efforts can also be measured using two metrics: spending as a percent of total sales revenue (“%rev.”), or spending divided by total sales volume (“\$/MWh” or “\$/Mm³”). Here again, each metric introduces its own bias, though this problem is specific to electricity rates.

On the one hand, a percent of revenue metric introduces bias in favour of low-rate regions, since low rates reduce the denominator in the equation. In fact, rates should have little bearing on the potential for cost-effective energy efficiency. Indeed, such potential is based on marginal costs which, for electricity at least, depend on the cost of building new supply or buying new power (available natural resources and/or continental fuel prices), not on rates (which are based on historical costs).*

On the other hand, a \$/MWh or \$/Mm³ metric introduces its own bias, this time working against regions with energy-intensive industrial structures. Indeed, experience strongly demonstrates that as a percent of demand, the greatest and lowest-cost opportunities lie in residential and commercial sectors, not in large industry. This is especially true for electricity-intensive industries, which tend to be far more energy conscious (they tend to have dedicated on-site energy managers). Service-oriented economies, on the other hand, work with a strong relative potential for efficiency savings, and a smaller relative denominator.

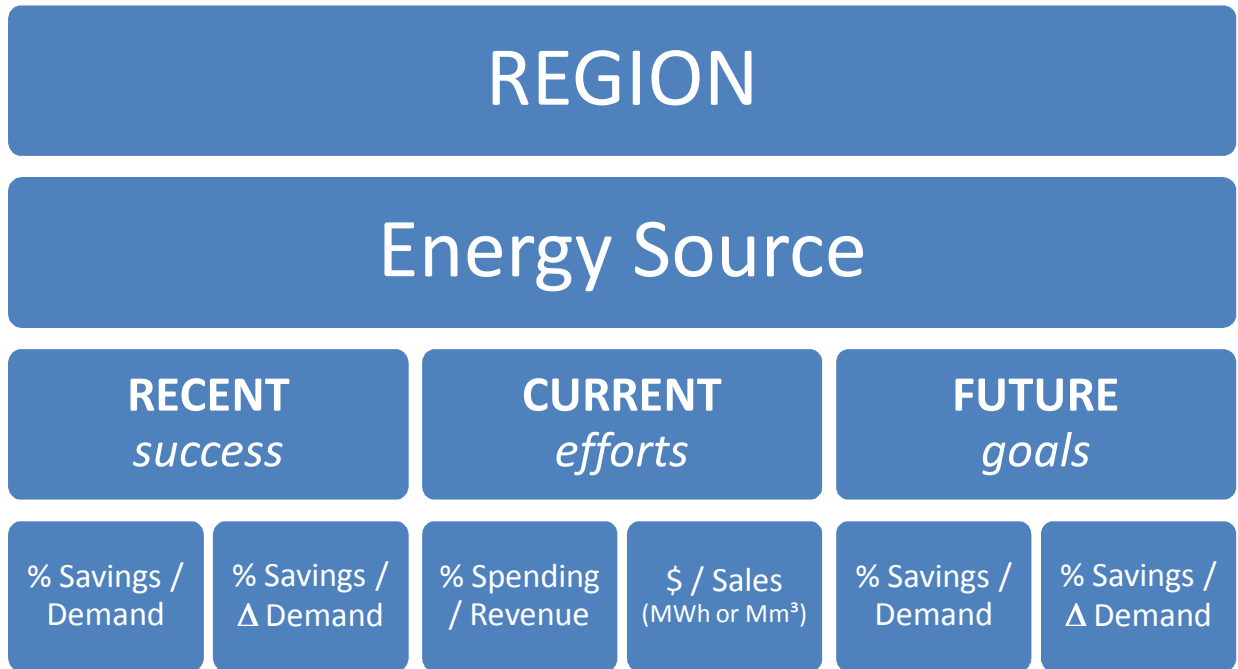
For these reasons, we provide effort-related results using both % revenue and \$/MWh metrics, although we urge the reader to focus more attention on the latter.

Metrics for Judging Future Goals

Finally, future goals can also be measured using at least two metrics: projected savings as a percent of projected sales volume (“%dem.”), or projected savings as a percent of projected sales growth (“%Δdem.”). The reader will note that these are essentially the same metrics as for past success, except that they are measured on a forward-looking basis. Given the dual biases presented previously in our discussion of metrics for judging recent success, we have again elected to provide results using both metrics.

* Lower rates would normally argue for higher utility spending. Indeed, one could argue that to the extent that low rates have led to end-use inefficiency in the past, such regions may offer even *greater* opportunities than high-rate regions, at lower *total* cost. Yet because lower rates make the *customer's* (not the utility's) value proposition more daunting, low-rate utility programs could be expected to cover a greater share of these project costs, i.e. to be more “generous” than high-rate utility programs. Finally, spending in lower-rate regions leads to less lost revenues from energy savings, thus reducing the rate impacts relative to higher-rate regions.

The following table summarizes the categories and metrics we have examined for each region.



Note that in all cases, we do not examine another, oft-used metric: spending per capita. Indeed, this is arguably 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. Similarly, we do not examine a “savings as a percent of economic potential” metric. While conceivably the most interesting of all, data on each region’s economic potential for energy savings are both more sparse and more subject to variations in methodology than for our other, preferred metrics.

Case Studies

For our portfolio-level reviews, we selected case studies based on two criteria:

- **Independent Rankings:** All of our U.S. case studies were selected among the top ten performing States in terms of ratepayer-funded energy efficiency programs, as rated by the American Council for an Energy Efficiency Economy (ACEEE) in 2008. The three Canadian provinces included in our benchmarking exercise (Ontario, Quebec and British Columbia) are rated among the top four (along with Manitoba Hydro) provinces for ratepayer-funded energy efficiency programs according to the Canadian Energy Efficiency Alliance (CEEA).
- **Relevance to Manitoba context:** When choosing among leaders, similarities with Manitoba in terms of markets, principal end uses and measures, policy and programming contexts were further considered when choosing among options.

The table below summarize the basis for our individual selections.

Table 1 Case Studies for Quantitative Benchmarking

REGION	WHY SELECTED
1. VERMONT	Leading US jurisdiction, according to ACEEE and industry experts.
2. CONNECTICUT	Leading US jurisdiction, according to ACEEE and industry experts.
3. CALIFORNIA	Leading US jurisdiction, according to ACEEE and industry experts.
4. MINNESOTA	Leading US jurisdiction and similarity to Manitoba
5. MASSACHUSETTS	Leading US jurisdiction, according to ACEEE and industry experts.
6. B.C.	Leading Canadian jurisdiction, according to CEEA and industry experts. <i>Similarities to Manitoba in terms of low rates, predominance of hydro.</i>
7. ONTARIO	Leading Canadian jurisdiction, according to CEEA and industry experts.
8. QUÉBEC	Leading Canadian jurisdiction, according to CEEA and industry experts. <i>Similarities to Manitoba in terms of low rates, predominance of hydro.</i>
9. NEW YORK	Leading US jurisdiction, according to ACEEE and industry experts.
10. NEW JERSEY	Leading US jurisdiction, according to ACEEE and industry experts.

We should note that our choice of case studies does not ensure that Manitoba Hydro is being compared against the “best of the best” within each category (recent achievements, spending levels and future goals), nor for each energy source (electricity and natural gas). Indeed, when measured on a given category or for a given fuel, some case studies may underperform relative to other regions not retained for this study.* Rather, the same case studies were selected for comparisons against all categories and fuels.

* For example, while the State of Maryland has recently adopted aggressive energy savings goals, it was not retained here because it does not have a history of leadership.

We should also note that appropriate data was not available for all metrics for all regions and fuel sources, a problem particularly acute for natural gas energy efficiency strategies.

Caveats

We urge the reader to consider several caveats when interpreting the results presented below.

- **Reporting differences:** Though we have attempted to ensure an apples-to-apples comparison wherever possible, many underlying data may not, in fact, be directly comparable. For example, different regions may be more or less rigorous in adjusting deemed savings to account for free ridership, spillover or other market effects. Similarly, some regions may adjust results for T&D losses to reflect savings “at generation” (we have not for Manitoba Hydro). While we have attempted to isolate savings from non-efficiency programs (e.g., codes and standards), it is possible that we may have done so inaccurately in some cases, as some regions do not provide detailed breakdowns. Finally, for gas savings, while we have been able to confidently isolate power generation related sales for most metrics, we have not achieved this with any confidence for our spending metrics.
- **Underperforming case studies:** As mentioned previously, some case studies do not represent leaders in a given category or for a given energy source. For example, while we have included British Columbia as a region in our list of case studies, it would be hard to argue that Terasen Gas – despite its future intentions – is currently a leader in natural gas energy efficiency programs (the utility is currently awaiting approval of a plan it filed over a year ago).
- **Timeframes:** While we have tried to ensure that comparisons cover similar timeframes, available data varies from region to region. This point can be especially important insofar as there is currently a strong tendency toward increased goals and efforts, such that results and goals may differ significantly from one year to the next. For example, while New York’s reported spending includes some \$125m from the state agency NYSERDA, the organization’s budget was more recently increased to over \$350m annually, the latter value not being reflected in our analysis. In many regions, spending is increasing in the range of 30-100% annually.
- **Jurisdictions:** While Manitoba Hydro covers all of the province’s electricity and demand needs, many other regions are served by a multitude – sometimes a patchwork – of organizations, including investor-owned utilities, state-owned utilities, municipal utilities and provincial or State government agencies. We have made every reasonable effort to capture the bulk if not all of each region’s savings and spending data; however it is possible that some markets are inaccurately represented or neglect smaller utilities’ efforts.
- **Recent changes:** Our forward-looking metrics do not account for two new market conditions: first, the impact that the current market downturn may have in reducing projected demand growth in all markets; and second, the impact on our U.S. cases of significant new funds provided to States for additional energy efficiency efforts by the recent federal budget.
- **Contexts:** This benchmarking exercise does not account for a variety of contextual factors beyond those discussed previously, including most notably regional differences in avoided costs (the lower the avoided costs, the less cost-effective opportunities), historic rates (the lower the rates, the greater the untapped opportunity), historic energy efficiency achievements (the more

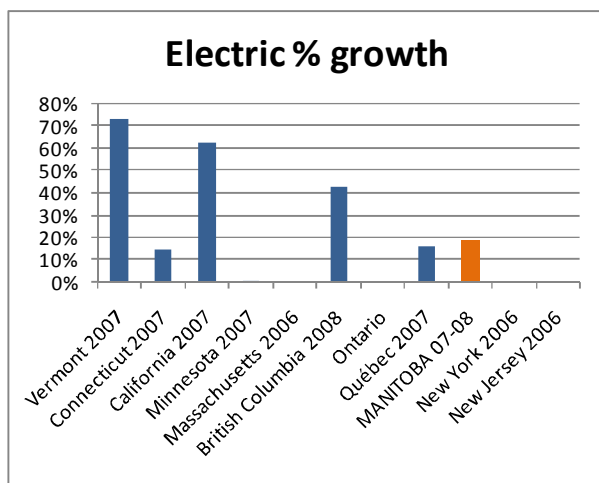
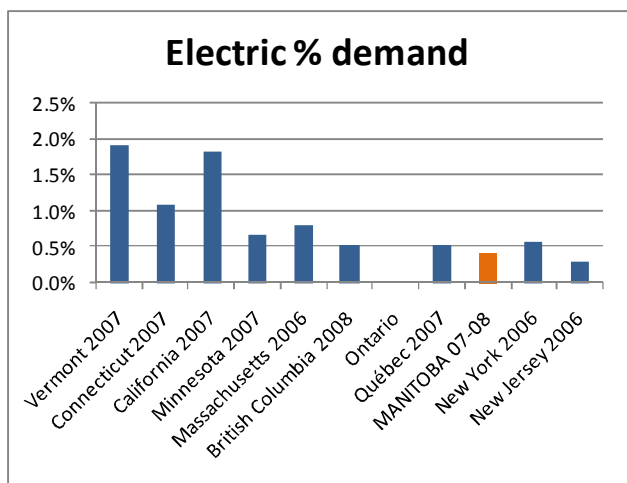
past programs were aggressive, the lower the residual opportunity), codes and standards, heating loads (electric heating loads are more difficult to reduce) and industrial loads (also more difficult). All of these impact Manitoba in different – and contradictory – ways relative to our 10 case studies.

Despite these caveats, we feel that the metrics taken as a whole provide sufficient information to draw some preliminary conclusions, at least insofar as the quantitative analysis is concerned.

RESULTS: ACHIEVED SAVINGS

Below we present the results of this benchmarking exercise in terms of each region's most recent achieved savings.

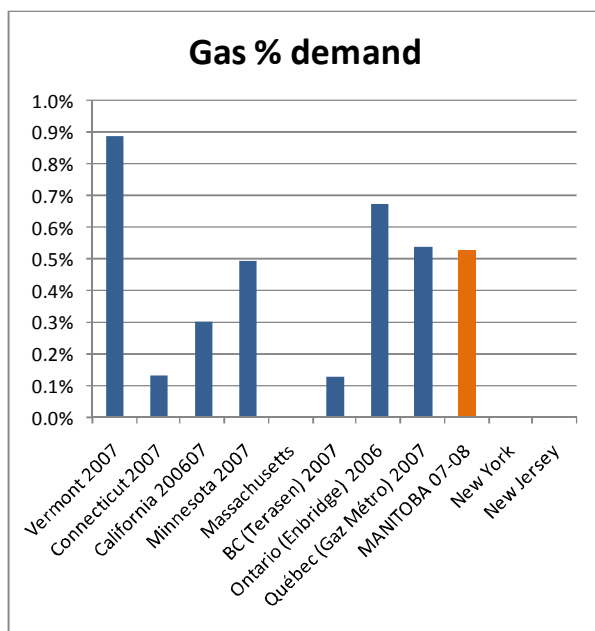
Electricity Savings (achieved)



Insofar as electric savings are concerned, the comparisons illustrated above suggest that Manitoba Hydro compares reasonably well with six of the nine regions for which percent of total demand data was available, and with two of the five regions for which we could compare savings as a percent of demand growth. Conversely, Manitoba Hydro's achieved savings are considerably lower than those of two historic North American leaders (Vermont and California) as well as of British Columbia (on a percent of growth basis only).

Gas Savings (achieved)

As far as natural gas savings are concerned, Manitoba Hydro compares reasonably well with four of our case studies, and far outpaces the three



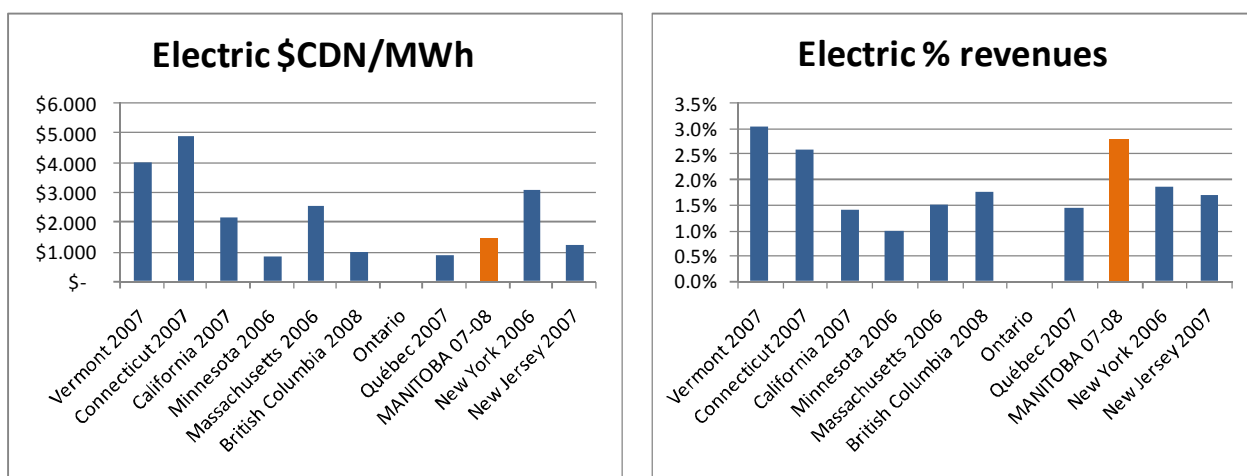
others, when measured as a percent of total gas demand in each region.

The reader will note that we have not provided a percent of demand growth metric, since natural gas demand can vary significantly from year to year. In fact, Manitoba recently reported negative growth in natural gas demand for our test year (2007/08), making any percent of growth comparisons inoperable.

RESULTS: CURRENT EFFORTS

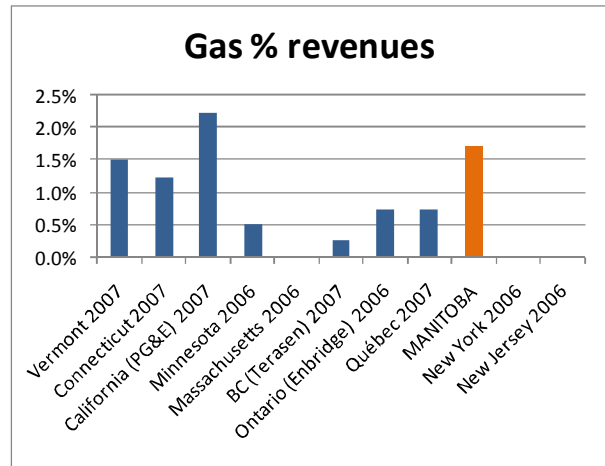
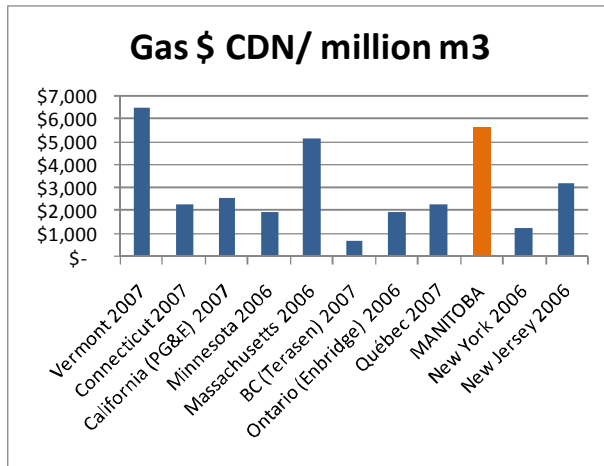
Below we present each region's current efforts as measured by budgets allocated to programs.

Electricity Spending (current)



As we can see, insofar as electricity-related spending is concerned, Manitoba Hydro's current spending falls on the lower end of the spectrum when measured per MWh sold. Conversely, it is as or more aggressive than other case studies when measured on a percent of revenue basis. However, as we noted previously, this metric introduces a significant bias, insofar as electric rates (and therefore per unit revenue) may be up to three times higher in the other leading regions as they are in Manitoba.

Gas Spending (current)

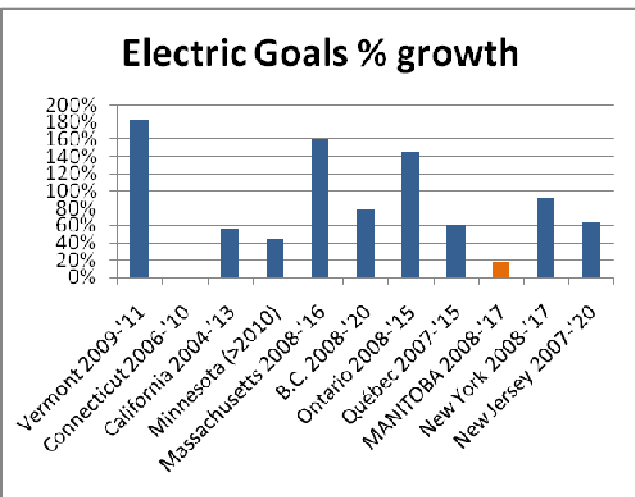
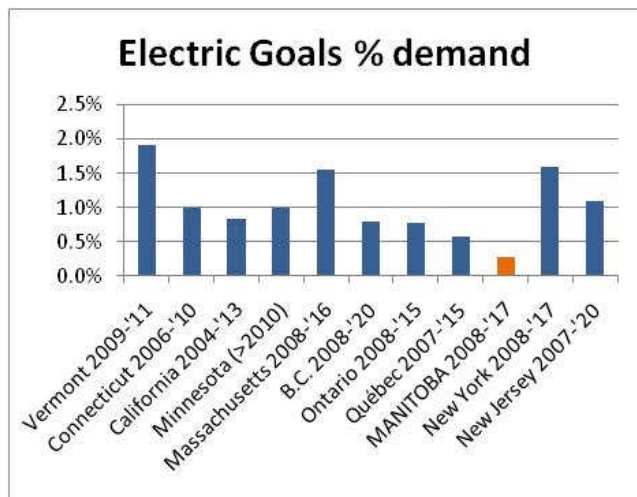


As far as natural gas savings are concerned, we urge caution in reviewing this metric, which is more likely to produce anomalies due to revenue and sales related to gas for power generation.

RESULTS: FORWARD-LOOKING GOALS

Finally, the data below indicate the relative energy savings goals of each of our case studies.

Electricity Goals (future)



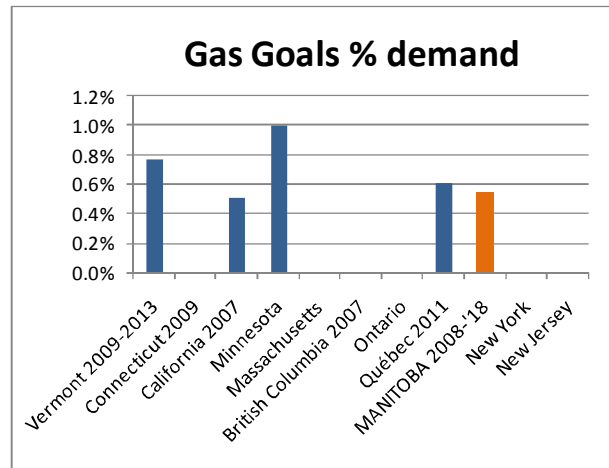
Finally, on a forward-going basis, Manitoba Hydro's goals are significantly lower than the mid- or long-range goals of all of our case study regions insofar as electricity savings targets are concerned. This is

true irrespective of the metric – percent of total demand or percent of forecast load growth – used. This is not surprising, in that many of our leading regions have recently adopted significantly more aggressive goals than in recent past, while Manitoba Hydro has not, to our knowledge, recently undertaken a comprehensive review of its long-range targets.

Gas Goals (future)

On the other hand, Manitoba Hydro's goals for long-range natural savings are more or less comparable with those case studies for which data was available. This too is not very surprising in that many of the recent aggressive savings targets are focused primarily on electricity savings, and less so on natural gas.

Again, the reader will note that we have not provided a percent of forecast demand growth metric, for the same reasons explained previously in our discussion regarding achieved savings.



RESULTS: DISCUSSION

Manitoba Hydro can rightly claim to be among – though not at the top of – North America's leaders in energy efficiency. Indeed, whether measured on achieved savings or current efforts, its performance in 2007/08 was roughly comparable to that of many of our test leaders. While several leading regions were either significantly further ahead (electricity) or further behind (natural gas) Manitoba Hydro in our rankings, on the whole the provincial utility could be considered, with some notable exceptions, relatively competitive among its leading peers. This finding confirms the CEEA's consistently-high rankings for Manitoba Hydro, and to some extent extends them continentally.

The same cannot be said, however, on a forward-looking basis, at least insofar as electricity savings targets are concerned. Indeed, whether measured on the basis of total forecast load or projected load growth, Manitoba Hydro's energy efficiency targets are considerably lower than those of our leading North American regions. This is even more telling when we consider that our leaders were chosen based on past and present performance, not future goals.

As we can see, leadership in energy efficiency – especially in recent times – is a moving target; indeed, a leader today may be a laggard tomorrow. Over the past couple of years, and still today despite the current economic downturn, regions throughout the continent are adopting increasingly aggressive annual savings goals, typically in the range of 1-2% of sales (at least insofar as electricity is concerned). In this respect, Manitoba Hydro's continued leadership in energy efficiency will require reconsideration of its electricity savings goals and, as a consequence, reconsideration of its current portfolio of programs and strategies in order to achieve these more ambitious goals..

QUALITATIVE COMPARISON

METHODOLOGY

Our qualitative comparison uses two methods:

Gap Analysis: We have mapped out the program offerings of Manitoba Hydro and the three case studies according to market segment and program strategy. By comparing how broadly the four portfolios cover efficiency opportunities, and how effectively they take advantage of program strategies, we can roughly evaluate the comprehensiveness of Manitoba Hydro's portfolio and identify further areas for energy savings opportunities.

Policy Analysis: We contrast the four jurisdictions according to key internal policies and external context: regulatory environment, goal setting and funding, program design and screening, and evaluation. This approach provides insight into factors that have driven portfolio-level success.

Note that this report does not discuss the question of whom – government, utilities or independent third parties – should administer energy efficiency programs, since we have recently conducted a separate review of this issue for Manitoba Hydro.

OUR CASE STUDIES

We compare Manitoba Hydro's overall portfolio to three leading providers of ratepayer-funded energy efficiency programs: Pacific Gas and Electric Company (California), Efficiency Vermont and Vermont Gas Systems, and Xcel Energy Inc. (Minnesota). Below we summarize each and note key forthcoming changes.

Case studies were selected on the basis of leadership and relevance to the Manitoban context.

Pacific Gas & Electric (PG&E): Pacific Gas and Electric serves 5.1 million electric accounts and 4.2 million natural gas accounts in central and northern California. The utility has offered efficiency programs since 1976. Along with the three other Californian IOUs, PG&E has contributed substantially to California's status as a leader in energy efficiency programs. After a period in the late 1990s of reduced interest in energy efficiency and a focus on market transformation strategies, PG&E and the other IOUs were directed to aggressively pursue resource acquisition and load management in response to the 2000-2001 energy crisis.

PG&E offers a comprehensive suite of residential and business programs targeting end-users, midstream actors and upstream actors. Its efficiency plans are approved on a three-year cycle by the California Public Utilities Commission (CPUC). Currently, PG&E is operating on a month-to-month basis while waiting for approval of its 2009-2011 plan.

Coming changes: PG&E will maintain its current overall portfolio structure. Notable new program offerings include a residential retrofit program, zero net energy home pilot projects, enhanced workforce training, and a green communities program to help local communities reach greenhouse gas reductions targets.

Efficiency Vermont and Vermont Gas Systems (EVT and VGS): Vermont is a longstanding leader in energy efficiency in North America, rated #1 by the ACEEE in both 2006 and 2008, and the top per capita spender on efficiency programs since 2003. Ratepayer-funded electric energy efficiency programs in Vermont are administered by a third party contractor that operates an 'energy efficiency utility' under a state-wide brand ("Efficiency Vermont", or EVT). Three 3-year contracts for EEU operation have been awarded to date, including two by competitive RFPs, all to the non-profit Vermont Energy Investment Corporation (VEIC). The current contract covers 2009 through 2011.

Vermont Gas Systems (VGS), the state's sole natural gas provider, has offered energy efficiency programs since 1993 and has been profiled as a national leader in natural gas energy efficiency by the ACEEE. It is a small utility with roughly 35,000 customers, a large percentage of which have participated in efficiency programs. The utility offers residential and business efficiency programs for new construction, building retrofits, and equipment replacement. VGS works in close collaboration with Efficiency Vermont on program implementation, in some cases co-delivering programs. Note that due to difficulties contacting current VGS program managers, we have less information about the gas utility's internal processes.

Both Efficiency Vermont and Vermont Gas Systems are overseen by the Vermont Public Services Board (PSB), assisted by the Department of Public Service (DPS).

Coming changes: Efficiency Vermont's 2009-2011 plan involves multiple changes to its programs. The most significant are:

- the integration of new funding for unregulated fossil fuel programs, with program designs to be determined;
- the addition of new products to residential equipment programs, and in particular a transition from CFLs to LED lighting;
- the development of several new low-interest financing options for both business and residential customers.

Xcel Energy: Xcel Energy is the largest combined gas and electric utility in Minnesota, a state with a longstanding history of leadership in energy efficiency and a "traditional", vertically integrated electricity market. Xcel provides electric and/or gas service to roughly one million clients in the state. The utility has been providing energy efficiency programs since the 1980s, and currently spends \$50 million/year on programs. It is required by the state to spend at least 2% of its annual gross operating revenues on efficiency programs, and as of 2010 will be required to achieve annual incremental energy savings equivalent to 1.5% of annual retail sales*. In 2007, the utility achieved 260 GWh and 855 million m3 in annual savings, equivalent to 0.78% and 0.61% of total electric and gas demand, respectively.

* Utilities are permitted to request reductions based on past performance. Xcel Energy intends to request a reduction to 1.1% initially.

Xcel is regulated by the Office of Energy Security (OES). Its efficiency efforts are also scrutinized by the Minnesota Public Utilities Commission (MPUC) when the commission reviews Xcel's Integrated Resource Plan.

Coming changes: The most significant future change for Xcel will be the application of binding savings targets in 2010. There are likely to be additional changes in its upcoming triennial Conservation Improvement Plan, due to be released in June 2009 and currently in the planning stage.

GAP ANALYSIS: PROGRAMS

This broad gap analysis compares Manitoba Hydro's portfolio as a whole with those of our three case studies. For purposes of the gap analysis, we have defined:

- Program areas: markets and opportunities that can be easily addressed by a single energy efficiency program. Although every jurisdiction defines its programs and markets slightly differently, we have used common categories used by many leading efficiency programs.
- Program strategies: activities or services used by a program to overcome market barriers and encourage the adoption of cost-effective efficiency measures. Examples include offering training to contractors and offering rebates or financing to customers.

We do not consider the specific efficiency measures targeted by each organization for a given market – this is covered in detail in our program-level comparisons.

Note that time and resources did not permit detailed analysis of each program offered by the three case study jurisdictions. Our analysis is based on relatively high-level interviews and a review of available plans, reports and publicity materials, and it is possible that we have overlooked strategies used for some programs.

PROGRAM AREA COVERAGE

To adequately compare portfolios of a variety of energy efficiency programs, we developed a common set of program categories. Although every jurisdiction defines its programs and markets differently, we have used common program areas generally targeted by most leading efficiency programs.

We begin by dividing programs areas into residential, commercial/industrial and 'cross-cutting' programs. The latter are programs that address issues or market actors common to all or most program areas, for example building codes and standards and community-based initiatives.

We then make the distinction between market-driven (also known as 'natural replacement') programs and retrofit / early retirement programs. Market driven programs target new construction, new purchases, or the natural replacement of existing appliances at the end of their lifespan. The term 'market-driven' underscores that these programs attempt to influence ongoing decisions taking place in the market place. They are sometimes called 'lost opportunity' programs to reflect the fact that market-driven decisions are time-limited opportunities to influence behaviour.

In contrast, retrofit / early retirement programs attempt to convince end-users to improve existing buildings or replace (or in rare times, simply retire) existing, functioning appliances earlier than they normally would. These programs are also referred to as 'discretionary' programs since participants decisions occur because of the program rather than market forces.

For a few program areas, we have used a separate "niche/other" category, primarily in order to better evaluate particular Manitoba Hydro programs, namely the Earth Power program, Agricultural Heat Pads and Network Energy Manager.

Beyond these distinctions, our program areas are defined by common decision making points, market actors and/or program designs. We also break out some program areas into segments where they are commonly addressed by separate programs or strategies.

In the residential sector, all program areas are classified as market driven, retrofit/early retirement, or niche/other. In the C&I sector, however, two of the most significant program areas - commercial custom programs and industrial processes programs - typically target both market driven and early retirement opportunities in a single program.

The tables below provide definitions for each program area and summarize how well each jurisdiction addresses key program areas. We classify program coverage using three categories:

Targeted program covering the program area

Programs in place but incomplete coverage

Gap – little coverage or no programs in place

Table 1 RESIDENTIAL Program Area Coverage

	Program Area	Definition	Segment	Manitoba Hydro	Pacific Gas & Electric	Efficiency Vermont / VGS	Xcel Energy
Market Driven / Natural Replacement	New construction	Programs encouraging a whole-house approach to improving efficiency of new buildings.	Single -family	Targeted program	Targeted program	Targeted program	Targeted program
			Multi-family	Gap: almost no coverage	Targeted program	Targeted program	Targeted program
			Manufactured	Gap	Targeted program	Targeted program	Gap
	Appliance, lighting and plug load	Standalone programs encouraging the purchase of more efficient lighting and appliances.	Non defined for gap analysis	Targeted program for lighting and appliances but not plug load.	Targeted program	Targeted program	Targeted program (lighting only)
	Standalone HVAC and DHW equipment	Standalone programs encouraging the purchase of more efficient heating, cooling, ventilation and water heating equipment.	Single -family	Targeted program	Targeted program	Targeted program	Targeted program
			Multi-family	Covered by general commercial programs	Covered by general commercial programs	Covered by general commercial programs	Covered by general commercial programs
Retrofit/ early retirement	Home retrofit	Programs encouraging whole-house energy efficiency retrofits of existing buildings.**	Single -family	Multiple complementary targeted programs	Poorly covered by rebates, duct sealing program	Targeted program	Multiple complementary targeted programs
			Multi-family	Covered by 4 programs but incentive levels do not incent retrofit.	Poorly covered other than lighting; targeted program focuses on natural replacement not retrofit	Targeted program	Covered by general commercial programs
			Low-income	Targeted program	Targeted program	Targeted program	Targeted program
	Appliance retirement	Programs targeting the early retirement of still-functioning inefficient appliances*. Low-income programs typically incent early retirement and replacement of certain appliances*	General	Gap (under development)	Targeted program	Gap	Gap
			Low-income	Gap	Targeted program	Targeted program	Targeted program
	Other / Niche	Geothermal energy	Standalone programs encouraging the installation of geothermal heating and cooling	Single-family	Targeted program	Gap	Gap

*Generally refrigerators, freezers and, in certain climates, room air conditioners.

**Participants in these programs may take advantage of standalone lighting, appliance and HVAC incentives, however these incentives are primarily designed to affect market driven replacement/new purchase decisions and not early retirement or retrofit decisions.

Table 2 COMMERCIAL Program Area Coverage

	Program Area	Definitions	Manitoba Hydro	Pacific Gas & Electric	Efficiency Vermont / VGS	Xcel Energy
Market Driven/ Natural Replacement	Small commercial - new construction	Programs encouraging efficient building construction in small to medium commercial and institutional buildings.	Gap. (Future program planned)	Program available but less suited for small builders.	Targeted program.	Targeted program.
	Large new construction	Programs encouraging efficient building construction of large commercial or institutional establishments.	Gap. (Future program planned)	Targeted program.	Targeted program.	Targeted program.
	Prescriptive - Products	Programs that offer prescriptive incentives and other services to encourage the selection of more efficient equipment during natural replacement decisions.	Targeted programs.	Targeted program	Targeted program	Targeted program
	Prescriptive - Lighting	Programs encouraging the purchase of more efficient lighting during natural replacement.	Targeted program.	Targeted program.	Targeted program.	Targeted program.
Market Driven AND Retrofit	Commercial Custom	Programs that use an audit and either negotiated or calculated incentives to encourage both natural replacement and retrofit/early retirement of all potential measures. Can include other services and program strategies. Often complemented by a simpler prescriptive program. Programs generally target medium to large commercial and institutional buildings and may overlap with industrial processes retrofit programs.	Covered by multiple programs but incentive levels and outreach insufficient to encourage retrofit/early retirement.	Targeted program but incentive levels insufficient to encourage retrofit/early retirement.	Targeted program covering both natural replacement and retrofit/early retirement.	Targeted program but incentive levels insufficient to encourage retrofit/early retirement.
	Industrial Processes Custom	Programs that offer either negotiated or calculated incentives for both natural replacement and retrofit/early retirement of equipment involved in industrial processes. Some overlap with commercial custom.	Targeted program – flexible incentives and market outreach sufficient to encourage retrofit/early retirement.	Targeted program – flexible incentives and market outreach sufficient to encourage retrofit/early retirement.	Targeted program – flexible incentives and market outreach sufficient to encourage retrofit/early retirement.	Targeted program
Retrofit/ Early Retirement	Small Commercial retrofit	Programs encouraging retrofitting/early replacement of equipment in small commercial establishments, a hard to reach market. Generally require higher incentives, turnkey approach.	Gap. (Single measure Rinse and Save program only, but future program planned)	Targeted programs (3 rd party).	Programs available for some regions only.	Targeted program (lighting only)
Other	I/T Savings	Programs that aim at energy savings via reducing standby energy use in IT networks. Note: defined as a separate program area in order to focus on Manitoba's Network Energy Manager program; other I/T-related opportunities (efficient power supplies and data server virtualization, etc.) are not considered here.	Targeted program.	Targeted program.	No targeted program but assistance available via custom program and technical support.	Gap (minor program area however)

LEADERSHIP IN ENERGY EFFICIENCY: Comparing Manitoba Hydro's Power Smart with Leading North American Strategies

	Program Area	Definitions	Manitoba Hydro	Pacific Gas & Electric	Efficiency Vermont / VGS	Xcel Energy
	Geothermal Systems	Standalone programs encouraging the installation of geothermal heating and cooling. Note: defined as a separate program area in order to focus on Manitoba's Earth Power program.	Targeted program.	Gap	No targeted program but incentives available via custom program	Gap
	Agricultural Programs	Programs specifically adapted to the agricultural market. Note: defined as a separate program area in order to focus on Manitoba's Heat Pad program.	Targeted program for one end-use; commercial custom and prescriptive products programs available to agricultural sector cover natural replacement but not retrofit.	Targeted programs by sub-sector.	Targeted program for dairy sector; standard C&I programs available to the agricultural sector cover both natural replacement and retrofit.	No targeted program. Standard C&I programs available to the agricultural sector cover natural replacement but not retrofit.

Table 3 CROSS-CUTTING Programs

Program Areas	Definition	Manitoba Hydro	Pacific Gas & Electric	Efficiency Vermont / VGS	Xcel Energy
Community-level initiatives	Programs engaging with community governments to plan and/or deliver community-wide efficiency programs.	Limited efforts: Funding and technical support for retrofits of City buildings. Manitoba Hydro has also offered free audit tools to municipalities and individual programs have participated in community events (lighting giveaways, etc.)	Limited efforts: Regional governments are funded as program implementers to conduct awareness campaigns and direct install programs for municipal buildings and other sectors.	Targeted efforts: comprehensive outreach and support for community initiatives at a variety of levels.	Gap: Little leveraging of community opportunities.
Research and Development	Funding for research and development work on new efficiency measures.	Targeted efforts: Manitoba Hydro provides funding and expertise to partner organizations and in some cases conducts its own research.	Targeted efforts: Dissemination of existing research results, demonstration projects for emerging technology.	Gap: Little R&D work prior to 2009.	Funding for renewable energy research (required by statute), including efficiency research.
Support for Codes and Standards	Participation in work on building codes and equipment standards, for example by advocacy, committee participation, and funding research on efficiency impacts.	Targeted efforts: Manitoba Hydro actively participates in multiple provincial and national committees; recent work has included participation in a review of the Model National Energy Code for Buildings (MNECB) and work on a provincial Green Building policy for government facilities.	Targeted efforts: Funding of research studies to support C&S development; active participation in C&S committees; training for enforcement personnel.	Targeted efforts: Participation in state codes committees.	Gap: None.

Discussion - Residential Program Areas

PG&E covers all residential program areas except geothermal energy but offers very limited programs for single-family and multi-family retrofits. Vermont covers all residential program areas except appliance retirement and geothermal, while Xcel covers all residential program areas except new construction of manufactured housing and appliance retirement, and does not incent appliance natural replacement.

For its part, Manitoba Hydro covers a majority of residential program areas with targeted programs. Its four gaps are manufactured new homes, appliance retirement, low-income appliance replacement and multifamily new construction. Manitoba Hydro's coverage of multifamily building retrofit opportunities consists of four separate programs (retro commissioning, building envelope, commercial HVAC and custom measures) but incentive levels for most measures are insufficient to encourage true retrofit.

OVERALL: Manitoba Hydro's program area coverage is comparable to the three case studies, but the utility has more gaps than any of the three American jurisdictions. In particular, its lack of a multifamily new construction program is significant – the other jurisdictions' gaps are in niche markets such as geothermal energy and manufactured housing. This should, however, be eliminated once Manitoba unrolls its commercial new construction program, currently under development. The utility should consider adding appliance replacement to low-income retrofit programs and developing a more targeted multifamily retrofit program. Note that Manitoba Hydro is already in the process of developing an appliance retirement program for refrigerators and freezers.

Discussion - Commercial/Industrial Program Areas

PG&E specifically targets all program areas except geothermal, with two areas of poor coverage, small commercial new construction and commercial custom retrofit opportunities. Vermont covers all program areas with targeted programs, with the exception of geothermal programs. Its small commercial retrofit programs are only offered in part of the state. Xcel has specific, targeted programs in place for all program areas aside from three niche areas (geothermal, agricultural and I/T savings). Like Manitoba Hydro and PG&E, its commercial custom programs arguably address market driven opportunities but no retrofits. It has effective small commercial direct install programs in place targeting retrofits, but for lighting only.

For its part, Manitoba Hydro has significant gaps in coverage, with no new construction programs* and poor coverage of retrofit/early retirement opportunities, with the significant exception of the industrial sector. It compares well with case studies for market driven programs and targets the geothermal market, not covered by PG&E and Vermont.

* We should note that Power Smart staff have in the past worked with interested customers to adapt and bundle existing programs for new construction projects they have been made aware of. Examples include the Health Sciences Centre, Winnipeg Airport, the University of Winnipeg and the new Post Office. Though this flexibility is welcome, a more proactive strategy is still required in order to reach the majority of new construction projects that may not come to the utility's attention in time for serious design changes.

OVERALL: Manitoba Hydro has more significant gaps than case studies, although it is in the process of planning programs to address these gaps. Although it is similar to case studies in its coverage of the two biggest program areas, commercial custom and industrial processes, Manitoba Hydro’s lack of new construction programs and a small commercial retrofit strategy is significant, though the latter is currently being planned. As in the residential sector, it is unusual in having a targeted program for geothermal systems.

Discussion – Cross Cutting Strategies

Community Initiatives: Efficiency Vermont is arguably the only jurisdiction among those profiled with a comprehensive communities strategy. It targets specific communities with outreach to community groups and leaders, and provides technical, organizational and financial assistance for grassroots campaigns to encourage efficiency action. Although Manitoba Hydro is involved in community events, and sponsors specific work with seniors and school groups, it does not have a targeted strategy that works broadly with multiple groups on community-wide strategies. Similarly, although PG&E funds regional governments as delivery agents, it does not have a community-focused approach to leveraging non-governmental and citizen groups.

Research and Development: Manitoba Hydro participates in multiple projects each year with research partners, while PG&E focuses on results dissemination and Xcel on funding third-party research. Again, Manitoba Hydro compares well with case studies by virtue of addressing this opportunity; it may find value in investigating PG&E’s results dissemination approach.

Codes and Standards: Manitoba Hydro and PG&E are both particularly active in this area, with Manitoba Hydro dedicating a full-time resource to C&S work and PG&E contributing substantial funding to research work required for state code development.

Overall conclusion – Manitoba Hydro compares well with case studies but could benefit from a broader communities strategy.

USE OF STRATEGIES

Beyond market coverage, we have also examined and compared Manitoba Hydro’s use of the full breadth of strategies with those of our case study leaders.

Table 4 Program Strategy Definitions

Strategy	Definition	Relevance for Residential Programs	Relevance for C&I programs
Customer education	Efforts beyond marketing campaigns to educate consumers. Can include one-on-one education during home audits; offering free or subsidized workshops; or providing substantial reference works (how-to guides, etc.)	Relevant where basis for efficiency measures is complex and customer lack of information is a barrier: largely retrofit and geothermal.	Relevant where lack of information/awareness of efficiency opportunities is a barrier: all program areas.
Market actor training /	Subsidizing and/or organizing training or technical certifications for market actors – for example, sales staff	Relevant where either sales staff lack of information on efficiency opportunities or	Relevant where either sales staff lack of information on efficiency opportunities or

Strategy	Definition	Relevance for Residential Programs	Relevance for C&I programs
certification	training, building design training, measure installation training, etc.	contractor skills and capacity are a barrier: all program areas except appliance retirement.	contractor skills and capacity are a barrier: all program areas.
Free / subsidized audits / studies	Subsidizing and possibly managing building energy audits or feasibility studies.	Relevant where identifying opportunities is a barrier: new construction, retrofit.	Relevant where identifying opportunities is a barrier: all program areas except where straightforward prescriptive incentives are offered (products and services, lighting, I/T Savings).
Technical support (customer or contractor)	Making expert technical advice available to customers or contractors regarding the use and/or installation of efficiency measures.	Relevant where consumer or contractor lack of technical information is a barrier: new construction and retrofit in particular, also geothermal.	Relevant where consumer or contractor lack of technical information is a barrier: all program areas.
Customer incentives	Any financial support (rebates, incentive payments) to customers tied to the uptake of efficiency measures.	Relevant where first cost, split incentives and/or hassle/ transaction costs are a barrier: all program areas.	Relevant where first cost, split incentives and/or hassle/ transaction costs are a barrier: all program areas.
Upstream incentives	Any financial support or incentives to market actors. For example, subsidies on equipment purchase; incentives tied to sales or display space, or incentives tied to comprehensiveness of savings.	Relevant where market actor infrastructure is lacking or where market actors have strong influence on customer decision-making: all program areas except low-income, appliance retirement.	Relevant where market actor infrastructure is lacking or where market actors have strong influence on customer decision-making: all program areas to varying degrees.
On-bill financing	Loans offered by the utility and paid via a charge on utility bills.	Relevant where access to capital is a barrier – principally home retrofits.	Relevant where access to capital is a barrier – all programs except I/T Savings.*
3rd party financing	Loans offered by third-party institutions to cover the cost of efficiency measures.	Ibid.	Ibid.
Turnkey installation (Direct installation)	The program organizes and manages the installation of efficiency measures. For example, in a turnkey residential retrofit program, the program identifies cost-effective measures, finds and oversees contractors, and ensures quality control, with the customer only needing to approve of planned measures.	Relevant where hassle/transaction barriers are high, installation quality issues are significant and/or customers are hard to reach: home retrofits and in particular low-income retrofits; also appliance retirement, HVAC in some cases.	Relevant where it is feasible to offer: products and services and small commercial retrofit. Usually for smaller customers where lighting makes up a significant part of the load.
Co-marketing with market actors	Collaborative campaigns or funding for upstream products and services campaigns. For example, subsidizing 50% of a retailer's campaign re Energy Star appliances. Note – this goes beyond upstream program marketing.	Relevant where market actor marketing has a high impact and customer awareness is low: all programs except appliance retirement.	Relevant where a product or service needs marketing: new construction, products and services, lighting, geothermal systems, agricultural programs.
Market outreach/ expertise	Consistent long-term involvement with market actor associations, and/or outreach to individual customers by dedicated program staff with expertise in that market.	Involvement with builder, contractor, retailer and manufacturer associations relevant for most programs, except appliance retirement.	Relevant for all program areas.

*By "I/T Savings" we refer here to limited niche programs aimed at reducing energy use by I/T equipment on standby, and not wider-scope programs aimed at incenting the purchase of efficient equipment, etc.

The tables below rate each organization’s use of program strategies as comprehensive (green), underused (light orange) or a gap (orange). Since each type of strategy is only relevant to certain categories of market segments, our rating is based on our judgement of whether or not a strategy is being used for most or all relevant programs, based on our discussion in Table 4. We discuss residential and commercial/industrial sectors separately.

Table 5 Residential Program Strategy Use

Strategy	Manitoba Hydro	PG&E	Efficiency Vermont / VGS	Xcel Energy
Customer education	Used for most relevant programs	Underused: some programs only.	Used for most relevant programs	Underused: some programs only
Market actor training / certification	Gap: extremely limited.	Used for most relevant programs	Used for most relevant programs	Gap: extremely limited.
Free / subsidized audits / studies	Used for relevant programs except MF new construction	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs
Technical support (customer or contractor)	Used for relevant programs except MF new construction	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs
Customer incentives	Used for relevant programs	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs
Upstream incentives	Gap: extremely limited.	Used for most relevant programs	Used for most relevant programs (except retrofit)	Gap: extremely limited
On-bill financing	Used for relevant programs	Gap: not used	Gap: not used	Gap: not used
3rd party financing	n/a	Gap: not used	Used for most relevant programs	Gap: not used
Turnkey installation	Underused: LI program only.	Used for both LI and HVAC replacement	Used for both LI, home retrofit.	Underused: LI only
Market actor outreach / expertise	Used for relevant programs	Used for relevant programs	Used for relevant programs	Used for relevant programs

Broadly speaking, we see several patterns in the residential sector:

Broadly-used strategies: Six strategies are used broadly by the majority of jurisdictions, including Manitoba Hydro: customer education, subsidized audits and/or feasibility studies; technical support to customers and/or contractors; customer incentives; co-marketing with upstream actors, and market actor outreach.

Manitoba’s key strength (on-bill financing): On-bill financing can be a powerful – and often overlooked – tool for overcoming several key barriers to energy efficiency in a number of customer segments. In the residential sector, on-bill financing reduces or eliminates the time and complexity involved in obtaining a loan and managing repayments. By locating repayment amounts on the utility bill, it also offers a

compelling argument for efficiency investments that can generate positive net cash-flow, since benefits and repayment costs are easily and quickly comparable. Finally, if financing is structured to remain tied to the home's bill (as opposed to the owners themselves), it can overcome the significant barrier of homeowner uncertainty regarding their ability to recover the costs of long-run investments in a resale market that undervalues energy efficiency. In the commercial/industrial sectors, on-bill financing can be an important tool for some customers hampered by limited capital budgets (and competing priorities), especially insofar as it may be treated off balance sheet.

In all cases, Manitoba Hydro's ability to offer on-bill financing is a significant tool in its arsenal, providing it a considerable advantage over other energy efficiency program implementers.

The key difference (upstream efforts): Two key strategies underutilized in both Manitoba Hydro and Xcel Energy's portfolios are market actor training/certification and upstream incentives. This lack of upstream services for market actors marks the biggest difference between the four organizations. PG&E and Efficiency Vermont (and to a lesser degree VGS) both place great emphasis on services and incentives for market actors. By combining downstream customer incentives, education and marketing with upstream training, incentives, and outreach, the two organizations impact the market much more than they could with an emphasis on downstream or upstream efforts only.

Manitoba Hydro and Xcel Energy, although they invest significant effort into market actor outreach, do not complete this effort with the incentives and services needed to overcome market barriers. We believe that a more comprehensive use of upstream strategies could make a significant difference for many Manitoba Hydro programs, as we discuss in our more detailed program level analyses. It is worth noting that Xcel Energy, until recently barred from upstream efforts by its regulator, is now likely to expand its use of market actor incentives and training.

Turnkey installation: One other strategy in limited use by both Manitoba Hydro and Xcel Energy is turnkey installation. All four organizations use this approach for their low-income retrofit programs, but it can also be used for general residential retrofit programs and (where sizing issues exist) in HVAC programs. The biggest advantages of this strategy are a) it greatly reduces hassle costs for participants and b) it ensures greater utility quality control of installations. We suggest that Manitoba Hydro consider this option in our section on comprehensive residential retrofits.

Table 6 Commercial/Industrial Program Strategy Use

Strategy	Manitoba Hydro	PG&E	Efficiency Vermont / VGS	Xcel Energy
Customer education	Underused: some programs only	Underused: some programs only	Used for most relevant programs	Underused: some programs only
Market actor training/certification	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs	Gap: not used
Free/subsidized audits/studies	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs
Technical support (customer or contractor)	Underused: principally larger customers.	Used for most relevant programs	Used for most relevant programs	Underused: some programs only
Customer incentives	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs
Upstream incentives	Gap: not used	Used for most relevant programs	Used for most relevant programs	Gap: not used
On-bill financing	Underused: principally larger customers, above market rates.	Gap: not used	NA - 3 rd party financing used for some programs	Gap: not used
3rd party financing	n/a	Gap: not used	Underused: some programs only	Gap: not used
Turnkey installation	Gap: extremely limited	Used for most relevant programs	Used for most relevant programs.	Underused: some programs only
Co-marketing with market actors	Gap: not used	Underused: some programs only	Underused: some programs only	Gap: not used
Market Outreach/ Expertise	Used for most relevant programs	Used for most relevant programs	Used for most relevant programs	Underused: limited outreach.

Common patterns: Broadly, we can see that the most common strategies used by the four programs are market actor training, subsidized or free audits, technical support, customer incentives and using in-house experts for market outreach. The exception is Xcel Energy, which has a more typical utility C&I program profile, limited largely to the provision of incentives for audits/subsidies and measure installation.

Less commonly used by all four cases studies are customer education, turnkey installation and co-marketing with market actors. This is a common pattern for other utilities. Customer education is expensive and its effects are hard to measure, making it a less popular strategy. Co-marketing can pose difficulties because the program administrator risks being held responsible or linked to controversial or unfounded statements by market actor partners. Turnkey installation is expensive – generally speaking, until a program administrator is driven to work with small customers for policy reasons or comprehensiveness reasons, this strategy is underused.

Manitoba Hydro is unusual relative to case studies in providing financing for C&I programs, although financing is limited and offered at above-market rates.

CONCLUSIONS: GAP ANALYSIS

Program Areas: Although Manitoba Hydro has a broad suite of programs targeting most program areas, it has more gaps in coverage and incompletely covered program areas than the three case studies. It will, however, be addressing many of those gaps with new programs. On the residential side, Manitoba Hydro covers most major opportunities but is missing opportunities for multifamily new construction, multifamily retrofits and appliance retirement. In the commercial and industrial sector, the utility has no new construction programs, no small commercial retrofit programs, and (like 2 of our case studies) does not effectively address commercial retrofit opportunities.

Program Strategies: On the residential side, Manitoba's use of downstream (customer-targeted) strategies is comparable to the other jurisdictions: all four make wide use of customer education, technical support, subsidized audits and/or feasibility studies; and customer incentives. A particular strength of Manitoba Hydro's is its ability to offer on-bill financing, something not matched by our three case studies.

The biggest difference between Manitoba Hydro and the other organizations for residential programs is in the use of upstream (market actor targeted) strategies. Although it makes use of co-marketing with upstream actors and provides some technical support to contractors, Manitoba Hydro offers little in the way of market actor training or certification and upstream incentives. Xcel Energy, for regulatory reasons, has also been limited in its market actor offerings, although it will now apparently expand its upstream activities in response to new targets and regulatory changes. In contrast, PG&E and Efficiency Vermont offer extensive training and certification support and use a variety of incentive types for contractors, retailers, and manufacturers, and both attribute a large part of their success to their market-based approaches.

In the commercial/industrial sector, Manitoba Hydro compares reasonably well with the case studies in its use of strategies. As with the residential programs, PG&E and Vermont emerge as the leaders among the four programs, using the widest variety of strategies, while Xcel uses more limited, end-user-focused strategies. Manitoba Hydro is more closely aligned with PG&E and Vermont, using a combination of upstream and downstream strategies, with two notable gaps, upstream incentives and comprehensive technical support. All of the jurisdictions could take fuller advantage of turnkey installation and co-marketing with market actors.

OPPORTUNITIES FOR MANITOBA HYDRO

Beyond a few program-specific opportunities we deal with in the appropriate program sections, Manitoba Hydro should consider:

- Closing program gaps by creating or expanding programs for: multifamily residential housing, manufactured new homes, consumer electronics and office equipment, appliance retirement, commercial new construction, commercial custom retrofits and small commercial retrofits.
- Providing market actor training in the residential sector, beginning with a comprehensive review of opportunities and needs for market actor training for all programs.

- Using upstream incentives in both residential and commercial/industrial sectors, beginning with a comprehensive review of the potential of upstream incentives in all programs. Market actors - retailers, designers, and contractors – are uniquely situated to help customers overcome several market barriers. Product unavailability can be overcome by increased retailer and contractor stocking, which can be encouraged by stocking incentives and market share incentives. Hassle and transaction costs involved in integrating efficiency into complex building designs can be overcome by offering design incentives through owners directly to their design teams. Product first cost can be more effectively reduced via negotiated cooperative promotions (product buydowns) offered to manufacturers and wholesalers. Sales staff incentives can also be used to ensure customers receive adequate information on product efficiency features.

GAP ANALYSIS: POLICIES

Internal and external policies can affect program success in multiple ways. Our comparison of Manitoba Hydro with the three case study jurisdictions considered a total of 19 elements of program design, grouped together into three categories for discussion:

Regulatory Environment – oversight, program design requirements, utility incentives and cost-recovery, integration with long term planning, savings targets and savings drivers.

Program Design and Screening - identification of opportunities, screening tests and screening scope, design process for existing and new programs, stakeholder involvement, flexibility to adapt programs and program integration.

Evaluation – use of impact evaluations, use of process evaluations, use of market effects evaluations, breadth of effort and spending.

We discuss each of these three categories below.

REGULATORY ENVIRONMENT

Oversight: PG&E, Xcel Energy and Vermont Gas must submit 3 year efficiency plans to their respective regulators. In both cases, regulatory review involves a stakeholder intervener process which can be lengthy and costly, but arguably may lead to improved program designs. Efficiency Vermont also submits annual or biannual plans for review, but the third-party administrator has more latitude in program design and is held to account principally for results. With the exception of AEF-funded programs and gas programs, Manitoba Hydro's efficiency programs do not require regulatory approval, giving it greater latitude and flexibility to adapt to changing market conditions and feedback, but also removing some of the transparency and stakeholder involvement that can drive utilities elsewhere to step outside their comfort level to adopt more aggressive strategies. It should be noted that, although the Manitoba Public Utilities Board (MPUB) does not have direct jurisdiction over electricity efficiency plans, the plans are frequently discussed in other rate hearings.

Program Design Requirements: Regulators specify broad program design requirements in all of our case studies. PG&E is required to conform to standardized program designs for some programs, for example

its low income retrofit program, to ensure consistent programming across the state's four IOUs. Efficiency Vermont must meet performance criteria designed principally to ensure equity between customer classes and geographic regions and access for hard to reach sectors. Xcel Energy was until recently not allowed to run programs focused on market transformation. Manitoba Hydro again faces no requirements outside of AEF programs and gas programs, giving it the advantage of flexibility. One interesting aspect of both Xcel and PG&E's contexts is the requirement to fund independent third-party programs. This provision is designed to stimulate a regional program design and implementation industry outside of the utility, and encourage program design innovation. It is beyond the scope of this report to evaluate its effectiveness, but we encourage Manitoba Hydro to consider options toward these ends.

Incentives and cost-recovery: Manitoba Hydro and our case studies recover costs by a variety of mechanisms (system benefits charges (SBCs), rates, and export revenues). All of our case studies (except Vermont Gas Systems) receive performance incentives, while Manitoba Hydro does not. Unlike IOUs, Manitoba Hydro does not have a strong built-in disincentive towards energy efficiency, reducing – though not necessarily eliminating – the inherent value of performance incentives. However, performance incentives can also spur organizations to innovate and exceed targets and so an incentive may be worth exploring for the utility.

Integration with long term planning: PG&E and Xcel must file long range procurement plans with regulatory bodies and in both cases must demonstrate that all available, cost-effective energy efficiency is being actively pursued before new generation can be considered. This process can be time consuming but again allows efficiency to compete on an apples-to-apples basis with generation alternatives. In both California and Minnesota, the process has frequently led to more ambitious efficiency targets. Vermont's single transmission utility faces the same requirement for approval of transmission-related investments, recently culminating in additional energy efficiency efforts through a contract with Efficiency Vermont to provide geographically-targeted savings beyond those already planned. On the power generation front, where Vermont operates as a small importer within a regional grid, a similar result is obtained through a different mechanism: since 2007, the regional grid's forward capacity market allows energy efficiency to bid competitively against generation. As for Manitoba Hydro, the utility includes efficiency in its internal generation planning.

Savings targets: PG&E and Efficiency Vermont must both meet targets set by their regulators, while Xcel Energy will be required to meet imposed targets next year. Vermont Gas Systems, for its part, proposes savings targets for regulatory approval based on pre-established spending requirements. Manitoba Hydro sets its own targets based on its forecasts of program performance.

Savings drivers: PG&E, Efficiency Vermont and VGS targets are driven by an overall commitment to achieve all cost-effective energy efficiency, with a specific deadline included in California's case. Xcel's legislative requirement is driven by a similar broad state goal, and the 1.5% incremental annual efficiency target is in line with what is commonly considered toward the upper limit of achievable savings (see our Quantitative benchmarking section for more information). Manitoba Hydro's targets are driven by broader customer service and efficiency leadership goals, and by the natural incentive of export revenues. It is difficult to compare these drivers clearly, but we would suggest that a time-limited goal to achieve most or all cost-effective available efficiency, as used in California, provides clearer direction for establishing performance-driven savings targets.

Opportunities for Manitoba Hydro

Consider options for encouraging limited third-party ideas or implementation: Manitoba Hydro, or the provincial government, should evaluate the effectiveness of a variety of options for encouraging innovation within the specific context of Manitoban opportunities. Third-party set-asides, such as those in California and Minnesota, are one option to consider.

Establish aggressive savings targets: We recommend that Manitoba Hydro adopt aggressive savings targets, in line with those of leading regions identified in this report (e.g. 1-2%/yr), if possible with extensive stakeholder input.

Table 7 Regulatory Environment Summary

Element	Manitoba Hydro	PG&E	Vermont	Xcel Energy
Oversight	<ul style="list-style-type: none"> No oversight for programs aside from low income and gas programs, which are reviewed by the Public Utilities Board. 	<ul style="list-style-type: none"> 3-year programs reviewed by Public Utilities Commission (CPUC). CPUC sets short term and long term goals. 	<ul style="list-style-type: none"> <u>Electric</u>: 3-year renewable contract with Public Services Board (PSB) sets budgets, savings targets, spending requirements, performance bonuses. <u>Gas</u>: reviewed by PSB. 	<ul style="list-style-type: none"> 3-year Conservation Improvement Plans reviewed by Office of Energy Security.
Regulatory program design requirements	<ul style="list-style-type: none"> None aside from PUB orders re AEF funds and gas programs (case-by-case basis). 	<ul style="list-style-type: none"> 20% of program spending must be on third-party programs. Mandatory standard designs for key areas. 	<p><u>Electric</u>:</p> <ul style="list-style-type: none"> Equity between market segments. Equity between counties. Geographic targeting. Low-income spending. Small business participation. <p><u>Gas</u>: unknown.</p>	<ul style="list-style-type: none"> Resource acquisition programs only (recently changed). Third parties can propose programs and obtain funding from utility budgets Minimum R&D funding
Incentives and cost-recovery	<ul style="list-style-type: none"> No incentives. Cost-recovery via export revenues. 	<ul style="list-style-type: none"> Decoupled revenues. Cost recovery via SBC, rates (procurement). Performance incentive: 9-12% of net benefits. 	<ul style="list-style-type: none"> <u>Electric</u>: Performance incentive: ~3% of contract; budgets funded by SBC. <u>Gas</u>: cost recovery via rates; can request lost revenue recovery. 	<ul style="list-style-type: none"> Performance incentive, cost recovery via rates, no lost-revenue recovery.
Integration with resource planning	<ul style="list-style-type: none"> Generation planners take long term efficiency goals into account. More aggressive efficiency scenarios considered as part of generation planning. 	<ul style="list-style-type: none"> Utility 'Long Term Procurement Plans' must prove that all cost-effective efficiency opportunities have been exhausted before new generation is approved. 	<ul style="list-style-type: none"> <u>Electric</u>: Transmission plans must prove that all cost-effective EE opportunities have been exhausted; EE eligible to bid into forward capacity markets for generation <u>Gas</u>: n/a. 	<ul style="list-style-type: none"> Integrated Resource Plans filed every two years with Public Utilities Commission (MPUC) must evaluate efficiency as a supply option.
Savings Targets	<ul style="list-style-type: none"> Generated internally based on program design projections. 	<ul style="list-style-type: none"> Set by CPUC. 	<ul style="list-style-type: none"> Set by DPS. 	<ul style="list-style-type: none"> Currently: set internally based on minimum spending, reviewed by OESS As of 2010: set by legislature (as a % of sales)
Drivers	<ul style="list-style-type: none"> Policy goals (export revenue; customer service, efficiency leadership). Export revenues. 	<ul style="list-style-type: none"> CPUC overall goal of achieving 70% of economic potential and 90% of achievable potential by 2013. 	<ul style="list-style-type: none"> Statutory requirement to obtain all cost-effective achievable efficiency. Transmission constraints 	<ul style="list-style-type: none"> Currently: spending requirements. As of 2010: legislative requirement.

PROGRAM DESIGN AND SCREENING

Identification of opportunities: All four jurisdictions follow a similar approach, using periodic potential studies, market research and technology monitoring to identify new opportunities for programs or program measures. PG&E and Efficiency Vermont also use their dedicated, industry or market specific outreach teams to identify new opportunities, and Efficiency Vermont has access to VEIC's large in-house consulting firm which often brings forward new program ideas or measure opportunities.

Screening – Use of Tests: All four jurisdictions use one or more cost-effectiveness tests to screen their efficiency program designs. Vermont and Minnesota both use the Societal Cost Test (SCT), which takes the societal perspective by considering participant and utility costs and benefits, reflecting the benefits of reduced environmental externalities, and using a social discount rate. PG&E uses a weighted average of, on the one hand, a hybrid of the Total Resource Cost the Social Cost tests, and on the other hand the Program Administrator Cost test (PAC).^{*} The TRC is similar to the SCT but does not include externalities and uses the utility's discount rate; the PAC considers only the costs (not including lost revenues) and benefits to the administrator. Manitoba Hydro requires its programs to pass the TRC and informally screens most programs by the Rate Impact Measure test (RIM), which evaluates the impact on non-participants only by comparing the administrator's costs and lost revenues (i.e. participant savings, treated as a cost) with administrator benefits.[†]

A complete discussion of the different tests and their advantages and disadvantages is beyond the scope of this report; however, we do offer a few general observations:

- RIM: The RIM test was used as a primary screen by a number of utilities in the late 1980s and early 1990s, but has since largely been abandoned by leading regions. Indeed, Manitoba is the only region we are aware of that formally strives for energy efficiency leadership while using the RIM. In British Columbia, the regulation that required RIM screening was recently replaced with TRC and SCT requirements. By reflecting only the perspective of non participants, the RIM test virtually ensures that cost-effective energy savings opportunities will be missed.
- PAC: The PAC test makes no attempt to quantify non-energy benefits, nor to account for what may often be considered their corollary – participant spending. Rather, the PAC limits itself to answering a simple question: will the costs of implementing an energy efficiency program exceed or be outweighed by the (generation, transmission and other) costs it will allow the utility to avoid. In other words, is energy efficiency a cheaper alternative for the utility? The PAC – both as a test and as a perspective – is increasingly being used to determine the merits of energy efficiency programs.
- TRC/SCT: These tests remain the most commonly-applied primary screening tests throughout North America. By attempting to incorporate both the utility's and customer's perspectives, they seek to reflect a societal perspective. It is worth noting, however, that as the industry comes to understand that customers are often driven to efficiency for reasons other than bill

^{*} PG&E essentially uses the TRC, however, a greenhouse gas adder per ton of CO₂ avoided is included in the benefit-cost calculations. This makes this test more of a hybrid between the TRC and the SCT rather than a "pure" use of the TRC.

[†] Manitoba Hydro also uses a greenhouse gas adder per ton of CO₂ avoided in its application of the TRC – as with PG&E, this could be considered a hybrid TRC/SCT.

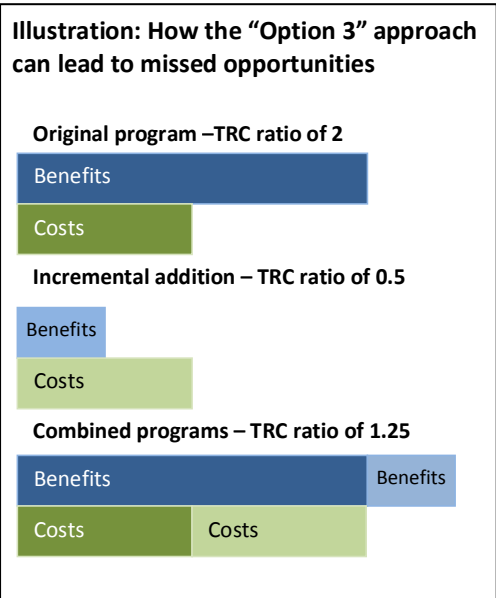
reductions (comfort, health, productivity, etc.), it is struggling to modify these tests accordingly. Ultimately, it is unclear whether and to what extent it will be possible to quantify these non-energy benefits.

Given these observations, Manitoba Hydro may want to reconsider its screening protocols, and notably give serious consideration to alternatives to both the RIM and TRC tests.

Screening - Application Level PG&E and Vermont are both required by their regulators to ensure that their portfolio as a whole is cost-effective, while Xcel’s regulator and Manitoba Hydro’s internal policies require all programs (with the exception of low-income retrofit programs) to be cost-effective on their own. PG&E and Vermont’s situation provides leeway for educational and market transformation programs, not cost-effective or easily measurable on their own, to be included where more cost-effective programs can balance them out. Due to recent changes, Xcel will in the future be able to include market transformation programs, evaluated under to-be-developed protocols. In practice, Manitoba Hydro is also able to include non-cost-effective programs at the discretion of senior management, since its screening criteria are internal policies rather than regulatory requirements. Note that Manitoba Hydro is the only utility to apply its screening incrementally (see below).

Design process – existing programs: All four organizations share a similar process for designing programs. In all cases, program managers informally review program designs as needed, with a more formal, regularly scheduled review on an annual (Vermont, Manitoba) or triennial (Vermont, PG&E, Xcel) basis.

Manitoba Hydro uses an unusual process to consider more aggressive designs, referred to as the Option 3 approach. Program managers prepare alternative “incremental” options for electric program designs. The manager designs a more aggressive program and tests the cost-effectiveness of the additional program spending on its own via the TRC and RIM tests. If this incremental spending passes both tests, it may be incorporated into the program design. In theory, this process is repeated until an incremental design does not pass. While this approach should theoretically help identify the optimal level of efficiency investment, in practice it is unlikely to meet this goal. Indeed, programs (and the customers they focus on) are complex, and new measures or more aggressive strategies may play critical loss-leader or market effect roles that incremental analyses cannot properly evaluate. Manitoba Hydro’s approach likely leads to missed opportunities, as shown in our simplified example (see inset).



Design process – new programs: Again, all four organizations use a similar process, where new programs can be proposed at any point but are generally developed as part of a periodic and more comprehensive plan review. PG&E, Vermont and Xcel Energy all follow a three-year planning cycle. Manitoba Hydro uses a yearly review cycle, but the majority of its current programs were launched as part of a deeper review and planning effort in 2003-2004.

Stakeholder Involvement: PG&E, Vermont and Xcel are all required to meet with stakeholder groups for a review of efficiency plans. Vermont and Xcel meet only 4 and 2 times/year respectively. PG&E's requirement is more rigorous, with extensive public workshops and stakeholder meetings during the triennial planning process. Manitoba Hydro consults with stakeholders at its own discretion on an as-needed basis.

The relatively minimal level of stakeholder involvement in Vermont and Minnesota suggests that stakeholder advisory groups are not a "must-have" for efficiency leadership. That being said, the stakeholder process has arguably been valuable for PG&E, and several other leading jurisdictions have found that advisory groups offer additional innovation, rigorous review and wider program acceptance, particularly when supported by expert counsel.*

Latitude to adapt programs: All four jurisdictions have significant freedom to make program design changes in order to respond to market feedback and new information, with Manitoba and Vermont having the widest latitude.

Program integration: All four jurisdictions consider program integration as part of their planning process, and Manitoba Hydro uses regular program manager meetings to ensure information sharing. Vermont and PG&E emphasize a one-stop-shop approach by market segment to simplify participation and capture all opportunities for each participant. See our Program Areas sections for more detail on program integration issues.

Opportunities for Manitoba Hydro

Screen programs by either Manitoba Hydro's (PACT test) or society's (TRC or SCT tests) perspectives: As discussed, the Rate Impact Measure test is likely leading to lost opportunities. We urge Manitoba Hydro to reconsider its screening process as a whole to ensure it is in line with common and leading practice.

Screen alternative program designs on whole-program cost-effectiveness: As discussed, the 'Option 3' incremental approach to considering more aggressive program designs likely leads to missed opportunities. We suggest that all program designs considered should be screened for total program cost effectiveness. Again, we urge Manitoba Hydro to reconsider its screening process as a whole to ensure it is in line with common and leading practice.

Consider an expert-supported stakeholder advisory group: An adequately funded stakeholder review of energy efficiency plans can lead to better designs and programs, especially where stakeholders are supported by independent experts and the process is non-adversarial in nature. This model needs to be carefully considered and designed to avoid some key pitfalls, however, especially as they relate to potential for micromanagement and for undue influence given to individual intuition and ideology.

* For example, Connecticut (profiled in our report on administrative models) and Massachusetts have both had success using expert-supported advisory groups.

Table 8 Program Design and Screening Summary

Element	Manitoba Hydro	PG&E	Vermont**	Xcel Energy
Identification of opportunities	<ul style="list-style-type: none"> Potential studies. Market research and technology monitoring. 	<ul style="list-style-type: none"> Potential studies. Market research and technology monitoring. Stakeholder groups. Dedicated market segment outreach teams. 	<ul style="list-style-type: none"> Potential studies. Market research and technology monitoring. Dedicated market segment outreach teams. VEIC external consulting branch. 	<ul style="list-style-type: none"> Potential studies. Market research and technology monitoring.
Screening	<ul style="list-style-type: none"> TRC* test used as general guideline for measures. Programs must pass TRC. RIM* test used as informal threshold for program approval. 	<ul style="list-style-type: none"> Portfolio as a whole must pass weighted average of 2/3 hybrid TRC/SCT*, and 1/3 PAC test*. 	<ul style="list-style-type: none"> <u>Electric</u>: Portfolio as a whole must pass SCT*, with environmental externalities considered. 	<ul style="list-style-type: none"> All programs must pass the SCT*
Design process – existing programs	<ul style="list-style-type: none"> Ongoing informal review by manager. Annual design review with “Option 3” approach 	<ul style="list-style-type: none"> Ongoing informal review by manager. Triennial review by planning team. 	<ul style="list-style-type: none"> Ongoing informal review by manager. Annual and triennial review by planning team. 	<ul style="list-style-type: none"> Ongoing informal review by manager. Formal review triggered if savings targets not met. Triennial review by planning team.
Design process – new programs	<ul style="list-style-type: none"> Can be proposed at any point. Typically developed by program management staff during annual plan review. 	<ul style="list-style-type: none"> Developed by planning team during triennial planning process. 	<ul style="list-style-type: none"> Can be proposed at any point. Typically developed by planning team during triennial planning process 	<ul style="list-style-type: none"> Can be proposed at any point. Typically developed by planning team during triennial planning process.
Stakeholder involvement	<ul style="list-style-type: none"> Informal stakeholder consultation as needed by program managers (LIEEP holds quarterly meetings). 	<ul style="list-style-type: none"> Obligatory, regular consultation with two stakeholder groups on plan development and mgmt. 	<ul style="list-style-type: none"> Public advisory committee meets four times/year. 	<ul style="list-style-type: none"> Stakeholder committee meets 2 times/year.
Latitude to adapt program design	<ul style="list-style-type: none"> Wide latitude, with no regulatory oversight. 	<ul style="list-style-type: none"> Significant latitude to adapt without regulatory approval (only large incentive changes and new measures require approval). 	<ul style="list-style-type: none"> <u>Electric</u>: wide latitude to adapt without regulatory approval. 	<ul style="list-style-type: none"> Significant latitude to adopt more aggressive program designs Regulator must approve substantial changes.
Program integration	<ul style="list-style-type: none"> Biweekly program manager meetings to ensure information sharing. Annual planning process includes all-manager discussion of integration. 	<ul style="list-style-type: none"> One-stop-shop approach for market segments Planning team review of programs for integration 	<ul style="list-style-type: none"> <u>Electric</u>: one-stop-shop and account manager approach for segments. Planning team review of programs for integration <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> Regulatory requirement to offer separate, single-end-use programs. Single-window and “handholding” approach used to minimize silos.

* PAC: Program Administrator Cost Test; RIM: Rate Impact Measure Test; SCT: Social Cost Test; TRC- Total Resource Cost Test.

**This summary refers to Efficiency Vermont only.

EVALUATION

Impact evaluations: All four organizations conduct annual impact evaluations. In Vermont and California, these are conducted by the regulator; in Minnesota, Xcel conducts evaluations internally which are then reviewed by the regulator. Manitoba Hydro conducts its own impact evaluations and publishes portfolio-level results in its annual review.

Process evaluations: PG&E and Xcel conduct regular process evaluations of their programs as budgets permit. Both use independent evaluators although PG&E also uses internal staff. Vermont and Manitoba Hydro conduct informal program reviews as part of their planning processes but do not bring in outside evaluators and do not conduct full process evaluations.

Market effects: Of the four organizations, none claim savings due to market effects, and only PG&E conducts formal market effects evaluations.

Breadth of effort: Manitoba and Vermont assign effort equally to all programs for impact evaluations and conduct informal internal reviews on an as-needed basis. PG&E's regulator will require a greater level of effort for evaluations based on a program's overall contribution to savings, uncertainties or risks around its potential achievements, and/or recent program or market changes.

Spending as a % of total budgets: We do not have figures for Manitoba (where most work is conducted internally) and Vermont; PG&E is mandated to set aside an industry-leading 8% of total energy efficiency budgets, while Xcel until recently could spend no more than 3% of budgets. Other leading jurisdictions typically spend in the range of 3-5% of total budgets on evaluation.

Opportunities for Manitoba Hydro

Consider independent evaluations for some programs: Independent evaluations can be expensive, but ensure an unbiased review of program accomplishments, increase the credibility of utility claims, and provide insight into program operations. Manitoba Hydro should consider periodically hiring independent evaluators to conduct impact and process evaluations for a portion of its programs, selected using criteria similar to California's (program's relative importance to portfolio; market or program design changes; uncertainty or risk around savings and net to gross estimates).

Evaluation Approaches

Impact evaluations: determine actual energy savings from a program, via customer surveys, engineering and site studies, and bill analysis.

Process evaluations: analyze program design and implementation via a review of program logic and interviews with participants, market actors and administrators.

Market effects evaluations: estimate a program's contribution to changes in the market that effect energy efficiency. In some cases quantify savings from program-induced market changes.

Table 9 Evaluation Summary

Element	Manitoba Hydro	PG&E	Vermont	Xcel Energy
Quantitative Evaluation	<ul style="list-style-type: none"> Internal annual impact evaluations. 	<ul style="list-style-type: none"> Impact evaluations by independent contractors reporting to CPUC. Use ~80% of evaluation budgets. 	<ul style="list-style-type: none"> <u>Electric</u>: Impact evaluations by Department of Public Service <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> Internal impact evaluations, reviewed by regulator.
Qualitative Evaluation	<ul style="list-style-type: none"> Informal program review as part of annual planning cycle. 	<ul style="list-style-type: none"> Process evaluations by internal staff or independent contractors reporting to PG&E. 	<ul style="list-style-type: none"> <u>Electric</u>: No process evaluations – effort invested in market research, frequent internal reviews. <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> Process evaluations by independent contractors reporting to Xcel, as budgets permit.
Market transformation	<ul style="list-style-type: none"> Informal review of anecdotal information when available. No savings claimed. 	<ul style="list-style-type: none"> Evaluated at CPUC discretion where potentially valuable for program design. No savings claimed. 	<ul style="list-style-type: none"> <u>Electric</u>: Not evaluated, no savings claimed. <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> Not evaluated, no savings claimed. Will be evaluated and claimed in some cases as of 2010.
Integration into program design	<ul style="list-style-type: none"> Program managers sign off on impact evaluations. All evaluation results considered in program design. 	<ul style="list-style-type: none"> Reviewed by managers and integrated into triennial planning process. 	<ul style="list-style-type: none"> <u>Electric</u>: internal program reviews are part of design process. <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> All evaluation results reviewed by program managers.
Allocation of effort among programs	<ul style="list-style-type: none"> All programs receive same level of impact evaluation. 	<ul style="list-style-type: none"> CPUC assigns effort based on savings levels, future program growth, risk and uncertainty, recent program changes. 	<ul style="list-style-type: none"> <u>Electric</u>: all programs receive same level of impact evaluation; internal program reviews vary by program success. <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> Triggered by program manager concern or market changes.
Spending (% of budgets)	<ul style="list-style-type: none"> Not available – evaluation accounts for roughly 3% of PS staff effort 	<ul style="list-style-type: none"> 8% 	<ul style="list-style-type: none"> <u>Electric</u>: unknown. <u>Gas</u>: unknown. 	<ul style="list-style-type: none"> 3% Likely to rise in future as cap has recently been removed.

Program Reviews

METHODOLOGY

CATEGORIZING THE PROGRAMS

To evaluate Manitoba Hydro's programs, we first categorized them according to the program areas they addressed (see our section on Program Area Coverage beginning on page 42 for more details and definitions of program areas). We then prepared detailed descriptions of Manitoba Hydro program designs and operations, reviewed and revised as needed by Hydro staff, based on interviews with program staff and in some cases market actors involved in the programs. We also prepared detailed profiles of the case studies selected for each market segment. These profiles are based on a review of program materials, evaluation reports, and existing profiles from other organizations, and have been complemented by interviews with program managers for most profiles.

The following tables indicate where we have considered Manitoba Hydro programs. Note that we only considered programs active as of December, 2008, and excluded programs slated to disappear in the near future.

Residential Programs

	Program Area*	Manitoba Hydro Programs
Market driven / natural replacement	New Construction	PS New Homes Earth Power Loan R-2000
	Lighting and Appliances	Appliance program Lighting program Furnace and Boiler Replacement program
Retrofit / early retirement	Comprehensive Retrofit	ecoENERGY (federal program) Home Insulation Program Furnace and Boiler Replacement program Residential Loan Earth Power Loan Miscellaneous audits, workshops
	Low Income Comprehensive Retrofit	Lower Income Energy Efficiency Program ecoENERGY (federal program)
Other / Niche	Appliance Retirement (general and low-income)	No program
	Geothermal Systems	Earth Power program
	Plug load / consumer electronics	No program

*See page 44 for definitions.

Two relatively small residential programs, the W.I.S.E program and the solar hot water heater pilot project, were not assessed. We also did not compare the Furnace and Boiler program with other stand-alone natural replacement programs, since the program was slated to end as of the end of 2008.

Commercial and Industrial Programs

	Program Area*	Manitoba Hydro Programs
Market-Driven/ Natural Replacement	New Construction	No programs.
	Prescriptive – Products (Commercial kitchens)	Kitchen Equipment Refrigeration Rinse and Save
	Prescriptive - Lighting	Lighting, Commercial Custom
Market Driven <u>AND</u> Retrofit	Commercial Custom	Commercial optimization Energy Manager schools PS Design Standards Commercial Custom All prescriptive products programs
	Industrial Processes Custom	Performance Optimization Gas Optimization
Retrofit/Early Retirement	Small Commercial Retrofit	No programs.
Other / Niche Programs	I/T Savings	Network Energy Manager.
	Geothermal Systems	Earth Power
	Agricultural Programs	Heat Pads Refrigeration Building Envelope Commercial Optimization HVAC Lighting Commercial custom

*See page 45 for definitions.

Several commercial prescriptive products programs were not specifically reviewed: building envelope, commercial clothes washers, HVAC and parking lot controllers. We have instead focused on one sub-market, the commercial kitchens market, to consider Manitoba Hydro’s performance in the prescriptive products program area. All Manitoba Hydro programs are taken into account as complementary programs in our discussion of commercial custom programs.

Note also that we did not evaluate the Bioenergy Optimization Program (BOP), an important Manitoba Hydro industrial sector program. The BOP is a customer self-generated power program which lay outside the scope of our end-use efficiency focused mandate.

EVALUATING THE PROGRAMS

For the purposes of our comparison of Manitoba Hydro and case study programs, we considered four key issues:

- Market barriers^{*}: we identify the most significant market barriers for the program area and compare how well the programs address them.
- Measures: we identify the primary relevant efficiency measures for the program area and compare how comprehensively each program addresses them.
- Design: we compare program designs and assess their use of key strategies and tools.
- Lessons from other programs: Although our assessment of Manitoba Hydro programs is based on a comparison with specific case studies, throughout this report we have kept broader lessons from other programs in mind.
- Results: we compare available quantitative metrics, where relevant, and assess their implications for program effectiveness.

We should note that quantitative results should be interpreted with caution. Programs track different metrics and use unique savings assumptions, and data is often unavailable or incomplete. Note in particular that we have elected not to compare commercial and industrial programs based on results, because the principal metric available (\$/MWh) would be a misleading indicator of program effectiveness in the absence of other (unavailable) data. We discuss this issue further below on page 69.

Based on our analysis of the five factors described above, we then identify the strongest elements of each Manitoba Hydro program, the greatest challenges facing the program, and identify potential opportunities for improving program performance. Finally, we rate Manitoba's programs by one of the following five categories. The reader should note that we consider all of our case studies to be either "leaders" or "advanced" performers.

- LEADER: Manitoba Hydro programs perform as effectively as our case studies and other leaders in results, coverage of cost-effective opportunities, overcoming market barriers and use of effective program design.
- ADVANCED: Manitoba Hydro programs go beyond typical, non-leading programs, but either are not at the level of case studies or are not at the level of other strategies of which we are aware.
- STANDARD: Manitoba Hydro programs are typical for non-leading utility offerings in this area, though not as effective or comprehensive as our leading programs[†].
- BASIC: Manitoba Hydro programs do not cover the majority of opportunities, are narrower in scope and services than typical programs from other utilities, and/or are achieving low savings levels.
- WEAK: Very limited programs in place, generally with low savings and participation levels.

Again, we should underscore that this is a high-level review and a subjective rating process.

^{*} Market barriers are 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. See Appendix 5 for definitions of the most common and significant market barriers to energy efficiency.

[†] Note that we are considering only utilities that have at least limited energy efficiency programs in place.

COMMERCIAL & INDUSTRIAL METRICS

As noted above, comparing residential program performance on the basis of metrics is difficult; in the C&I sector it is nearly impossible. Unlike the residential sector, where data on population, appliance saturation, housing starts, and number of existing homes exists, the commercial sector has no such comparable commercial and industrial data for utility territories. Added to this dearth of data, program managers track performance in inconsistent ways, apply different meanings to key terms, and adopt assumptions that may vary according to regional preferences or climate. For example, participants in the commercial sector may be viewed as a single customer relationship, or may be defined as a single meter. In almost all C&I scenarios, metrics have a tendency to be misleading and, thus, inconclusive when assessing the totality of any program's ability to acquire lasting energy savings. It is very rare that utilities possess the publically available information as to the number of commercial or institutional buildings or the associated square feet of commercial space in their territory upon which comparisons can be made.

While we have collected data on programs as shown in the example below, we are reluctant to report on metrics in the C&I sector. We believe that were we to include metrics in our report, the data may misrepresent the effectiveness of Manitoba Hydro's and our case studies' programs.

Metrics Considered

Spending/Savings (\$/MWh): Dividing program spending over total program energy savings (kWh) is a common – but potentially misleading – metric. Indeed, one could assume that the lower the cost per kWh, the more effective the program. But without data regarding depth of savings (market penetration, for example), a unit savings cost metric can mean one of two things: either (a) the program is particularly cost-efficient, (b) the program is cream-skimming, and/or (c) the program may be young and thus benefitting from pent-up demand at low incentive levels. In the latter two cases, the program would be generating missing opportunities (that are more difficult and costly to achieve at a later date) as well as high free ridership). Note that experience strongly suggests that programs that offer very small incentives are often unable to shift customers' investment decisions, thus attracting largely those projects that would have been undertaken without the program.

As a case in point, we have included here the results of our Commercial lighting studies. At face value, this metric may lead to the conclusion that Manitoba Hydro pays too much for lighting savings compared to exemplary programs – Efficiency New Brunswick's Bright Ideas, Xcel's Lighting efficiency program and NYSERDA's "Right Light" Program. In reality, the data may suggest that Manitoba Hydro is either overspending, or doing what's necessary to achieve deep savings. And since utilities do not report consumption by load, it is impossible to verify savings depth. For these reasons, a \$/MWh metric alone tells us nothing or, worse, is misleading.

Percent Participation: Another metric often considered in residential sector programs attempts to gage market penetration through a participants over total customers metric.



However, utilities do not define their clients in a consistent manner. Some report numbers of customers, others report meters, and yet others report number of individual sites. These can result in radically different numbers, making any percent participation metrics hazardous at best.

Percent of Potential: Finally, an appropriate metric might involve determining the relative share of the cost-effective potential that programs achieve, year-in, year-out, in a given sector. Unfortunately, not all utilities – including Manitoba Hydro – have current potential studies available, thus rendering this metric, while theoretically interesting, practically impossible to apply.

CASE STUDY SELECTION: PROGRAMS

To the extent possible, we selected case studies for our program reviews based on the following criteria:

- **Leadership:** All case studies were selected from programs identified as exemplary by independent reviews, our own experience or that of other leading experts in energy efficiency. We address our application of this criterion below.
- **Representation of program type:** We selected programs that offered broad coverage of the program area and measures in question.
- **Balance between case study strategies:** Where multiple program approaches existed, we strove to include a variety of program designs and delivery models.
- **Relevance to Manitoba Hydro context:** Similarities in markets, principal end uses and measures, policy and programming context were considered when choosing among options.

A large majority of our case studies were recognized as leaders by independent third party reviews. Our principal sources for these reviews were:

- best practices reports from the American Council for an Energy Efficient Economy (ACEEE);
- the US National Energy Efficiency Best Practices Study, a study of residential and commercial programs commissioned by Californian utilities and completed from 2004 to 2008;
- the US Environmental Protection Agency's National Action Plan on the Environment and the Economy Report, produced in 2006;
- Energy Star awards for 2008 and earlier years, for both the US and Canada

We also consulted with colleagues from the ACEEE, the Canadian Energy Efficiency Alliance, and the Vermont Energy Investment Corporation (VEIC). For the selection of geothermal programs, we consulted with Canadian and American industry organizations, including the Canadian GeoExchange Coalition, the International Ground Source Heat Pump Association, and the US Geothermal Energy Association.

Note that the majority of our case studies are American. This is partly a result of the sheer number, diversity and experience of US examples. It is also due to a lack of independent best practices reviews focusing on Canadian programs. In some cases, few or no longstanding Canadian programs exist. For example, multiple Canadian jurisdictions are now developing low-income comprehensive retrofit programs, but none of these programs have been in place long enough for a conclusive assessment.

SUMMARY

RESIDENTIAL PROGRAMS

Overall, we see that Manitoba Hydro's existing residential programs are strong, but that it has several significant gaps in programming and could go beyond current performance. Among its existing programs, only the single-family new construction program was considered standard, largely because of its low market penetration compared with case studies and other leaders. Its other core residential programs are either advanced or exemplary performers, although there are interesting opportunities to improve performance in all four areas. There are several significant opportunities that are targeted poorly or not at all: multifamily new construction, multifamily low-income retrofits, appliance replacement and appliance early retirement. As we have suggested in our portfolio-level review, these are all potential opportunities for additional savings for Manitoba.

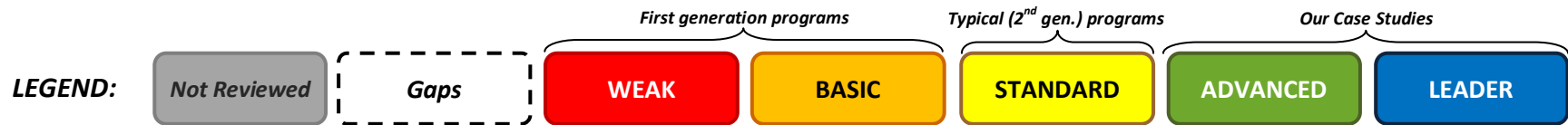
The opportunities we have identified for existing Manitoba Hydro programs share a few common themes. Participants in retrofit programs would be better served by integrated programs with a single point of entry, and a more turnkey approach to the general residential market. All programs could benefit from more use of upstream incentives and market actor services such as training and certification. These approaches, and more program-specific opportunities discussed in each profile, will be vital if Manitoba Hydro is to continue to be a leader in energy efficiency.

COMMERCIAL AND INDUSTRIAL PROGRAMS

All Manitoba Hydro C&I programs are rated as standard performance, with the exception of lighting (advanced) and the Earth Power program, Manitoba's sole exemplary C&I program. As in the residential sector, there are also substantial gaps, with no programs in place for new construction and small commercial retrofit.

The biggest opportunity for improving Manitoba's C&I programs lies in adopting a more proactive, holistic and customized program strategy. Program research has shown time and again that all C&I customers, from the smallest to the largest, expect a customized approach that makes sense for their particular circumstances. This is best provided by a focus on account management and incentives based on either a percentage of installed costs or negotiated case by case incentive levels. Active account management allows programs to capture a customer's attention and help them understand the business case for efficiency measures, while flexible incentives ensure that this business case makes sense. For smaller customers, turnkey installation ("direct install" approaches) become particularly relevant in order to address their situation. Administrative barriers – due to a multiplicity of individual measure-based "programs" – can also be addressed.

ALL PROGRAM AREA RATINGS



	RESIDENTIAL	COMM. / INST. / IND.
MARKET-DRIVEN	<p>LIGHTING AND APPLIANCES</p> <p>SINGLE FAMILY NEW CONSTRUCTION</p>	<p>LIGHTING</p> <p>PRESCRIPTIVE PRODUCTS (Commercial Kitchens)*</p>
	<p>Standalone HVAC and DHW</p> <p>Multifamily New Construction</p>	<p>Small Commercial New Construction</p> <p>Large Commercial New Construction</p>
RETROFIT	<p>SINGLE-FAMILY RETROFIT</p> <p>LOW INCOME SINGLE-FAMILY RETROFIT ‡</p>	<p>COMMERCIAL CUSTOM</p> <p>INDUSTRIAL PROCESSES^o</p>
	<p>Multifamily Retrofit</p> <p>Low Income Multifamily Retrofit</p>	<p>Small Commercial Retrofit</p>
NICHE / OTHER	<p>Appliance retirement</p> <p>Plug load / cons. electronics</p> <p>GEOTHERMAL HEAT PUMPS</p>	<p>GEOTHERMAL HEAT PUMPS</p> <p>I/T NETWORKS</p> <p>AGRICULTURAL</p>

* Our review of the prescriptive products program area focuses on the food services industry. Other prescriptive incentive-based programs (Building Envelope, HVAC, etc.) are reviewed within the Commercial Custom sector. ‡ This is a new program that was rapidly evolving while this review was being conducted, making analysis difficult. As a result, and contrary to other programs, our assessment here is based in part on *projected* performance (participation). ^o Our review of the industrial processes program found a significant difference in program design and implementation based on customer size.

RESIDENTIAL PROGRAMS

COMPREHENSIVE SINGLE FAMILY RETROFIT

SUMMARY

How does Manitoba compare?

LEADER

- **Results**
 - **Caveat:** particularly difficult to make relevant comparisons for this program area.
 - **Participation:** ecoENERGY has low market penetration, HIP compares well to case studies.
 - **Savings:** both ecoENERGY and HIP compare well with case studies.
 - **Spending:** both ecoENERGY and HIP compare well with case studies.
- **Barriers:** addresses most barriers, but not as fully as some programs.
- **Measures:** covers most measures but key installation issues likely not addressed, air sealing needs to be incented as part of the HIP program, and there is a missed opportunity to use audits to install light measures.
- **Program design:** Manitoba Hydro successfully uses the standard 'audit + incentives' model to target this market. Innovations from other programs could, however, expand and improve this approach.
- **Lessons from other programs:** The industry is still struggling to define an effective residential retrofit program. Although Manitoba Hydro compares well with case studies, maintaining leadership in the long term will likely require design changes.

What works?

- Comprehensive audits identify savings opportunities
- Prescriptive incentives cover most measures
- On-bill financing overcomes first cost
- Contractors used to market programs

What are the challenges?

- Multiple applications, lack of program integration
- Market barrier still in place - ensuring quality installation
- Contractor incentives and certification

Opportunities

Manitoba Hydro should explore the following options further:

- **Integrate programs further** with automatic enrolment and follow-up.
- **Consider direct installation of cost-effective measures** such as CFLs, air sealing and faucet aerators.
- **Providing generous incentives for comprehensive air sealing** to overcome the barrier of invisible benefits.
- **Harness the sales power of contractors** with more referral incentives and possibly the auditor-contractor model.
- **Improve contractor skills** via certification and training.
- **Consider the auditor-contractor turnkey installation model** to overcome remaining barriers and transform the market.

DEFINITION OF PROGRAM AREA

Comprehensive single family retrofit programs treat the home as a system and encourage discretionary, efficiency-driven renovations and early replacement of equipment. Principal categories of measures are envelope (insulation, air sealing, windows and doors), HVAC (equipment and ducts), water heating ("domestic hot water", or DHW), lighting and major appliances. Programs generally offer homeowners free or subsidized home energy audits, and some combination of: free or subsidized direct installation of measures; cash incentives; low-interest financing; and some form of quality control or certification of contractor work. Many programs also focus on market transformation by offering training, certification, marketing support and performance incentives to contractors.

CURRENT MANITOBA HYDRO APPROACH

Manitoba Hydro (MH) targets this market with multiple programs:

- Federal ecoENERGY program: MH administers this program on behalf of the federal government. It consists of a home audit and a set of prescriptive incentives from the federal government for most measures. MH subsidizes the audit cost to bring it down to \$180, and subsidizes the obligatory follow-up visit by 100\$ if participants receives at least \$400 worth of ecoENERGY grants. Participants have 18 months to complete work from time of audit. Note that we treat this program as part of MH services although it is technically a separate program and MH does not claim savings from the program.
- Home Insulation program: MH offers prescriptive incentives for the insulation of attics, basements and walls to specific standards. Participants apply via insulation contractors or retailers. Incentives are provided upon proof of purchase (DIY) or completion of contract (contractors). Participants can apply multiple times to this program, completing insulation of different areas on their own schedule. Incentives cannot exceed the cost of materials.
- Home Comfort Loan: MH offers on-bill financing of up to \$7500, for up to 60 months, at 6.5%. The loan can be used for a broad variety of measures (insulation, air sealing, windows and doors, heating and ventilation, solar hot water). Participants apply via a registered retailer or contractor and receive the loan upon proof of purchase/installation.
- Residential high-efficiency furnace or boiler program: MH offers a \$245 on-bill incentive for the purchase of a high-efficiency (92% AFUE + ECM motor) oil, gas, or propane furnace or boiler; the program is due to end in 2009. Note that although we include this program in our analysis of Manitoba Hydro's comprehensive retrofit offerings, the program design and incentive levels make it essentially a natural replacement program.

Note that the Earth Power loan does technically address this market, but it is being compared separately as a specialized program. Similarly, lighting and appliance rebates are open to homeowners but target the natural replacement market rather than the early-retirement market. It should also be noted that as of December 2008, Manitoba Hydro was in the process of designing programs to offer light DHW measures and offer incentives for solar hot water heaters.

CASE STUDY SUMMARIES

We examined 3 case studies, summarized below.

New York: Home Performance with Energy Star (HPwES): NYSERDA's HPwES program uses a "one-stop-shop" model where a single, program-approved contractor is hired by a consumer to perform an audit, recommend energy efficiency measures and install them. Additionally, contractors assist customers in applying for program incentives and low-interest financing. The program is recognized for its focus on long term market transformation: contractors must be accredited with the Building Performance Institute and receive subsidized training and certification, per-project incentives, equipment subsidies and co-marketing funds. Contractors also benefit from the program's overall marketing campaign. Note that the program incorporates more generous subsidies for lower-income participants, who typically make up 1/3 of participants. Program strengths include: its one-stop-shop approach, focus on contractors, rigorous quality control, gradual roll-out across the state, and successful market transformation approach.

Connecticut: Home Energy Solutions (HES): HES is a state-wide program offered by Connecticut's two electric investor owned utilities (IOUs) with gas funding provided by the state's three gas utilities. The program is open to all residential customers regardless of heating fuel, but program marketing targets high users. The program offers homeowners a subsidized home audit and auditors also provide free air sealing, duct sealing and installation of light measures during the audit. Auditors also inform homeowners about subsidies for appliances and some air conditioning, available uniquely via HES. The program also subsidizes training for participating contractors. Audits are available to all homes regardless of heating fuels. Participants can also apply for low-interest funding under the Energy Conservation Loan (ECL) program (not utility-administered). Program strengths include: its all-fuel approach, use of direct install, and customized participant education.

The program is considering numerous changes for the 2009-2010 program year. A program-specific financing option is being developed and may include an interest rate buy-down by the utilities. Customers will also be required to pay some of the cost of air sealing and duct sealing, and energy modelling and financial analysis of measure payback will be added to the home audit.

Massachusetts: MassSAVE: Statewide home retrofit program, offered by all electric and gas state investor-owned utilities (IOUs) and the Department of Energy Resources (DOER). Each utility administers its own program under a common design, with different designs for electric and gas utilities. Our profile focuses on one utility, National Grid.

Under National Grid's electric program, residential customers receive a free home audit, turnkey installation of recommended measures, cash incentives and 0% financing. Audits and weatherization incentives are available regardless of heating fuel. National Grid's gas retrofit program offers a free audit and cash incentives, but no financing and no turnkey installation – participants must find their own

Key Supporting US Programs

Home Performance with Energy Star: national initiative within Energy Star. Provides program design parameters, tools, and common branding and marketing.

EPACT Tax Credits: measure-specific tax credits for retrofits (\$500 cap)

Building Performance Institute: independent, national certification and accreditation organization for weatherization and efficiency retrofit contractors.

contractors. Program strengths include: its turnkey one-stop-shop approach, contractor skill development, and aggressive rebate levels for envelope measures.

National Grid plans to combine its gas and electric offerings in a single program. Participants will have the option of choosing a turnkey retrofit bid or selecting their own contractors from a list of preferred contractors. Program managers are considering emphasizing some measures more, in particular air sealing and duct sealing. The utility also plans to require all insulation contractors to receive Building Performance Institute training, and to conduct higher levels of quality control on completed jobs.

COMPARISON OF SERVICES

Note – Dollar values are in Cdn dollars for Canadian programs and US \$ for American programs.

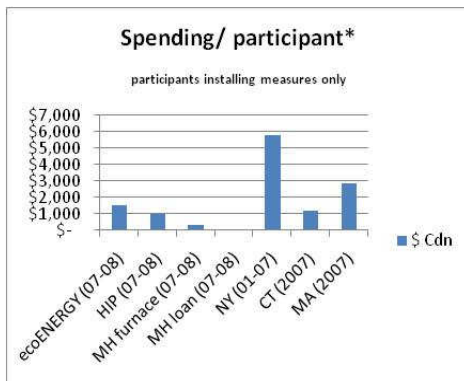
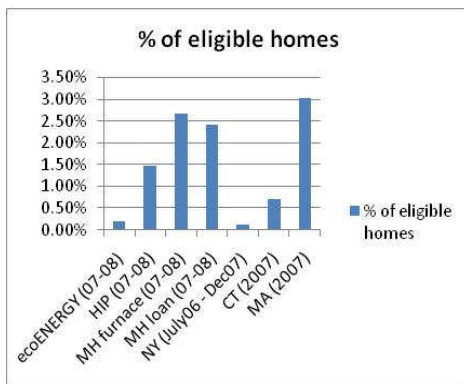
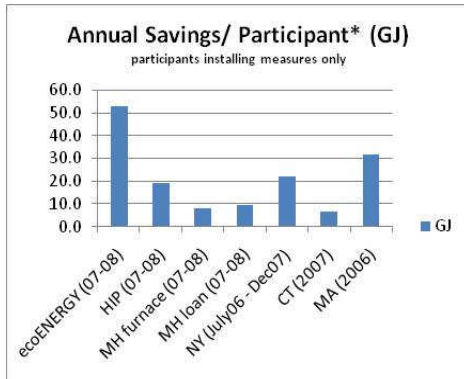
	Services	Manitoba Hydro	New York	Connecticut	Massachusetts
	Heating fuels	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> All (gas and electric focus) 	<ul style="list-style-type: none"> All (no HVAC for non gas/electric)
	Program integration	<ul style="list-style-type: none"> 4 semi-integrated programs (ecoENERGY, HIP, loan, , furnace/boiler) 	<ul style="list-style-type: none"> 2 semi-integrated programs (HPwES, financing) 	<ul style="list-style-type: none"> 2 programs (HES, financing) 	<ul style="list-style-type: none"> 2 programs (HPwES, financing)
Homeowner	Energy Audit	<ul style="list-style-type: none"> \$100 subsidy on initial audit, \$100 subsidy on ex-post if sufficient measures adopted; no auditor-contractor connection DIY also eligible 	<ul style="list-style-type: none"> No initial subsidy but free ex-post audit; conducted by certified contractor 	<ul style="list-style-type: none"> ~225 subsidy, no ex-post. No energy modelling Certified auditor/contractor 	<ul style="list-style-type: none"> Free ex-ante and ex-post audits Certified auditor/contractor
	Recommendations	<ul style="list-style-type: none"> measures and savings only (no financial analysis or work scope) 	<ul style="list-style-type: none"> measures and savings financial analysis, work scope, bid 	<ul style="list-style-type: none"> measures and savings informal financial analysis, work scope no bid 	<ul style="list-style-type: none"> Electric: includes financial analysis and work scope, bid. Gas: no work scope.
	Direct install	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> Air and duct sealing, CFLs, light DHW, oil heating tune up. Value ~\$750 	<ul style="list-style-type: none"> Free CFLs (12-15) Light DHW
	Incentives	<ul style="list-style-type: none"> Up to \$5000 federal (envelope, HVAC, DHW) Insulation \$0.02-\$0.08 per R/ft2 Heating \$245 	<ul style="list-style-type: none"> 10% of total cost up to \$3000 ceiling IF financing not used.* Separate appliance rebates 	<ul style="list-style-type: none"> Insulation \$0.50/ft2 Appliances \$50-\$100 HVAC \$300-\$500 Incentives <u>doubled</u> if measures installed <45 days. 	<ul style="list-style-type: none"> 75% of insulation and air sealing, \$2 000 cap. HVAC: up to \$1 000 Appliance and A/C rebates
	Financing	<ul style="list-style-type: none"> 6.5%, 5 years, \$7 500 	<ul style="list-style-type: none"> 4.99%, 10 years, \$20 000 IF no 	<ul style="list-style-type: none"> Low interest, 10 years, \$25 000. 	<ul style="list-style-type: none"> 0%, \$15 000, 7 years.

* Lower-income households receive up to 50% of the cost of measures to a cap of \$5000/home (\$10 000 for 2-4 family homes).

LEADERSHIP IN ENERGY EFFICIENCY: Comparing Manitoba Hydro's Power Smart with Leading North American Strategies

	Services	Manitoba Hydro	New York	Connecticut	Massachusetts
		<ul style="list-style-type: none"> Geothermal 4.9%, 15 years, \$20 000 On-bill financing 	incentive.		
	Contractor selection and management	<ul style="list-style-type: none"> contractor lists 	<ul style="list-style-type: none"> Auditor offers bid, manages subcontractors 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> Electric: turnkey envelope measures Gas: contractor list
	Quality assurance	<ul style="list-style-type: none"> auditors monitored and randomly inspected Insulation inspected ex ante and ex-post; program suspends problem contractors 	<ul style="list-style-type: none"> Contractors are BPI certified, program suspends problem contractors One-year warranty 	<ul style="list-style-type: none"> Utility stands behind directly installed measures. 	<ul style="list-style-type: none"> Auditors inspect subcontractor work but little utility inspection
	Other homeowner	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> Free Kill-a-watt meter 	<ul style="list-style-type: none"> none
Contractor/upstream	Training	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> Up to 75% subsidy NYSERDA supports community college network 	<ul style="list-style-type: none"> \$400-\$500 subsidy for BPI training 	<ul style="list-style-type: none"> BPI subsidies <i>planned</i> for 2009
	Equipment	<ul style="list-style-type: none"> No subsidies 	<ul style="list-style-type: none"> Diagnostic equipment purchase subsidy 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Purchase subsidies (up to 80%) <i>planned</i> for 2009
	Certification	<ul style="list-style-type: none"> ecoENERGY auditors must be certified. 	<ul style="list-style-type: none"> BPI accreditation required, subsidized for both audits and measures 	<ul style="list-style-type: none"> BPI auditor certification required 	<ul style="list-style-type: none"> BPI accreditation <i>planned</i> for 2009
	Per-project incentives	<ul style="list-style-type: none"> \$25 auditor incentive for referral to insulation program 	<ul style="list-style-type: none"> Depth-of-savings incentive Referral incentive 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> \$1/CFL installed Volume-based incentives
	Marketing	<ul style="list-style-type: none"> General campaign 	<ul style="list-style-type: none"> Co-marketing funds General campaign 	<ul style="list-style-type: none"> General (low-level) marketing 	<ul style="list-style-type: none"> General campaign
	Other	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Aggressive contractor outreach 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> none

QUANTITATIVE METRICS



Caveats:

- Very difficult to fairly compare these fundamentally different programs – in particular, Manitoba’s single-measure HIP program with audit-based comprehensive programs.
- Manitoba
 - Majority of furnace replacements likely market-driven - can’t be compared to retrofit programs.*
 - Substantial double-counting of savings between ecoENERGY and Manitoba Hydro programs – cannot amalgamate results.
 - ecoENERGY savings figures may be overstated.
 - Incomplete spending figures for ecoENERGY (OEE administrative costs not included).
- NYSERDA program results include lower-income homes who receive higher incentive levels –1/3 of participants.
- Massachusetts - percentage of participants installing measures is rough estimate.
- Connecticut – savings results do not include substantial oil, propane and wood savings.
- % of eligible homes – our figures for housing stock were approximate in each case.

EcoENERGY: On its own, ecoENERGY appears to obtain deeper savings per participant than case studies, at a lower cost. However, savings claims may be questionable (there is some evidence that the software overstates savings and free ridership can be significant). Similarly, budget figures are incomplete. Even if we conservatively halve savings and double spending results, however, the program compares well to case studies, outperforming NYSERDA and Connecticut on savings and spending less than NYSERDA. In terms of the percentage of the eligible market reached each year, ecoENERGY scores better than NYSERDA but worse than

Connecticut and Massachusetts. In terms of the percentage of audits that lead to installed measures, ecoENERGY’s 25% result suggests there are opportunities to improve the program’s design. Our overall conclusion: results suggest that ecoENERGY performs as well or better than case studies.

* One exception - during the period from August 4, 2008 to December 31, 2008 Manitoba Hydro offered it's natural gas customers a limited-time rebate of \$500 if they replaced their existing gas furnace with a gas furnace that has a minimum efficiency of 92% AFUE and a DC variable speed motor, making them eligible for a total of \$1000 if they were also eligible for a federal grant via the ecoENERGY Program. The limited time offer accelerated the replacement of conventional and mid-efficient furnaces by 28% over the previous year, likely including substantial early replacement.

Program	Free ridership	Free drivership	Total audits	Participants installing measures	% of audits installing measures
ecoENERGY (2007-08)	unknown	unknown	3171	786	25%
HIP (2007-08)	7%	0%	NA	4537	NA
MH Furnace (2007-08)	26%	0%	NA	4911	NA
MH Loan (2007-08)	not considered	not considered	NA	7427	NA
NYSERDA (2007)	26%	42%	4301	unknown	unknown
Connecticut (2007)	unknown	unknown	6655	6655	100%
Massachusetts(2007)	2%	0%	5989	2395.6	40%

Manitoba Hydro programs: In considering results from the three MH programs, we need to discount most furnace savings and spending since they are likely not due to early retirement of existing furnaces. We also need to be careful with loan results – loan programs can have high free ridership rates, particularly when, as in this case, loans are at market rates and aesthetic measures such as windows are eligible.* MH does not, however, estimate free ridership for this program. Essentially, these two factors mean that we should largely consider results from the HIP program in isolation.

On its own, the HIP program is nearly on par with NYSERDA, and achieves deeper savings than Connecticut. Regarding annual market penetration, the three Manitoban programs each go far beyond Connecticut and NYSERDA and come close to Massachusetts, although once again we need to discount the furnace program results. Finally, spending/participant figures suggest that the HIP and furnace program are achieving their relatively deep savings for a fairly low cost. The loan program is particularly cost-effective since in effect it is revenue neutral. In conclusion, even when we look principally at the HIP program in isolation, it compares favourably with the case studies on all three measures of program results.

New York: NYSERDA’s program does well in terms of depth of savings, but has high costs per participant and captures a very small percentage of eligible homes. High costs/participants are due in part to the inclusion here of lower-income households participating via the Assisted Home Performance with Energy Star program.† Program managers also explain that high costs are due to the focus on market transformation, which requires a significant investment and lead time to obtain results. Similarly, low annual market penetration is likely due to its gradual, region-by-region rollout. A recent evaluation of the program found modest evidence of market transformation‡. Looked at together, NYSERDA results suggest that its approach can achieve deep savings but at a higher cost and a slower initial pace than other programs.

Connecticut: Connecticut has the lowest savings/participant of all programs and fairly low market penetration. Low savings results, however, are likely due in part to Connecticut utilities not claiming non-gas heating fuel savings. Another key factor for low savings is that we are dividing Connecticut savings by all participants whereas ecoENERGY, NYSERDA and Massachusetts savings are only divided by

* Windows were the most popular measure under the loan program in 2008.

† Our rough estimate is that spending/participant for the HPwES program without the AHPwES program would be roughly \$4000/participant rather than \$5700.

‡ Increased incorporation of energy efficiency considerations in non-program work by both participating and non-participating contractors; increases in non-prompted homeowner requests for energy audits.

the number of participants who went beyond audits and installed measures. We also do not know if low market penetration is caused by budget limitations or lack of consumer interest. Taken together, we feel that we cannot draw any firm conclusions from the available data on Connecticut.

Overall conclusions re results: Although results are particularly difficult to compare in this program area, the HIP program and ecoENERGY each appear to be performing well in comparison with case studies.

Manitoba Hydro sources for quantitative metrics:

- ecoENERGY:
 - GJ/participant: OEE data indicates 52.3 GJ/participant receiving incentives, 786 participants receiving incentives. MH total ecoENERGY participants 3171 taken from "Power Smart residential Program Participation by Region by Year", paper copy.
 - Spending/participant: OEE data indicates average incentive payment of \$1 310.87. $(\$1310.87 * 786) / 3171 = \324.92 /participant. MH spending in 2007/08 was \$652 284.
 - % of eligible homes: 3171/402170. 402170 = single-family homes and 'other' dwellings according to Statistics Canada 2006 Census results
- HIP
 - GJ/participant: from 2007/08 preliminary evaluation memo
 - Spending/participant: ibid
 - % of eligible homes: ibid, with eligible homes = single-family homes from 2006 Census
- Furnace replacement
 - Savings, spending, participants: from 2007/2008 preliminary evaluation memo
 - % of eligible homes: ibid, with eligible homes taken from 2005 MH gas potential study
- PS loan
 - Savings, spending, participants: From 2007/2008 preliminary evaluation memo.
 - % of eligible homes: ibid, with eligible homes as per ecoENERGY

Estimates of program eligible housing markets. We used:

- ecoENERGY: single-family homes and 'other' dwellings according to Statistics Canada.
- HIP program: single-family homes only according to Statistics Canada.
- Furnace replacement program: MH single family gas customers with furnaces, according to MH's internal potential study.

ANALYSIS

Barriers:

See Appendix 3 for definitions of key market barriers to energy efficiency.

- **Identifying opportunities and contractors** (Information/Search Costs): The ecoENERGY audit and MH educational material help homeowners identify opportunities, and MH's lists of preferred contractors give homeowners a place to start in the contractor selection process. Connecticut provides a similar level of assistance and goes further than MH for light measures and air sealing, by providing free direct installation. NYSERDA and Massachusetts go significantly further by removing the need to select a contractor.

- **Performance uncertainties:** all of the programs address this, if only partially, via homeowner education, in particular the financial analysis offered by NYSERDA and Massachusetts.
- **Ensuring quality installation (Asymmetry/Opportunism):** The issue here is consumers having limited abilities to identify well-trained, effective contractors. MH addresses this with its lists of participating insulation and heating contractors and the assurance of quality control inspections, but NYSERDA goes much further by requiring BPI certification, performing rigorous quality control and guaranteeing all work. Connecticut's guarantee of directly installed measures and Massachusetts's use of approved, utility-hired auditor/contractors also go beyond MH's efforts here.
- **Hassle or Transaction Costs:** The cost referred to here is the time and energy spent on program participation and finding and evaluating contractors. EcoENERGY does little to address this issue. The HIP, loan and furnace programs have simple application processes but do little to save time on choosing a contractor. NYSERDA and Massachusetts's use of turnkey installation by auditor/contractors again go the furthest in eliminating this barrier. Connecticut's direct installation goes even further, but only for some measures.
- **Access to financing:** All of the programs offer low interest financing. MH has the advantage of using on-bill financing, but its terms are consistently less generous than the other programs.
- **"Invisible" benefits (*bounded rationality*):** Consumers are often very reluctant to pay for measures that have no clear and immediate impact, such as insulation and in particular air sealing. All of the programs deal with this by providing education and by using incentives to reduce costs. Arguably, however, incentive levels need to be relatively high for these measures. Only Connecticut completely eliminates the barrier (for air sealing) by providing free direct installation. Manitoba and Massachusetts offer high levels of incentives for insulation, while New York does not specifically target insulation or air sealing. None of the jurisdictions except Connecticut give substantial incentives for air sealing.
- **Split incentives between current and future homeowners:** All of the programs address this barrier by using incentives to reduce payback periods – it is beyond the scope of this project to evaluate if current incentives reduce payback periods sufficiently. Free installation under the Connecticut program clearly eliminates this barrier, but again it only covers some measures.
- **Service unavailability:** Three key services needed for residential retrofits are arguably unavailable in most markets: comprehensive home audits, quality weatherization services (air sealing and insulation) and proper HVAC sizing.* All of the programs ensure the availability of qualified energy auditors. Only NYSERDA appears to systematically address the remaining issues, by requiring that insulation, air sealing, and heating system replacements be installed by BPI-qualified contractors.

At a more general level, NYSERDA and Massachusetts are supporting the development of a new type of premium renovation service – the comprehensive, one-stop-shop efficiency retrofit.

Overall conclusion re barriers: Manitoba Hydro programs attempt to address most barriers but generally do not go as far as the three case studies. In particular, the turnkey and direct install approaches used by case studies remove barriers around finding and evaluating contractors, and New

* An evaluation of Manitoba's weatherization and HVAC infrastructure is outside of the scope of this project. However, problems with insulation installation and oversizing of heating and cooling equipment have been consistently identified throughout the US. We also have anecdotal evidence from Manitoban insulation contractors that similar issues exist in the province, although they had been mitigated to some degree by quality control inspections via the HIP and ecoENERGY programs.

York's extensive support for training and certification address barriers arising from a lack of skilled contractors.

Measures:

- **Insulation:** All programs target this measure, but only NYSERDA (and possibly Massachusetts) deal with the issue of installation quality.
- **Air sealing:** All jurisdictions target this measure to some degree. In Manitoba, only the ecoENERGY program offers a subsidy (~15% of the total costs), and only 24% of participants undertake the work, despite a 90% recommendation rate (although almost 100% of participants who installed any measures under ecoENERGY did undertake some level of air sealing)*. Massachusetts has a similarly low uptake rate. Connecticut's offer of free direct installation during the audit is likely the most successful approach to targeting this measure.
- **Heating system replacement:** MH's furnace replacement program is successfully reaching a large share of its gas market and we assume that most replacements are market-driven – i.e. the furnace is not being retired early. MH does not target duct sealing. We have little data on replacement rates for other jurisdictions.
- **Cooling system replacement:** addressed by all programs. Less relevant for Manitoba.
- **DHW:** addressed by all programs to a limited degree. Greywater film exchangers (GFX) are a technology that may be worth exploring for MH's program. Only Connecticut takes advantage of audits to install light DHW measures (aerators, pipe wrap, low-flow showerheads).
- **Lighting and appliances:** all programs offer lighting and appliance rebates, but these are generally from separate programs targeting natural replacement rather than early replacement. Connecticut's direct install program successfully targets early replacement of lighting.

Overall conclusions re measures: Manitoba Hydro compares well to case studies, but could target air sealing more effectively and should take advantage of audits to directly install some measures.

Program design:

The MH programs and case studies we review here offer essentially 3 approaches:

- **Separate audit and incentive programs (MH):** Homeowners in Manitoba can receive a home audit and prescriptive incentives for measures, but don't have access to turnkey retrofit services. Four separate programs incent different measure mixes. The main advantages of their approach are a) ensuring auditor objectivity (auditors don't over-recommend their own services) and b) allowing measure-specific contractors to market the insulation and furnace programs directly. Disadvantages include participant drop-outs after the initial audit in the ecoENERGY program and missed opportunities when participants only use a single program.
- **One-stop-shopping (NYSERDA, Massachusetts):** Participants in these programs get an audit and a bid for comprehensive retrofit work in one setting, removing much of the hassle involved in efficiency retrofits. NYSERDA goes further, overcoming the auditor objectivity issue by providing auditors incentives for comprehensive savings and referrals to other contractors. The main

* OEE statistics for 2007-2008.

advantages of these approaches are a) removing a key barrier to participation and reducing drop-out rates and b) creating an incentive for auditors to aggressively market their business.

- **Direct-install (Connecticut):** Connecticut offers a separate audit and incentive program similar to MH, but complements it with direct installation of cost-effective light measures and air sealing, an essential but often underused weatherization measure. The main advantage of the direct install component is that it overcomes almost all barriers to participation and completely avoids post-audit drop-out.

Noteworthy: One unique design element from our case studies is NYSERDA's market transformation approach. Like most NYSERDA programs, the principal goal of the HPwES is to create a self-sustaining efficiency market in the long-term. NYSERDA's program attracts contractors in with training, equipment, and marketing subsidies, and maintains high contractor quality via certification requirements and quality control. As mentioned, its well-designed contractor incentives appear to substantially overcome the issue of auditor-contractors who 'cherry-pick' easily-installed measures or only recommend measures they can install themselves. Our (limited) quantitative comparison suggests that NYSERDA's approach is relatively costly and has taken time to develop. Despite this, we suggest that this is an approach that MH should explore further (see below).

Overall conclusions re program design: After reviewing our case studies and Manitoba Hydro programs, we can't conclusively point to one design as being categorically better than the others. However, we would argue that it is to Manitoba Hydro's advantage to adopt design elements from our case studies, in particular direct installation, more work with market actors and a turnkey approach.

Lessons from other programs:

Many utilities struggle to provide effective residential retrofit programs. The need for on-site audits and higher incentive levels make them expensive, and even well-designed programs have difficulty convincing homeowners to undertake efficiency retrofits because of the disruption of renovations. In addition, few utilities have focused on this program area until recently. In the US, most ambitious efficiency programs have come from the electricity sector, and low levels of electrically-heated homes have meant that these programs had little motivation to target retrofits in the past. This situation is now changing as many states put ambitious all-fuels efficiency targets into place, and begin to value avoided greenhouse gas emissions as well as avoided new generation. However, it is fair to say that the industry is still trying to define a fully effective residential retrofit program. For this reason, although Manitoba Hydro's programs compare well with case studies, we would caution that long-term leadership in this area will likely require design changes.

OPPORTUNITIES FOR MANITOBA HYDRO

***Caveat:** The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.*

Integrate programs further: The current four programs are targeting similar markets and overlap on many measures. Although MH has made it relatively simple to apply to each program, multiple application forms and separate marketing likely create barriers and missed opportunities. Ideally, customers applying for an ecoENERGY audit should be automatically contacted or enrolled in HIP and

the Power Smart loan program, and auditors should assist in enrolment on the spot. All HIP and PS loan program applicants should similarly be automatically contacted re the ecoENERGY program.

Consider direct installation of cost-effective measures: Simply 'getting through the door' of a participant requires substantial program effort. Once an auditor is already in the home, it becomes cost-effective to install many measures even with a 75%-100% subsidy. One approach to take advantage of this would be to have ecoENERGY auditors and participating HIP and furnace contractors install CFLs, light domestic hot water measures and possibly air sealing as standard practice, free of charge or for a small fee.

Harness the sales power of contractors: Insulation contractors, HVAC contractors and energy auditors already promote MH programs directly relevant to them, and ecoENERGY auditors receive an incentive for referring customers to the HIP program. At a minimum, however, MH could provide referral incentives for insulation and HVAC contractors for successful referrals to all four programs. At the other end of the spectrum, MH could adopt the auditor-contractor turnkey model used in NYSERDA and Massachusetts (see below).

Improve contractor skills: As mentioned, it is likely that Manitoba faces the same issues with insulation, air sealing and HVAC sizing skills faced by the rest of North America. At a minimum, MH should investigate and consider options (training, increased quality control, certification) for addressing this problem.

Provide generous incentives for comprehensive air sealing: Comprehensive air sealing in attics and basements will typically cost ~\$2 000 per home.* Current ecoENERGY incentives of \$150-\$300 are unlikely to incent unplanned, comprehensive work, especially because this measure is unpopular among homeowners because of a lack of tangible, immediate benefits. Higher incentives are needed to increase uptake, either as part of the HIP program or as part of a new turnkey program.

Address the "finding contractors" barrier, by one of two means:

- **Using the auditor-contractor turnkey installation model:** As discussed, this model has many advantages over the more traditional audit-and-incentives model, especially when all of the design elements used by NYSERDA are in place. For homeowners, it eliminates one of the biggest market barriers still in place: the difficulty of finding trustworthy, competent contractors. On the contractor side, it supports the development of a new market by reducing barriers to contractor investment. Auditor-contractors also have a strong incentive to market the program.
- **Providing neutral support in evaluating contractor bids:** Phone-based technical support in reviewing and comparing bids, combined with Manitoba's Hydro list of approved contractors, could reduce participant transaction costs and increase their comfort level with the program.

* Based on estimates from two Winnipeg-area insulation contractors; these costs are in line with those seen in other jurisdictions. A typical breakout might be ~\$300 for sealing most attic penetrations, \$1 000 for sealing top plates under attic eaves, and \$500-\$900 for sealing basement rim joists.

NEW CONSTRUCTION

SUMMARY

How does Manitoba compare?

STANDARD

- **Results**
 - **Market share:** Case studies outperform Manitoba Hydro by two to five times.
- **Overcoming market barriers:** Power Smart standards make participation simple and give consumers an assurance of quality. However, the program incompletely addresses two key barriers that case studies successfully address: split incentives between builders and home buyers, and builder knowledge of efficiency measures.
- **Measure coverage:** Manitoba Hydro covers all major measures for new construction and its standards are for the most part equal to or more stringent than Energy Star.
- **Program design:** Manitoba Hydro has many elements in place but provides insufficient upstream services and gives incentives to home buyers rather than builders. It also does not offer optional “a la carte” measures.
- **Lessons from other programs:** Our case studies are representative of industry trends: a focus on supporting and incenting builders rather than homeowners, and increasing adoption of the Energy Star standard.

What works?

- Solid standards – PS Gold is equivalent to or better than Energy Star requirements
- Free building certification and technical support for builders
- Involvement in builder association

What are the challenges?

- Higher incremental costs than other jurisdictions
- No incentives for builders = substantial barrier left in place
- Limited training and insulation inspection
- Low market share relative to other programs

Opportunities

Manitoba Hydro should explore the following options further:

- **Provide incentives to builders rather than homeowners** to overcome split incentives
- **Evaluate the need for contractor training**
- **Bring in better insulation inspection** to ensure quality installation
- **Consider “a la carte” incentives** to encourage builders to go further

DEFINITION OF PROGRAM AREA

This section considers ratepayer-funded programs that encourage the construction of homes that are more energy efficient than homes built to existing building codes. Upstream strategies include builder training, builder design and construction assistance, builder equipment subsidies, building audits and certification, builder incentives and financing, and co-marketing funding. Downstream strategies include consumer education, homebuyer incentives and financing, and marketing. Programs generally

focus on the building envelope, HVAC systems, DHW systems, and lighting fixtures, with some programs also incenting major appliances.

Note that we focus on single-family homes here, since Manitoba Hydro does not have a program that specifically targets multi-family homes.

CURRENT MANITOBA HYDRO APPROACH

Manitoba Hydro targets this market with its Power Smart New Homes program, which also encompasses the federal government's R-2000 program, administered by MH in the province. New homes are also eligible for the Earth Power loan.

- **New Homes Program:** The program provides 2 levels of certification – silver and gold. Standards are designed to ensure that the home will meet an Energuide rating of at least 77 (silver) and 80 (gold). Homes must follow a prescriptive list of measures (minimum insulation, air tightness levels; specific furnace and DHW requirements, lighting requirements) and choose one of a menu of optional measures (additional lighting, ECM motor for furnace, upgraded HRV). Given that silver does not receive incentives and is in the process of being phased out, our analysis focuses on the gold standard.

Builders receive free marketing materials, certification, technical support, and training. Homeowners receive a \$600 on-bill incentive or a rebate of up to \$1000 covering the cost of purchasing an Energy Star front-loading washing machine. The federal CMHC also offers gold level homes a 10% rebate on mortgage loan insurance and no charge for extending the mortgage amortization period to 40 years. Recent building code changes have made a program redesign necessary (ongoing).

- **Earth Power Loan:** The program provides home buyers with a loan of up to \$20 000, at 4.9%, for up to 15 years. The home buyer must obtain approval for the loan prior to installation of the geothermal system. Installers must be recognized by the MGEA. The loan program is complemented by provincial tax credits worth \$2 000 and a \$1 000 incentive for new homes in areas served by natural gas.

Note that stand-alone lighting, appliance and heating system rebates are available to builders but do not principally target the builder market.

CASE STUDY SUMMARIES

We examined three case studies for this program area, summarized below.

California: Energy Star New Homes (PG&E): The program offers builders free Energy Star (ES) certification, tiered builder incentives, builder co-marketing, and an “à la carte” set of builder incentives for specific efficiency measures. The program also offers home buyers a “buyer’s kit” and a property-searching website for PG&E territory. PG&E offers separate programs for both single family and

multifamily homes: we are profiling the single family option only. Note that HERS energy ratings are virtually a standard requirement for new construction in California. Strengths include: program longevity and stability, coordination with other programs, and a comprehensive focus on builders.

The program is considering adding a design assistance component. There is also a move in the state towards net-zero homes. Program standards will be increased as the 2008 Energy Code, due to come into effect in 2009, will make current program base requirements standard for all new homes.

Vermont: Vermont Energy Star Homes/Home Base New Construction (Efficiency Vermont and Vermont Gas Systems):

The programs offer support and incentives for single family and multifamily new construction across Vermont. VESH is offered throughout the state by Efficiency Vermont, for all heating fuels aside from gas. Home Base New Construction is offered in Vermont Gas Systems' service territory, via a partnership with Efficiency Vermont. The programs focus on builders, offering free certification, technical support, incentives per building in some cases and some a la carte incentives for additional measures. Strengths include: a fuel-blind approach, a customer-service approach and comprehensive support for builders.

VESH is considering the creation of a new tier of higher-efficiency standards with additional incentives.

Utah: Energy Star new Homes (Rocky Mountain Power): The program is relatively new, having started in 2005. It offers free builder training, builder incentives and co-marketing funds, and markets ES homes to consumers. It is managed by a third-party consultant (Ecos Consulting).

The program targets electric savings but is complemented by a gas utility program, Questar Gas' Thermwise Rebate Program, that offers similar incentives and services. The gas program was designed to work with the existing electric program and the two programs collaborate on training and quality assurance. Our profile focuses on the Rocky Mountain Power program but does refer to gas incentives. Program strengths include: coordination with the gas program, strong relationships with builders, and a quick program ramp-up using the Energy Star model.

The Utah Public Service Commission may eventually require the gas and electric programs to coordinate their offerings as a single program. The current program cycle ends in 2009 and it is unclear what changes may occur in next program cycle.

Key Supporting US Programs

Energy Star New Homes: National-level brand managed by the Department of Energy and the Environmental Protection Agency. Requires that homes are at least 15% more efficient than the 2004 International Residential Code (IRC). Homes must also complete a "thermal bypass inspection".

EPACT Tax Credit: \$2 000 tax credit for homes more than 50% more efficient than the International Energy Conservation Code (IECC – largely the basis for IRC efficiency requirements).

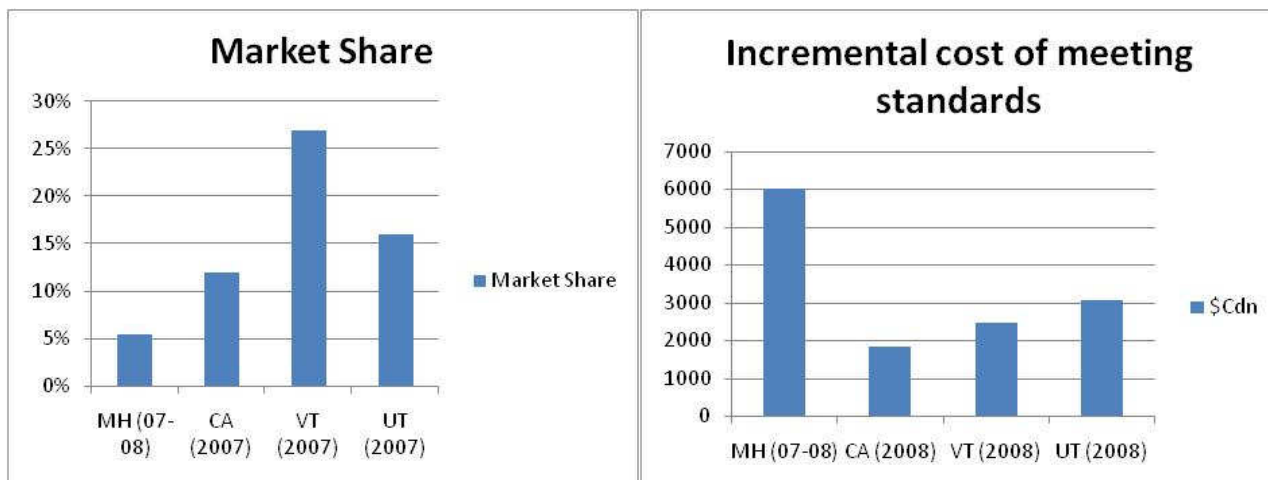
HERS rating: Home Energy Rating System (HERS) is a set of criteria and a common performance scale for conducting a home energy audit. The most comprehensive level of HERS audit is comparable to the ecoENERGY home audit.

COMPARISON OF SERVICES

Note – Dollar values are in Cdn dollars for Canadian programs and US \$ for American programs.

	Services	Manitoba Hydro	California	Vermont	Utah
Other	Heating fuels	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> all 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> all
	Incremental cost of building	<ul style="list-style-type: none"> \$5 000 - \$ 7 000 	<ul style="list-style-type: none"> \$1300-\$1500 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> ~\$2 000
Customer	Incentive	<ul style="list-style-type: none"> Silver: none Gold: \$600 or up to \$1 000 of ES clothes washer cost. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Quality control	<ul style="list-style-type: none"> 100% of homes inspected post-construction. 	<ul style="list-style-type: none"> 100% via HERS rating. 	<ul style="list-style-type: none"> 100% via HERS rating. 	<ul style="list-style-type: none"> 100% via HERS rating + 20% by program.
	Loans	<ul style="list-style-type: none"> Earth Energy Loan 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Other	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> web property search tool 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
Contractor/upstream	Incentive	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Standard: \$ 400-\$ 500 35% above code: \$ 2 000 "a la carte" incentives: \$10-\$500 per measure. 	<ul style="list-style-type: none"> non-gas heat: no basic incentive gas heat: \$500. "a la carte" incentives: \$800 bundled package; \$10-\$100/measure. 	<ul style="list-style-type: none"> electric: \$200 (basic) to \$700 + \$10-\$750 optional gas: \$500 (basic) to \$800 + \$50 to \$750 optional.
	Training	<ul style="list-style-type: none"> periodic training on R-2000, PS for builders 	<ul style="list-style-type: none"> Free training for all trades. 	<ul style="list-style-type: none"> informal training; certification subsidies via retrofit program. 	<ul style="list-style-type: none"> free training for all trades, free sales training.
	Design support	<ul style="list-style-type: none"> review and modelling of plans 	<ul style="list-style-type: none"> review and modelling of plans (HERS raters) 	<ul style="list-style-type: none"> plan review and modelling. 	<ul style="list-style-type: none"> plan review and modelling
	Technical support (during construction)	<ul style="list-style-type: none"> During plan review and inspections. 	<ul style="list-style-type: none"> available from circuit riders 	<ul style="list-style-type: none"> one-on-one support available throughout the process 	<ul style="list-style-type: none"> one-on-one support available
	Certification	<ul style="list-style-type: none"> free certification 	<ul style="list-style-type: none"> free beyond HERS rating cost (\$500-\$700, mandatory in state) 	<ul style="list-style-type: none"> Free HERS rating, ES certification, related state certifications 	<ul style="list-style-type: none"> free beyond HERS rating cost (\$300-\$500)
	Marketing	<ul style="list-style-type: none"> free materials, benefits of general PS campaign, referrals, use of PS brand. 	<ul style="list-style-type: none"> free materials, benefits of general campaign, referrals, use of brand 	<ul style="list-style-type: none"> referrals, use of brand. 	<ul style="list-style-type: none"> free materials, use of brand, general campaign co-marketing funds – 30% up to cap (\$2 500 to \$10 000)
	Engagement	<ul style="list-style-type: none"> builders' association. 	<ul style="list-style-type: none"> builder's association 	<ul style="list-style-type: none"> "account management" approach with builders 	<ul style="list-style-type: none"> outreach to equipment and materials distributors.
	Participation assistance	<ul style="list-style-type: none"> As required. 	<ul style="list-style-type: none"> Circuit riders provide support. 	<ul style="list-style-type: none"> As required. 	<ul style="list-style-type: none"> As required.

QUANTITATIVE METRICS



Metrics used: As this is a market-driven, “lost opportunities” program, market share (among all new single-family homes) is one of the most relevant metrics for comparing programs. We also present the incremental cost of meeting the standards, to highlight the fact that Manitoba builders face significant additional costs. We have not presented average savings per home since climate differences make this impossible to compare meaningfully. Data on program spending per home was too limited for comparison.

Caveats:

- **State data only:** We only have state-wide market share data for California, Vermont and Utah, provided by Energy Star. This does not matter for Vermont (where the program covers the entire state) and Utah (where Rocky Mountain Power covers more than 85% of the state), but makes our data on PG&E less reliable, since there are four large utilities in California. All data is for single-family homes.
- **Changes due to housing crisis:** All US program managers reported that Energy Star market share was up substantially in 2008. A disproportionate number of the builders still building during the housing crisis, generally higher-quality housing builders, were already participants.
- **Incremental cost:** the costs given here are rough estimates for single-family homes, provided by program managers.

Overall conclusions: We can see that all three case studies substantially outperform Manitoba Hydro in terms of capturing market share. This could be due to multiple causes, three of which strike us as the most likely: relatively high incremental costs for builders in Manitoba; the lack of an aggressive national umbrella program in Canada and the lack of sufficient incentives for builders in Manitoba.

ANALYSIS

Barriers:

See Appendix 3 for definitions of key market barriers to energy efficiency.

- **Split incentives:** The new construction market faces an important split incentives barrier. In on-spec markets, builders are making design choices while facing only the initial cost of building. All operation and management costs and savings are passed on to the home buyer. PG&E, Vermont Gas Systems and Rocky Mountain Power address this barrier by providing substantial builder incentives and support, while Manitoba Hydro and Efficiency Vermont provide only free certification and inspection services. Note, however, that Efficiency Vermont also offers substantial builder incentives for optional measures beyond basic Energy Star certification.
- **Information and search costs:** All four programs use certification to make it easy for home buyers to find energy efficient homes. Similarly, the standardized criteria used by all four programs make participation straightforward for builders.
- **Builder skills and knowledge (product or service unavailability/organizational practices):** The three case studies address this issue via free training, extensive as-needed technical support, and stringent, inspection-backed insulation standards (the thermal bypass checklist). Manitoba Hydro's support for builder development is limited to design advice during the plan review and inspections, and its inspection process does not include a mandatory post-insulation/pre-drywall inspection phase.

Overall conclusions re barriers: Power Smart standards make participation simpler and give consumers an assurance of quality. However, the program misses two key barriers that case studies successfully address: split incentives between builders and home buyers, and builder knowledge of efficiency measures.

Measures:

Comparing the four programs is complex, because of differences in climate zones, compliance requirements and reference standards. We can, however, compare Manitoba Hydro with the national Energy Star prescriptive and performance requirements for southern Manitoba's climate zone. We were unable to compare the Californian requirement used by PG&E because of a lack of information.

We can compare Manitoba Hydro and the national Energy Star standard using both a performance and a prescriptive approach, since Energy Star offers both types of compliance standards and Manitoba Hydro has estimated the typical performance resulting from its prescriptive standards.

Performance Approach

The three case studies all use a performance approach that requires a minimum HERS rating, while Manitoba Hydro uses the Energuide rating system. Vermont and Utah both use the national Energy Star performance standard, which requires homes to obtain a score of 80 or better on the HERS rating scale, as well as installing efficient heating and efficient lighting. Manitoba Hydro's evaluation of its Gold prescriptive standards indicate that they typically achieve an Energuide rating of 80.

To compare the two standards, we used HOT2000 to obtain Energuide scores for a reference home built to meet Power Smart Gold standards (electric and gas) and to achieve HERS 80 (again both electrically

and gas heated). The results are presented below. Note that this comparison is based on a single set of simulations and is by no means exhaustive.

Standard	Electric	Gas
Power Smart Gold – Energuide rating	80	79
HERS 80 – Energuide rating	78	78
Power Smart Gold <u>total</u> energy consumption as a % of HERS 80	92.1%	95%
Power Smart Gold <u>heating</u> energy consumption as a % of HERS 80	86%	95%

As the table shows, Power Smart’s standard is more stringent than Energy Star.

Prescriptive Approach

We compare Manitoba Hydro’s Gold standard with Energy Star’s national prescriptive standards for the equivalent climate zone below. California does not offer a prescriptive approach, although its Title 24 building code is in some cases more rigorous than national Energy Star specifications. Notably, Title 24 requires energy efficient light fixtures or motion detectors in most rooms.

Measure	Gold	ES National
Attic insulation	R-50, raised heel truss	R-49
Foundation insulation	R-24	R-13
Floor insulation	R-28	R-30
Above grade exterior walls	R-26 electric R-20 gas	R-21
Thermostat	Energy Star programmable	Energy Star
Heating	High efficiency gas (90 AFUE) or electric furnace, geothermal	Gas furnace: 90 AFUE Boiler or oil furnace: 85 AFUE
Cooling	No specification	Proper sizing Minimum SEER 13
Duct leakage	No specification	<4 cfm to unconditioned space; R-6 insulation in unconditioned space
Air tightness	1.5 ACH@50	<4 ACH@50
HRV	required	No specification
Windows	No specification	Energy Star
Domestic Hot Water	Low flow shower head Electric hot water tank with 2 inch insulation	Gas (Energy Factor): 40 Gal = 0.61 60 Gal = 0.57 80 Gal = 0.53 Electric (Energy Factor): 40 Gal = 0.93 50 Gal = 0.92 80 Gal = 0.89
Lighting/appliances	EE lighting in 3 rooms (or additional pick from optional menu)	5 or more ES fixtures or appliances

Measure	Gold	ES National
Other	Permanently wired car plug timer Choose at least one of: <ul style="list-style-type: none"> Gas fireplace electronic ignition EE lighting in every room ECM for furnace Upgraded HRV efficiency 	
Quality control measures	Pre and post-construction inspections	Design review, Pre-drywall/post-insulation Thermal Bypass Checklist, post-construction inspection

There are several significant differences between the two prescriptive standards:

- **Insulation:** less basement insulation under Energy Star;
- **Air tightness:** substantially more air tightness required by Power Smart;
- **Lighting and appliances:** A higher number of fixtures required by Energy Star
- **Quality control:** more rigorous inspection requirements by Energy Star

Finally, the three US programs each offer additional incentives for optional HVAC, DHW, lighting and appliance measures. Manitoba Hydro offers only its standard lighting and appliance rebates.

Optional measures offered by utilities (for additional incentives once basic standards are met)

Measure	Manitoba	California	Vermont	Utah
HVAC	none	AFUE 90 furnace; CEE Tier 1 AC/ASHP; night ventilation; verified ducts; refrigerant charge and air flow	Optional: ECM motors; ES central A/C	Optional: SEER 14+, high performance evaporative cooling;
DHW	none	Tankless water heaters	GFX	-
Lighting/appliances*	Standalone retail lighting and appliance rebates	Optional: additional lighting; clothes dryers, washers, refrigerator	5 appliances + lighting package; clothes dryers, washers; additional lighting fixtures.	Additional lighting, fixtures; dishwasher,

Overall conclusions re measures: In summary, Power Smart and Manitoba Hydro cover a similar range of opportunities and have largely similar standards. Power Smart is somewhat more rigorous in terms of envelope and heating systems for electrically –heated homes, but less stringent than Energy Star for gas-heated homes. It also doesn't offer optional, additional incentives for going beyond the standard. In addition, Manitoban builders don't have the option of using performance-based standards. Finally, Energy Star's insulation inspection procedures are much more stringent than Power Smart.

The biggest opportunities for improvement for Manitoba Hydro linked to measures are: increasing insulation levels for walls in gas heated homes, bringing in post-insulation/pre-drywall inspections, and offering additional incentives for optional measures to encourage more savings.

Program design:

The four programs share several features in common: all of them provide building standards providing a similar level of efficiency; certify homes; and promote their housing 'brand' heavily. There are however some key differences:

- **Case studies focus on builders:** The most marked difference between program designs is the increased level of focus on builders in all three case studies. Unlike Manitoba Hydro, all three case study programs arrange free training, provide technical support during construction, offer substantial incentives to builders and offer no incentives to home buyers. This focus is based on the assumption that in markets where most homes are built "on spec" (i.e. buyers are not involved before construction), builders have more influence over efficiency decisions than buyers.
- **Provision of training:** The three case studies provide extensive, free and regular training to contractors on installation methods and sales. Manitoba Hydro offers more limited training opportunities (roughly 8 training sessions/year, 50-100 participants).
- **Insulation and air-sealing inspections:** Unlike Manitoba Hydro (where inspection during construction is voluntary and triggered by builder requests), the three Energy Star programs require a pre-drywall/post-insulation inspection that identifies otherwise hidden building defects in time to correct them.
- **Variable incentive levels:** Incentive levels vary significantly between programs, possibly reflecting differences in market conditions.
- **"A la carte" incentives:** All three case studies offer additional a la carte incentives for specific measures such as CFL lighting fixtures, ES appliances, and advanced HVAC measures. These incentives go beyond the rebates offered by each jurisdiction's standalone equipment rebates, and offer an opportunity to achieve additional savings.
- **Innovations:** Two innovations from Rocky Mountain Power are worth noting. The utility offers of co-marketing funds, and has also arranged for equipment distributors and manufacturers to provide free contractor training.

Overall conclusions re program design: Despite some common features, Manitoba Hydro is missing important program services (training and inspections), and provides incentives to home buyers rather than builders.

Lessons from other programs:

There is a strong trend in US programs towards focusing services and incentives on builders rather than home-buyers. The Energy Star for New Homes program is also popular as it is easy and quick for utilities

to put into place. Overall Energy Star statistics on market share suggest this model is effective: states with active programs had market shares of up to 50% in 2007.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Provide incentives to builders rather than homeowners: This addresses the biggest barrier for new construction, split incentives between builders and owners. It is a key feature of all three case studies, which have two to five times the market share of the Power Smart program.

Consider “a la carte” incentives: Additional incentives for optional measures can push builders to go further in achieving savings.

Require improved insulation inspection: The thermal bypass checklist developed by Energy Star could be easily adapted for the Manitoba market, and is seen by all program managers as the only way to ensure quality control on wall insulation and air sealing.

Evaluate the need for contractor training: As mentioned in our suggestions re MH's home retrofit programs, it is likely that Manitoba faces the same issues with insulation, air sealing and HVAC sizing skills faced by the rest of North America. Standard design and construction practices may also offer substantial opportunity for improvement via training. All other programs offer regular and free training sessions for builders and contractors. While Manitoba Hydro offers some training, it is unclear if this is sufficient to transform the building market. At a minimum, MH should evaluate the need for advanced design and installation training for the building community.

LOW INCOME COMPREHENSIVE RETROFIT

SUMMARY

How does Manitoba compare?	
<p>LEADER*</p> <ul style="list-style-type: none"> • Results: Savings data is too limited to compare with case studies, although pilot project results are very promising. Participation targets compare well to case studies. • Barriers: Manitoba Hydro compares well with case studies, although a small fraction of customers in remote areas continue to face barriers around obtaining contractors. • Measures: Manitoba Hydro compares reasonably well although there are several measures it should consider covering. • Program design: Manitoba Hydro compares well with case studies and has developed interesting innovations in delivery model and incentive levels. • Lessons from other programs: Manitoba Hydro is unusual in its requirement for customer co-payments. Participation targets in the US are also poised to go substantially beyond current levels – the national leader, California, is now targeting 8% of the eligible population per year – four times Manitoba's goals. 	
What works?	What are the challenges?
<ul style="list-style-type: none"> • Turnkey approach for customers • 100% measure cost coverage for insulation and air sealing • Innovative furnace replacement customer-copayment design 	<ul style="list-style-type: none"> • Barriers left in place for some customers (remote/rural areas) • Missing measures (GFX, lighting fixtures, appliances, education)
Opportunities	
<p><i>Manitoba Hydro should explore the following options further:</i></p> <ul style="list-style-type: none"> • Obtain funding for non-gas/electric heating systems from the provincial government to ensure fuel-blind retrofits in areas not served by gas. • Consider new measures such as grey-water heat recovery systems, lighting fixtures, and appliance replacement. • Consider increasing participation targets to remain among leading programs 	

*Note that this is a new program and was rapidly evolving as of December 2008, making analysis difficult. Unlike other programs, our rating here is based in part on *projected* performance.

DEFINITION OF PROGRAM AREA

Low income comprehensive retrofit programs aim at improving the energy efficiency of privately-owned homes occupied by relatively low income individuals or families. As retrofit programs, they are focused on early replacement of lighting, appliances, and HVAC and DHW systems, as well as efficiency-specific envelope retrofits (insulation, air sealing, and window or door replacement). Programs typically face stronger market barriers than non-low-income retrofit programs: low income households have less capital and less access to capital; participants may need additional support in the program application

process; contractors are less interested in dealing with low income households; and owners of low-income rental housing typically have less incentive to invest in building renovations.

These programs typically use a turnkey approach and provide measures at little or no cost to the participant. Many US utility programs 'piggyback' on existing state low-income weatherization programs. Programs also generally include an education component aimed at encouraging conservation.

CURRENT MANITOBA HYDRO APPROACH

Manitoba Hydro launched its Lower Income Energy Efficiency Program (LIEEP) in December 2007. The program creates a single "window" that amalgamates the HIP, Furnace, Residential Loan and ecoENERGY programs with additional low income measures – a 100% subsidy on the ecoENERGY audit, a 100% subsidy for qualifying insulation and air sealing, a \$19/month furnace program, and free basic energy efficient measures such as CFLs, shower heads and faucet aerators.*

The program offers two streams: in areas served by community groups working with MH, the program is marketed and delivered by community groups ("community-based approach"), with a single application process and all MH incentives paid by MH directly to the community groups. The ecoENERGY incentives are directed to an arm of the provincial government that provides some funding to groups for labour. Additional funding for community group training is also provided by the provincial government. Furnaces (available to homeowners only) are installed by contractors hired by MH. MH provides a high efficiency natural gas furnace to qualifying participants for \$19/mo, paid over 5 years via on-bill financing[†]. The participant may need to take a small loan at the end of the program to cover any remaining costs outside the scope of the program. This special lower income loan is amortized over 15 years with a 5 year rate of 4.9%. This is, however, the exception and not the norm.

In other areas, the program is offered by an "individual" stream. Here the participant applies once to the program, receives an ecoENERGY audit, and chooses a contractor from a list of contractors hired by MH. In some areas of Manitoba not yet covered by contractors under long term contract with the utility, participants must find their own contractors and submit at least 3 bids to Manitoba Hydro for approval.

CASE STUDY SUMMARIES

We examined three case studies for this program area, summarized below.

New Jersey Comfort Partners (Clean Energy Program): Comfort Partners is a state-wide program overseen by gas and electric utilities and contracted out to three for-profit third-party administrators.

* The program originally covered most, but not all, costs for insulation and air sealing; however, this approach was replaced with a 100% subsidy in early 2009, and extended retroactively to 2008 participants. We are therefore comparing Manitoba Hydro on the basis of its winter 2009 approach.

[†] 50-75% of the furnace cost is subsidized and on-bill financing is 0%.

Eligible customers receive a home audit and free installation of cost-effective envelope, HVAC, domestic hot water and baseload measures, up to a spending cap determined by prior household energy use. Program strengths include: consistent statewide delivery; gas and electric delivery in a single program; technical support for contractors and extensive education (up to two hours) for participants. Note that non gas and electric customers are referred to the state Weatherization Assistance Program (not profiled).

Multiple changes are coming to the program in 2009. Eligibility criteria will be raised to 225% of the federal poverty level and contractors will receive performance incentives. New measures will also be added to the program: white roof coating and window films (to reduce cooling load) and gravity film exchangers for hot water savings.

New Hampshire: NHSaves@Home/NH WAP (electric utilities and state gvt):

NHSaves@Home is an umbrella brand for electric utility-funded low-income programs in New Hampshire, which share a common design and delivery mechanism. Weatherization services are delivered via 6 Community Action Agencies (CAAs), who also deliver the state-funded, fuel-blind Weatherization program. From the customer perspective, NHSaves@Home and the state Weatherization program are delivered essentially as a single program. Utility funds pay for envelope measures (insulation, air sealing, and window and door replacement) for electrically-heated homes and some non-electric homes with high electricity consumption, and are used to pay for electric baseload measures in most non-electrically-heated homes. This allows state funding to be used solely for envelope and heating measures in non-electrically heated homes. Our profile covers both programs. Program strengths include: seamless integration of the two programs from customer perspective; contractor feedback on program design; strong quality control contractors; and the development

The Weatherization Assistance Program (WAP):

Since 1976, the US government has provided funding and program guidelines to states for weatherization programs targeting low-income households. State programs are typically fuel blind and do not require bill payment from tenants. WAP programs generally do not cover electric baseload measures (lighting and appliances). Many utilities provide funding to state WAP deliverers in lieu of developing a stand-alone program.

Pennsylvania: Low Income Usage Reduction Program (PECO): The Low Income Usage Reduction Program (LIURP) is offered by a combined gas and electric utility, PECO. The program follows a general universal low income program design provided by the state Public Utility Commission. It targets high-use lower-income customers and offers a comprehensive set of measures, at no cost, based on a whole-house energy audit. All participants receive baseload measures (lighting, appliance replacements and light DHW measures) and an innovative education component. Participants heating with electricity or gas receive envelope and heating system measures as well. Renters generally receive only baseload measures and are not eligible for appliance measures. The program is managed by a for-profit third party contractor, CMC Energy Services.

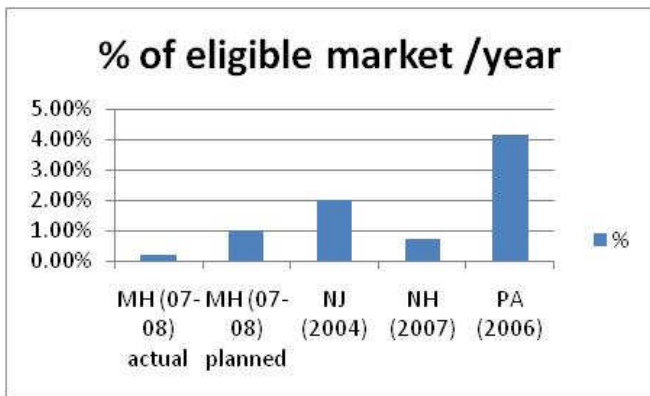
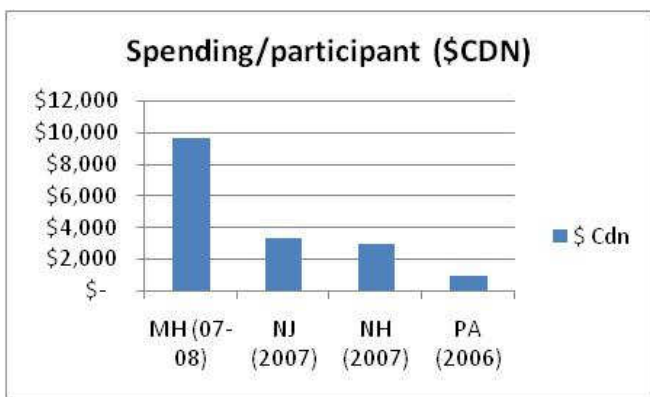
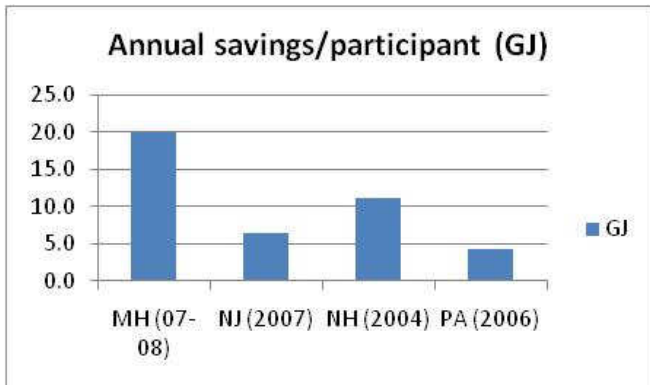
The program is considering offering additional measures to tenant participants, contingent on a copayment from landlords. The program will also likely computerize its home audit and measure screening process. Program strengths include: long term follow-up as part of the education component; and innovative, flexible solutions used for customers heating with oil.

COMPARISON OF SERVICES

Note – unless otherwise noted, dollar values are in Cdn dollars for Canadian programs and US \$ for American programs.

	Services	Manitoba Hydro	New Jersey	New Hampshire	Pennsylvania
General	Fuels	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> gas and electric 	<ul style="list-style-type: none"> all 	<ul style="list-style-type: none"> gas and electric
	Buildings	<ul style="list-style-type: none"> single family 	<ul style="list-style-type: none"> 1-14 units 	<ul style="list-style-type: none"> all 	<ul style="list-style-type: none"> all
	Income cut off (family of four)	<ul style="list-style-type: none"> \$CDN 34 000 - \$CDN 49 000 	<ul style="list-style-type: none"> ~ \$CDN 45 000 	<ul style="list-style-type: none"> ~ \$CDN 47 000 	<ul style="list-style-type: none"> ~\$CDN 47 500
	Treatment of renters	<ul style="list-style-type: none"> eligible; must pay electric and/or gas bill not eligible for furnace subsidy 	<ul style="list-style-type: none"> eligible; >50% of tenants required; must pay electric and/or gas. no new DHW, heating system. 	<ul style="list-style-type: none"> eligible; >50% of tenants in a building must be low-income. bill payment required for NHSaves, not for WAP. 	<ul style="list-style-type: none"> eligible; must pay electric and/or gas bill receive baseload only, with no appliance replacements.
Customer	Audit	<ul style="list-style-type: none"> ecoENERGY audit (inspection, diagnostics, energy modelling) 	<ul style="list-style-type: none"> comparable to ecoENERGY; single family only. 	<ul style="list-style-type: none"> comparable to ecoENERGY 	<ul style="list-style-type: none"> visual inspection and diagnostics.
	Education	<ul style="list-style-type: none"> education re measures no behaviour component (considering) 	<ul style="list-style-type: none"> up to 2-hour one-on-one session 	<ul style="list-style-type: none"> one-on-one education 	<ul style="list-style-type: none"> 30-60 minute one-on-one monthly follow-up calls/letters; possible site
	Eligible measures	<ul style="list-style-type: none"> Insulation and air sealing heating system replacement (gas furnace) DHW (light measures) CFLs low-flow toilets (non-efficiency measure) 	<ul style="list-style-type: none"> Insulation and air sealing Windows and doors Heating system (gas, electric) AC replacement DHW (light and replacement) CFLs and fixtures refrigerator and freezer H&S if required for EE 	<ul style="list-style-type: none"> Insulation and air sealing Windows and doors Heating system (all fuels) DHW (light and replacement) CFLs and fixtures refrigerator and freezer replacement H&S if required for EE 	<ul style="list-style-type: none"> Insulation and air sealing Heating system (electric and gas only) AC replacement DHW(Light and replacement) CFLs thermostat setback refrigerator replacement
	Incentive levels	<ul style="list-style-type: none"> light DHW measures, CFLs: free insulation and air sealing: free Loan to cover remaining costs (4.9% for first 5 years; 15 year) furnaces: \$1140 - \$19/month on-bill, over 5 years. 	<ul style="list-style-type: none"> 100% of cost; cap per home based on usage. 	<ul style="list-style-type: none"> 100% of cost; cap per home of \$4 000 	<ul style="list-style-type: none"> 100% of cost; no cap on spending.
	Quality control	<ul style="list-style-type: none"> 100% of homes 	<ul style="list-style-type: none"> 10% of homes 	<ul style="list-style-type: none"> >10% of homes 	<ul style="list-style-type: none"> 30% of homes
	Other	<ul style="list-style-type: none"> flexible custom approach with First Nations communities 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> none

QUANTITATIVE METRICS



Caveats:

- **All Manitoba Hydro data:** We only have data on the program's first year of operations, which saw only 139 participants, all of which were from two pilot projects. This makes it difficult to compare fairly with case studies.
- **Savings/participant:** MH savings were based on engineering estimates not program data. NH value is older and for NHSaves@Home only (i.e. does not include oil and gas savings). PA value may be inaccurate because of evaluation report reporting format.
- **Spending/participant:** MH value includes all external funding. NH value is an average of separately reported WAP and NHSaves@Home values – i.e. – may be understated.
- **% of eligible market:** We provide both planned and actual #s for Manitoba since 07-08 was its start-up year. Note that 2nd year MH targets are higher - ~ 1.7% rather than 1%. Figures for NJ, NH and PA are rough estimates based on limited data re markets.

Analysis: In its pilot program phase, Manitoba's program is spending more heavily and achieving deeper savings per participant than case studies, although again we must caution that these results are difficult to compare. Manitoba's participation *targets* (at 1.7%/year after the 2nd year) will be similar to New Jersey's, roughly halfway between PA and NH participation rates.* Additional data on PA's LIURP program suggest that, although it is designed as a comprehensive weatherization program, it is in practice more of a

baseload-measures focused program. 75% of participants in 2006 received only baseload measures (lighting, appliance replacement, and light DHW measures). This explains LIURP's low savings and spending per participant and its relatively high participation rates. It also makes it less relevant to compare the program with MH, NJ and NH.

* From other recent analyses we have conducted on a wider range of low-income programs, we know that reaching 1-2% of eligible markets per year is typical for most leading programs. However, recent US plans to increase Weatherization Assistance Program participation by 500% to 1000%, if successful, will lead to participation targets along the lines of 10-15%/year.

Overall conclusions: Manitoba Hydro savings results are too preliminary to compare fairly with case studies. The utility's participation targets compare well with case studies.

ANALYSIS

Barriers:

See Appendix 3 for definitions of key market barriers to energy efficiency.

- **Identifying opportunities and contractors (Information/Search Costs):** As with the non-low-income residential retrofit program, the ecoENERGY audit assists homeowners in identifying opportunities, and MH eliminates the need to find contractors via its use of community groups and approved contractors. However, in those areas where participants must find 3 quotes, the effort of finding contractors remains a barrier. The three American programs have removed these barriers entirely by providing a turnkey audit and installation service.
- **Ensuring quality installations (Asymmetry/Opportunism):** The barrier here is participant's lack of ability to judge installation quality. All four programs address this by taking on contractor management and quality control. Again, one gap in Manitoba's program is the need for some participants to find and evaluate their own contractors.
- **Hassle or Transaction Costs:** The barrier here is the time and energy involved in finding and supervising contractors. MH largely removes this barrier via the use of community groups, the provision of approved contractor lists, and "handholding" during contractor selection. Again, the one exception is the need for some rural participants to find 3 quotes on their own. The three American programs' turnkey approach removes almost all hassle/transaction barriers.
- **Access to capital and financing:** The case studies have completely eliminated this issue by providing all measures free of cost. MH largely removes this issue by covering costs for measures beyond furnaces. MH's innovative approach to furnaces appears to largely eliminate this barrier: uptake rates to date are very high, and the on-bill monthly cost is generally exceeded by energy savings.
- **Landlord-tenant split incentives:** MH deals with this issue by offering all measures to bill-paying tenants as well as homeowners. The exception is the furnace program, where gas bill-paying tenants cannot receive the measure despite an existing split incentive. Similarly, NJ does not offer heating system and DHW replacements to tenants. PA is even more limited, offering only light baseload measures to tenants. Only NH provides all cost-effective measures equally to renters and owner-occupiers.* We cover this barrier more extensively in the Strategies for the Low-Income Rental Market chapter.
- **Service unavailability:** As with the non-low-income residential retrofit market, energy audit, quality weatherization services and proper HVAC sizing services are insufficiently available in many regions. All four programs provide these services directly and verify insulation, air sealing and HVAC quality via quality control programs.

* Note that NH's approach is more representative – a majority of the low-income weatherization programs open to multifamily buildings that we have studied offer heating and DHW measures equally to tenants and homeowners. See the Strategies for the Low-Income Rental Market chapter for more details.

- **Contractor lack of interest:** Low-income customers face an additional service availability barrier: contractors can be less interested in working for low-income customers. All four programs deal with this by hiring contractors directly. The only exception is the requirement for some rural MH customers to find contractors directly.

Overall conclusions re barriers: Manitoba Hydro's turnkey approach compares well with case studies in overcoming most barriers. Its treatment of renters is similar to NJ, more generous than PA and less generous than NH (and a majority of other low-income programs we have assessed in prior work). Manitoba Hydro addresses the access to capital barrier less comprehensively than the other programs, and its requirement for a small minority of participants to find their own contractors leaves many barriers in place for this group.

Measures:

- **Insulation:** All programs target this measure, although PA does not offer it to multifamily buildings.
- **Air sealing:** All jurisdictions target this measure, although PA does not offer it to multifamily buildings.
- **Heating system replacement:** MH offers low cost gas furnace replacements but does not replace or repair oil, propane and wood heating systems. Similarly, PA and NJ will only repair or replace gas furnaces; however, they have the option to refer participants with oil-heated homes to the state weatherization program. NH's combined electric utility and weatherization program offers replacements regardless of fuel source.
- **Cooling system replacement:** NJ and PA offer free replacements of inefficient room air conditioners; MH and NH do not. We assume that this measure would not be cost-effective for the LIEERP program given Manitoba's climate.
- **DHW:** All four programs offer light DHW measures, and the three American programs replace inefficient gas water heaters and some electric water heaters. Greywater film exchangers (GFX), although not offered by the three US programs, are a technology that may be worth exploring for MH's program, as the technology has matured and prices have recently come down.
- **Lighting and appliances:** All four programs install free CFLs; only NJ and NH install efficient fixtures. The three American programs offer refrigerator replacement and NJ and NH both offer freezer replacement. Manitoba Hydro should explore the cost-effectiveness of these measures.

Overall conclusions re measures: Manitoba Hydro compares reasonably well with case studies and provides complete coverage of key measures except light fixtures, appliance replacement and non-gas heating systems.

Program design:

All four programs have a similar one-stop-shop design from the customer perspective, with differences in eligible measures and the treatment of renters. A key program design difference is the delivery mechanism. NJ and PA both use for-profit third party contractors who manage customer intake, energy audits, and measure installation, whereas NH uses weatherization-focused community groups. Manitoba's approach is possibly the most complex, relying on a combination of community groups, approved contractors, and independent contractors. This is not necessarily a weakness, since hopefully it captures the advantages of all approaches while minimizing disadvantages.

Typically, program delivery by community group has the advantage of leveraging participant trust in community organizations, government training funds available to community groups, and community goodwill. Disadvantages commonly cited elsewhere are a difficulty in expanding rapidly, installation quality issues, and conflicts between multiple mandates.

Private firms offer the advantage of professional project management experience and efficiency and an ability to rapidly scale up, and can respond well to performance incentives. Disadvantages include their cost and lack of familiarity and sensitivity toward with the needs of low income groups, although these can be overcome with proper training

Finally, MH's requirement that some rural participants find quotes from 3 independent contractors is not ideal, since it can involve significant effort on the participant's part. That being said, our understanding is that this approach is being used due to the difficulty in finding contractors in relatively remote areas, that it will eventually be phased out, and that MH will be flexible in reviewing quotes (i.e. may accept less than 3 quotes in some circumstances).

Another design difference is MH's requirement for a customer co-pay on furnace replacement. A strong majority of low-income programs we have reviewed in previous research require no customer co-pay, or require co-pays from landlords only, and there is anecdotal evidence that co-pays reduce participation. On the other hand, MH's use of low-cost monthly payments paid via utility bills seems likely to minimize loss of participation, and early uptake results suggest that the measure is very popular.

An additional design difference, as mentioned, is treatment of renters. As discussed, NH is the most generous of our case studies (offering all measures to renters) and the most representative of other low-income programs we have reviewed. Although Manitoba Hydro compares well (offering most measures to renters and being more generous than PA), it may want to extend a version of its furnace offer to rental households. We look at this issue more closely in the Strategies for the Low-Income Rental Market section.

Overall conclusions re program design: Manitoba Hydro is comparable to case studies. It has adopted the turnkey approach used successfully by most jurisdictions, and although its delivery mechanism is more complex than that used by case studies, it may prove to be just as successful. The utility's customer co-pay design for furnaces is innovative and likely overcomes barriers while reducing utility costs.

Lessons from other programs:

When we compare Manitoba Hydro's LIEEP program with a broader range of low-income programs, Manitoba is unusual in its requirement for participant co-pays. Most low-income retrofit programs use a similar model: free energy audits and comprehensive, free turnkey installation of all cost-effective measures.

As we discuss in our section on low-income rental strategies (see page 173), most programs are also open to both renters and owner-occupants, offering similar services and incentives to both groups. We should note that our case studies are somewhat misleading on this point, giving the impression that leading programs sometimes severely limit measures, in particular for renters and multifamily buildings.

Finally, we should note that participation levels in most US states are poised to increase dramatically, as targeted economic stimulus funds for weatherization programs increase targets by 1000%, and new

portfolio-level efficiency targets take effect. California has already taken the lead in this area – its state-wide utility-managed low-income program, already reaching ~4% of the eligible population per year, is now targeting 25% of eligible households over the next three years – over 8%/year.

OPPORTUNITIES FOR MANITOBA HYDRO

***Caveat:** The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.*

Obtain funding for non-gas/electric heating systems: A missing measure for Manitoban low income households is the repair or replacement of oil, propane, and wood heating systems in areas not served by gas. This measure is outside of Manitoba Hydro's electricity and gas efficiency mandate, but could be offered by the LIEEP program, with funding via the provincial government.

Consider new measures: Several commonly cost-effective measures are worth exploring for inclusion in Manitoba's program:

- GFX installation
- Lighting fixtures
- refrigerator and freezer replacement

Consider increasing participation targets to remain among leading programs, which are not aiming for 4-8%/year and in some cases beyond.

LIGHTING AND APPLIANCES

SUMMARY

How does Manitoba compare?

ADVANCED

- **Results:** insufficient data available.
- **Barriers:** Manitoba Hydro compares well with our case studies but could do more to address barriers around retailer sales staff incentives and stocking practices.
- **Measures:** Manitoba Hydro compares well with our case studies for lighting and appliances but should consider targeting plug load.
- **Program Design:** Manitoba Hydro compares reasonably well with our case studies but may want to explore additional upstream strategies, especially given lessons from other programs.
- **Lessons from other programs:** Many leading lighting programs (and increasingly appliance programs) focus incentive dollars on upstream actors via negotiated cooperative promotions (NCPs), which have substantial advantages over the in-store and mail-in rebates used by Manitoba and Québec.

What works?

- Consumer incentives for most opportunities
- Relationships with retailers
- Information sharing with other utilities

What are the challenges?

- Upstream barriers not fully addressed
- Lack of program data

Opportunities

Manitoba Hydro should explore the following options further:

- **Track product market share:** if feasible, this would allow Manitoba Hydro to more effectively track its programs' success
- **Investigate appliance opportunities,** in particular dehumidifiers.
- **Consider upstream incentives,** in particular negotiated cooperative promotions, marketing funds, sales staff incentives, and stocking incentives.

DEFINITION OF PROGRAM AREA

The programs we discuss here are all natural replacement/market driven programs: they attempt to encourage consumers already in the process of purchasing a product to choose the most efficient option available. Residential products are typically broken out by end-use: lighting, appliances, heating and cooling systems, domestic hot water (DHW) heaters and “plug load”, a catch-all category for consumer electronics and small appliance and tools. Our analysis here is limited to lighting and appliances because Manitoba Hydro does not currently target hot water heaters and plug load. The utility does have an incentive program for efficient heating systems, but it was decided not to cover this program because it was due to be phased out in 2009. Geothermal heating system incentives are covered separately.

CURRENT MANITOBA HYDRO APPROACH

MH offers rebates and promotional campaigns for CFLs, specialty CFLs, CFL lighting fixtures, chest freezers, and washing machines. It also offers turn-in rebates and promotional campaigns for seasonal LEDs and CFL torcheres, and promotional campaigns without rebates for all ES products. MH also sponsors specific events at communities and schools. Finally, there is a bulk purchasing program available for property managers, providing the same incentive levels as in-store rebates for CFLs and Energy Star clothes washers and chest freezers.

CASE STUDY SUMMARIES

We examined three case studies for this program area, summarized below.

New England: Northeast Energy Star Lighting and Appliance Initiative (NEEP): The Northeast Energy Star Lighting and Appliance Initiative (NESLAI) is a regional collaboration by nine utilities and energy efficiency administrations*, in coordination with four other major entities†. The program is coordinated by regional think tank Northeast Energy Efficiency Partnerships (NEEP). The initiative is unlike the other programs we are profiling in that it is a mechanism for regional coordination among programs, and not a program in itself. It focuses on promoting information sharing and collaborative approaches to standards, building codes, and strategies for emerging opportunities. The initiative also facilitates the develop of specific regional programs by subsets of its members, for example, a common lighting program shared by Rhode Island, Massachusetts and Vermont, and a common resource website, myenergystar.com, funded by 5 of the participating utilities. Program strengths include: collaboration and resource sharing; creating a common front with industry and effectively tracking new opportunities. Note that the NESLAI initiative played an active role in the adoption of negotiated cooperative promotion (NCP) strategies by many member utilities – see discussion of NCPs under our Analysis section (page 109).

Future program efforts will focus on developing strategies for emerging opportunities in consumer electronics, power management and solid state lighting; working with regional whole-homes programs (new construction and retrofit) to take advantage of opportunities for lighting and appliances; and supporting recent discussions between industry and program sponsors on the creation of an ES product “roadmap”.

New York: New York Energy Smart Products (NYSERDA): The New York Energy Smart Products (NYESP) program focuses on market transformation for lighting and home appliances in the state. It targets consumers with marketing and education, retailers with sales training, marketing support and incentives for product purchase and special promotions, and manufacturers with marketing support. Unlike many other lighting and appliance programs, it offers no consumer rebates. The state has some of the highest levels of market penetration in the country for certain products. Program strengths include: its

* Cape Light Compact, Connecticut Light & Power, Efficiency Vermont, Long Island Power Authority, National Grid, NSTAR Electric, United Illuminating, Unitil, Western Massachusetts Electric Company.

† NYSERDA, New Jersey Clean Energy Program, Efficiency Maine, Public Service of New Hampshire all sponsor the program and collaborate on it but to a lesser degree.

upstream focus; flexibility for participants; high participation rates among retailers; long term relationships with market actors, and its account management approach.

In the near future, the program will focus on new products such as consumer electronics, solid state lighting, and power management (energy monitors, home automation, advanced power strips). The program will also focus on lighting design support and education for consumers.

Québec: *Mieux Consommer* Lighting and Appliances (Hydro Québec) : *Mieux Consommer* is Hydro-Québec's overarching brand for its energy efficiency programs. The utility encourages the purchase of Energy Star (ES) lighting and appliances by offering customer rebates, conducting marketing campaigns and providing incentives and free materials for retailer marketing. Program strengths include: high levels of customer satisfaction and achieving double its recent program goals.

COMPARISON OF SERVICES

Note – Dollar values are in Cdn dollars for Canadian programs and US \$ for American programs.

	Services	Manitoba Hydro	NEEP	New York	Québec
Customer	Lighting rebates	<ul style="list-style-type: none"> in-store instant rebates bulk purchasing incentives 	N/A	<ul style="list-style-type: none"> none (unless funded via marketing incentives) 	<ul style="list-style-type: none"> in-store instant rebates
	Appliance rebates	<ul style="list-style-type: none"> mail-in rebates <ul style="list-style-type: none"> freezer \$25 clothes washer \$100 	N/A	<ul style="list-style-type: none"> none (unless funded via marketing incentives) 	<ul style="list-style-type: none"> mail-in rebates <ul style="list-style-type: none"> refrigerators \$50 freezers \$25 clothes washers \$50
	Other rebates	<ul style="list-style-type: none"> none 	N/A	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> pool timers, electronic thermostats
	Other strategies	<ul style="list-style-type: none"> School fundraising products – children assemble CFL kits and give away door to door, MH pays school 	N/A	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> none
Contractor/upstream	Marketing materials	<ul style="list-style-type: none"> free POP materials 	N/A	<ul style="list-style-type: none"> free POP materials 	<ul style="list-style-type: none"> free POP materials
	Training	<ul style="list-style-type: none"> free sales training 	N/A	<ul style="list-style-type: none"> free sales training 	<ul style="list-style-type: none"> free sales training (online/CD)
	Circuit riders	<ul style="list-style-type: none"> assist with POP materials, provide informal training 	N/A	<ul style="list-style-type: none"> assist with POP materials, provide informal training 	<ul style="list-style-type: none"> assist with POP materials, provide informal training
	General marketing campaign	<ul style="list-style-type: none"> province wide, print, television, radio, internet, billboard 	N/A	<ul style="list-style-type: none"> state wide, print, television, radio, internet, billboard 	<ul style="list-style-type: none"> province wide, print, television, radio, internet, billboard
	Marketing incentives	<ul style="list-style-type: none"> none 	N/A	<ul style="list-style-type: none"> up to 50% of costs, with caps: <ul style="list-style-type: none"> Retailers – \$6 000-\$400 000/year Manufacturers - \$50 000 - \$120 000/year 	<ul style="list-style-type: none"> none
	Stocking incentives	<ul style="list-style-type: none"> none 	N/A	<ul style="list-style-type: none"> short-term product specific incentives 	<ul style="list-style-type: none"> none
	Regional initiatives	<ul style="list-style-type: none"> none (beyond past CLIC promotional campaigns) 	<ul style="list-style-type: none"> Lighting and appliance rebates, coop marketing incentives, stocking incentives 	<ul style="list-style-type: none"> participation in NEEP 	<ul style="list-style-type: none"> none (beyond past CLIC promotional campaigns)
Regional coordination	<ul style="list-style-type: none"> Participation in NRCan's SLIC and CLIC lighting initiatives, Utility DSM Collaborative (principally information sharing), 	<ul style="list-style-type: none"> coordination of positions towards manufacturers, research on program strategies, information clearinghouse 	<ul style="list-style-type: none"> participation in NEEP 	<ul style="list-style-type: none"> Participation in NRCan's SLIC and CLIC lighting initiatives, Utility DSM Collaborative (principally information sharing), 	

Quantitative Metrics

Market share by product	US nat'l 2006	CDN nat'l 2007	MH and SK 2007	MH 2007/08	N.England 2006	NYSER DA (2007)	QC (2007)
CFLs (as % of all screw-based bulbs)			26.6%	38.7%			
lighting fixtures						12%	
seasonal LEDs							
Clothes washers	34%	56%			44%	49%	
Freezers						11%	61%
Refrigerators	30%	43%			38%	39%	52%
Dishwashers	92%	86%			93%	75%	95%
Dehumidifiers						70%	
Room A/C	37%				53%	48%	

Deemed annual savings per product (kWh)	MH (2008)	NYSERDA (2007)	HQ (2008)
CFLs	62	64	29
lighting fixtures	128	116	57
seasonal LEDs	2 to 30		
Clothes washers (electric)	622	127	82
Freezers	102	39	35
Refrigerators	58	79	63
Dishwashers		50	
Dehumidifiers		114	
Room A/C		40	

Caveats:

- Market share data is based on manufacturer reporting and may under-represent some retailer segments.

Market share data: As can be seen, availability of data varies by product and jurisdiction and almost no data is available for Manitoba on market share.

Deemed savings assumptions: We can see that case studies and Manitoba Hydro use similar assumptions for annual savings, with the significant exception of clothes washers, where Manitoba Hydro assumptions are five to six times those used by case studies. One other exception is freezers, where Manitoba Hydro deemed savings are almost three times those of NYSERDA and HQ.

Overall conclusions re results: Unfortunately, due to a lack of comparable data, we cannot analyze Manitoba Hydro and case study results for this program area.

ANALYSIS

Barriers:

See Appendix 3 for definitions of key market barriers to energy efficiency.

- **Lack of consumer awareness** (*Information/Search Cost*): Many consumers are unaware of the energy and financial savings offered by efficient products. MH, Hydro-Québec and NYSERDA all address this via their general marketing campaigns and training of retailer sales staff.
- **Retailer awareness** (*information/search costs*): Retailers are often unaware of the selling points of efficient products, MH, Hydro-Québec and NYSERDA all address this via retailer sales staff training and outreach.
- **Sales staff pay structure** (*Asymmetric information/opportunism*): Sales staff paid on commission are not motivated to specifically sell efficient products, despite the financial savings for the purchaser. Manitoba Hydro addresses this barrier via monthly prize draws for sales staff drawn at random from customer applications. Case studies do not address this barrier. . Programs in other jurisdictions, such as Wisconsin and Washington, offer retail sales staff commissions (“SPIFFs”) per successful sale, to overcome this barrier.
- **First cost**: Consumers are reluctant to purchase more expensive CFL lighting and Energy Star appliances despite relatively quick payback periods. Manitoba Hydro and Hydro-Québec both address this barrier via rebates. NYSERDA does not do so directly although individual retailers may use marketing incentives for product buydowns.
- **Retailer stocking** (*product or service unavailability*): Retailers may not stock a sufficient range of CFL lighting and ES appliances. This has been a common issue for lighting and appliance programs in the past, although anecdotal evidence suggests this is beginning to change in some markets. Manitoba Hydro program staff indicate that it is becoming less of an issue in urban areas but is still an issue for rural Manitoba. All three programs address it to a certain extent by encouraging participating retailers to expand dedicated floor space, and by providing marketing materials and displays. NYSERDA requires retailers to sell at least four ES products but this does not significantly address the issue. It also offers periodic incentives to retailers for increasing market share, which indirectly encourages increased stocking. Program evaluations have suggested that this approach has a more lasting post-program effect than consumer incentives. Note that programs in other jurisdictions have also used stocking incentives to address this barrier –see our profile of New Brunswick’s commercial lighting program for an example.
- **Feature unavailability** (*product or service unavailability*): At least in public perception, CFLs and CFL fixtures suffer from a lack of lighting choices, light quality, and specialty features. Although many of these problems have been resolved in the last few years, they remain a perception issue with many consumers. All three programs address this issue via consumer education and marketing.
- **Inseparability of product features**: this is an issue for appliances in particular – ES features tend to be bundled with other “premium” features. NEEP addresses this barrier indirectly via its lobbying of manufacturers and its work with government on codes and standards; NYSERDA, MH and Hydro-Québec do not.

Overall conclusion re barriers: All four case studies are most successful at targeting consumer and retailer awareness and negative perceptions about performance via marketing campaigns. Hydro-Québec and Manitoba Hydro also reduce first cost via rebates. The three direct programs also address stocking issues via retailer outreach and provision of marketing materials, but NYSERDA goes further via

its use of market share incentives. None of the programs address sales staff pay structure significantly, although Manitoba Hydro’s prize draw does target this barrier. We conclude that Manitoba Hydro compares well with our case studies but could do more to address retailer stocking and sales staff incentives.

Measures:

As noted in the program area description, this section only considers efforts targeting residential lighting and appliances. Among the more than fifty categories of residential Energy Star products, this accounts for only 14 categories. We do not consider HVAC and DHW equipment, home electronics and office equipment here, but categorize the lack of programs targeting the last two “plug load” categories as a gap in our gap analysis section.

Within lighting and appliances, MH, Hydro-Québec and NYSERDA all promote Energy Star products in general via their overall marketing campaigns. Beyond this, MH and Hydro-Québec limit their incentives to an almost-identical range of products, presented in the table below. NYSERDA addresses and tracks a broader range of products (essentially all residential ES appliances as well as several other categories) but targets them with non-product-specific marketing incentives.

Product	Manitoba Hydro	Hydro-Québec
CFLs	1\$	\$5-\$25 (\$5 per \$10 purchase)
Specialty CFLs	3\$	\$5-\$25 (\$5 per \$10 purchase)
CFL light fixtures	\$1-\$25 (generally \$10-25)	\$15
Seasonal light strings	\$4	-
CFL torcheres	\$25	\$15
chest freezers	\$25	\$25
refrigerators	-	\$50
washing machines	\$100	\$50
Pool timers	-	\$10/timer

A key question in looking at MH’s programs is: are any cost-effective appliances not being addressed, for which markets are not already transformed? A definitive analysis is beyond the scope of this report; however, several appliances are worth mentioning.

- **Dishwashers:** ES dishwashers were evaluated as cost-effective for Manitoba in Manitoba Hydro’s 2003 potential study. As in most jurisdictions, however, ES dishwashers already have very high market share in Manitoba, making this appliance not worth the effort.
- **Dehumidifiers:** Dehumidifier rebates are offered by many leading efficiency programs.* They do not appear to have been considered in Manitoba Hydro’s 2003 potential study, and may be worth investigating.

* Examples include Vermont, Rhode Island, and New Jersey

- **Room Air Conditioners:** Room A/C units are rebated by many leading programs as well*, and also do not appear to have been considered in the 2003 potential study. Manitoba Hydro has however investigated room air conditioners but energy savings are too low to justify incentives.

One other potential category of measures worth considering are appliances meeting specifications set by the “Super-Efficient Home Appliance Initiative” (SEHA), spearheaded by the Consortium for Energy Efficiency (CEE). Specifications are available for refrigerators, freezers, room air conditioners and dishwashers, and are designed to go beyond current Energy Star standards.

Overall conclusion re measures: Manitoba Hydro compares well with case studies and may want to consider incenting dehumidifiers and appliances meeting CEE SEHA standards. It should also consider developing programs for consumer electronics and office equipment.

Program design:

MH, Hydro-Québec and NYSEDA share several common strategies. All three use an extensive general marketing campaign to raise awareness of the Energy Star brand and efficient lighting and appliances in general. The three programs also offer free point of purchase materials and sales training to retailers, via circuit riders. The programs differ in their use of incentives:

- **Downstream product incentives:** MH and Hydro-Québec both focus on offering consumer incentives to reduce the incremental cost of lighting and appliances.
- **Upstream marketing and market share incentives approach:** NYSEDA's offers marketing incentives to retailers and manufacturers in an attempt to transform the market and harness the innovation of market actors. It also offers periodic performance incentives for increases in market share for retailer sales.

The two approaches are not mutually exclusive and there is no clear evidence from our case studies that one model is more effective than the other on its own. However, NYSEDA process evaluations and program manager experience have indicated that the upstream marketing incentives can in some cases exceed downstream product incentive results. For example, NYSEDA experimented with both customer incentives and retailer market share incentives for clothes washers. Both approaches raised the market share of Energy Star washers initially, but after customer incentives were stopped, market share returned to previous levels, whereas market share stayed the same after retailer incentives were stopped. NYSEDA's experience also suggests that these programs take several years to develop: for example, retailers were initially reluctant to take advantage of incentives for special promotions due to the effort involved, but now half of all retailers use this option.

One key issue raised by best practices reviews of other jurisdictions is the question of rebate simplicity. Consumer rebates can be mail-in coupons, “instant” rebates redeemed at the time of purchase, or negotiated buydowns where rebates are paid to manufacturers or retailers and consumers simply pay a lower price. Mail-in rebates have the advantage of reduced costs for utilities, since many consumers purchase bulbs but do not apply for rebates. They are also simpler to manage for retailers, who do not have to track coupons at the cash. On the other hand, they are more complicated for consumers and

* Examples include Vermont, PG&E, and Xcel Energy.

arguably have less impact. Hydro-Québec relies exclusively on mail-in rebates, whereas Manitoba Hydro uses mail-in rebates for appliances but instant rebates for lighting. Again, we cannot draw conclusions from case study data, but anecdotal evidence from best practices reviews suggest that the instant rebate approach is more effective as long as it is designed to be easy for retailers to implement.

We should also underscore that strength of NYSERDA's program is its leveraging of retailer marketing funds and innovation. Unfortunately we have no comparative data on retailer spending for energy efficiency promotions, but it seems likely that spending levels in New York are higher than elsewhere given the availability of incentives, and the program is indisputably leveraging retailer marketing dollars on a 1 to 1 basis with program spending. This co-marketing approach is worth further investigation by Manitoba Hydro.

At a broader level, NEEP's regional coordination approach complements both of these models, helping program administrators share knowledge, achieve economies of scale on collaborative projects, and adopt common priorities in dealing with manufacturers and large retailers. A similar information-sharing role is played for Hydro-Québec and Manitoba Hydro by the Strategic Lighting Initiative Committee (SLIC), organized by Natural Resources Canada, as well as the Canadian Utility DSM Collaborative. However, NEEP is able to go beyond information sharing by spurring regional collaboration on incentive projects and negotiations with retailers.

Overall conclusion re program design: Manitoba Hydro compares well with case studies, in particular Hydro-Quebec. It is difficult to evaluate if NYSERDA's model is more or less effective than Manitoba's, but we suggest that Manitoba Hydro explore more upstream strategies. Manitoba Hydro is already participating in information sharing forums but has no equivalent to the regional joint programs used by some NEEP members.

Lessons from other programs:

Manitoba Hydro and Hydro Québec are typical of many utility programs, in offering a combination of customer rebates, retailer support via field representatives, free point-of-purchase materials for retailers and utility-led marketing events. However, neither take advantage of upstream rebates aimed at the wholesaler or manufacturer level, in particular negotiated cooperative promotions (NCPs).

Under this model, the utility pays a set amount per item to the wholesaler or manufacturer, who commits to passing on this reduction to retailers. From the customer perspective, NCPs function similarly to instant rebates – they simply pay less at the time of purchase. There are two substantial advantages for the utility. Firstly, NCPs simplify retailer participation (retailers no longer have to track utility rebates), making it easier to attract retailer participation. Secondly, rebate dollars go further - as they are provided further upstream in the supply chain, they are applied before retailer/wholesaler mark-ups. NCPs are used by many utilities, in states such as Connecticut, Massachusetts, Rhode Island, California, Oregon, Washington and Arizona.

Given this strong trend towards upstream incentives among other leading programs, we feel that Manitoba Hydro cannot be classified as a leader for this field, despite comparing well with Hydro-Québec' *Mieux Consommer* program.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Collect additional data on appliance market share: If feasible, collecting data on market share would allow Manitoba Hydro to track the market transformation impacts of its programs and benchmark its performance against other programs.

Investigate appliance opportunities: Manitoba Hydro should analyze the energy savings potential of efficient dehumidifiers and consider strategies to promote appliances meeting CEE SEHA specifications.

Consider upstream incentives: Manitoba Hydro should consider negotiated cooperative promotions, stocking incentives, market share incentives, sales commissions and advertising co-operative incentives as additional strategies to target the lighting and appliances markets.

GEOTHERMAL

SUMMARY

How does Manitoba compare?	
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; font-weight: bold;">LEADER</div> <ul style="list-style-type: none"> • Results: Manitoba Hydro reaches more eligible customers/year than Hydro-Québec, although substantially less than DMEA. • Barriers: Manitoba Hydro's program overcomes most barriers. • Program design: In combination with federal and provincial incentives, Manitoba Hydro's program is comprehensive and effective. DMEA's innovative loop tariff approach is, however, even more effective at levelling the playing field for geothermal heating. • Lessons from other programs: relatively few utilities target geothermal heating systems: Manitoba Hydro stands as a leader among those that do. 	
What works?	What are the challenges?
<ul style="list-style-type: none"> • On-bill, low-interest financing • Consumer education • Requirements for certified installation • Support for industry association 	<ul style="list-style-type: none"> • Consumer reluctance to take on debt • Home builder – home buyer split incentive
Opportunities	
<p><i>Manitoba Hydro should explore the following options further:</i></p> <ul style="list-style-type: none"> • Explore the loop tariff model to overcome remaining barriers and bring geothermal into the mainstream • Consider builder incentives if maintaining current approach 	

DEFINITION OF PROGRAM AREA

This section profiles program aimed at encouraging residential geothermal heating and cooling installations, in both existing and new homes. In the new homes market, programs are encouraging market driven decisions on new equipment. In the existing homes market, programs may be targeting natural replacement or encouraging efficiency-specific retrofitting of HVAC systems.

CURRENT MANITOBA HYDRO APPROACH

The Earth Power loan program provides financing to home owners for the installation of ground source heat pumps. Existing home owners and purchasers of new homes are eligible for an on-bill loan of up to \$20 000 at 4.9% (5 year fixed term) for a period of up to 15 years. The program also provides consumer information, in the form of detailed information kits/guides explaining the principles of GSHPs, a comprehensive website, and an educational video on geothermal technology. To date, MH has hosted 10+ free consumer workshops across the province. Manitoba Hydro has extensively supported the

development of the province's geothermal industry in the past, financing training opportunities for installers and commercial designer engineers, mostly in the early years of the program.

The program is complemented by provincial and federal incentives. The provincial government offers tax credits worth roughly \$2 000 and a \$1 000 incentive for new homes in areas served by natural gas. The federal government's ecoENERGY program offers a \$3 500 incentive for systems installed in existing homes.

CASE STUDY SUMMARIES

We examined two case studies for this program area, summarized below.

Colorado: Loop Tariff and Co-Z Energy Plan (Delta-Monrose Energy Association): Long-standing, innovative and comprehensive program offered by a small (~30 000 customers) electricity cooperative in Colorado. The program originally offered incentives, financing, and rate rebates to home owners, as well as incentives and short-term financing for builders. Financing and rate rebates have now been replaced by a loop tariff model, where the utility builds and owns the ground loop portion of all geothermal systems, charging the customer a monthly fee in perpetuity. Incentives are still available but may be reduced in the future. DMEA also offers full geothermal system installation services. Currently the loop tariff is only available for systems installed by DMEA. The program is also complemented by recent geothermal tax credits (up to \$2 000) announced by the federal government. Program strengths include: its innovative loop tariff model; utility installation of systems; full adoption of geothermal as part of the utility's business model; and program maturity.

In the future, DMEA may allow consumers to choose other contractors to install the equipment portion of their system and still take advantage of the loop tariff option. DMEA would retain responsibility for installing the ground loop portion of the system.

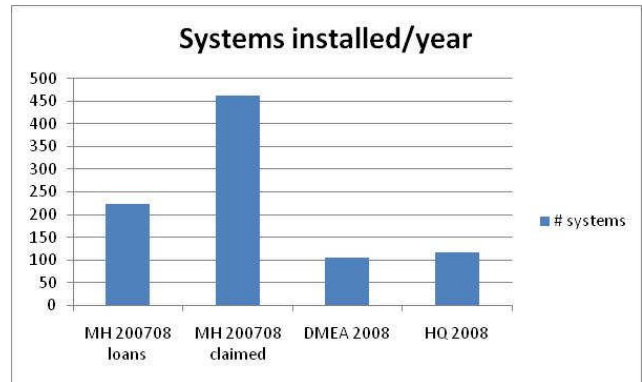
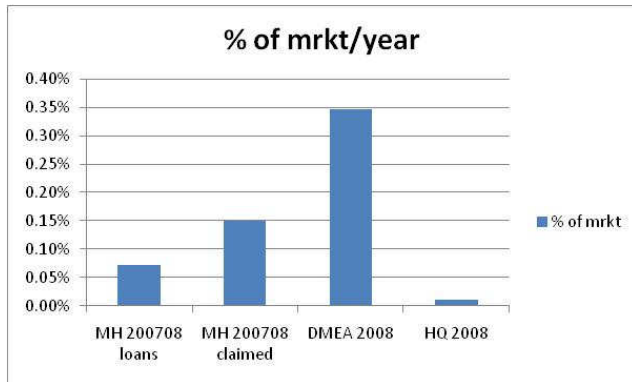
Québec: Hydro-Québec Geothermal Incentives (Hydro-Québec): Hydro Quebec has a straightforward incentive program for residential geothermal heating systems, which it characterizes as a niche market in the province. Customers interact with the program principally via geothermal installers and receive rebates for systems installed by certified installers. The program is complemented by incentives available from the federal ecoENERGY program for existing homes, and by third-party financing available via installers. Strengths include the program's simplicity and its requirement that all participating installers are certified by the Canadian GeoExchange Coalition.

COMPARISON OF SERVICES

Note – Dollar values are in Cdn dollars for Canadian programs and US \$ for American programs.

	Services	Manitoba Hydro	DMEA (loop tariff approach)	DMEA (Co-Z Energy, discontinued)	Hydro-Québec
	Original fuel (existing homes)	<ul style="list-style-type: none"> any 	<ul style="list-style-type: none"> any 	<ul style="list-style-type: none"> any 	<ul style="list-style-type: none"> electric only
	Typical installation cost	<ul style="list-style-type: none"> \$15 000 to \$30 000 average of \$22 500. 	<ul style="list-style-type: none"> ~\$20 000 (incl. loop) 	<ul style="list-style-type: none"> \$20 000 	<ul style="list-style-type: none"> \$25-\$40 000
Customer	Incentives	<ul style="list-style-type: none"> None (\$2k-\$3k from province; \$3.5k from federal gvt for existing homes) 	<ul style="list-style-type: none"> \$150 tonne, no cap extra \$150 for systems over 43 tonnes 	<ul style="list-style-type: none"> \$150 tonne, no cap extra \$150 for systems over 43 tonnes 	<ul style="list-style-type: none"> existing: \$2 000 to homeowner (+ \$3.5k federal) new: \$2 800
	Financing	<ul style="list-style-type: none"> 3.9%, 15 years, \$20 000 	<ul style="list-style-type: none"> none as of 2009 	<ul style="list-style-type: none"> 7%, 30 years, up to \$50 000 electric rates frozen in five year blocks 	<ul style="list-style-type: none"> 3rd party, via installers no limit; 5 yr or 10 yr loans prime +1.5% to 3% installer interest buydown.
	Information	<ul style="list-style-type: none"> free consumer workshops 	<ul style="list-style-type: none"> design advice and assistance 	<ul style="list-style-type: none"> design advice and assistance 	<ul style="list-style-type: none"> none
	Installation services	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> Loop: DMEA installs and maintains ownership Equipment: DMEA installs 	<ul style="list-style-type: none"> DMEA installs all systems, offers maintenance plan. 	<ul style="list-style-type: none"> none
	Ground loop tariff approach	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> horizontal: \$14-42.78/month vertical: \$30- \$89/month option to purchase system 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
	Quality control	<ul style="list-style-type: none"> Current: by MGEA upon complaint only. Future: CGC approach. 	<ul style="list-style-type: none"> internal QC on installations natural incentive due to loop ownership 	<ul style="list-style-type: none"> internal QC on installations 	<ul style="list-style-type: none"> CGC – 25% of installations inspected
Contractor / upstream	Home builder incentive	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> \$500/system after 1st system 	<ul style="list-style-type: none"> \$500/system after 1st system 	<ul style="list-style-type: none"> none
	Home builder financing	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> 0%, 1 year, up to \$20 000 	<ul style="list-style-type: none"> none
	Home builder marketing	<ul style="list-style-type: none"> extensive marketing, does not market builders directly. 	<ul style="list-style-type: none"> builders included in DMEA advertising (limited) 	<ul style="list-style-type: none"> builders included in DMEA advertising 	<ul style="list-style-type: none"> HQ provides Mieux consommateur logo to builders
	Home builder other	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> provision of heaters during construction. 	<ul style="list-style-type: none"> provision of heaters during construction. 	<ul style="list-style-type: none"> None.
	Upstream industry support	<ul style="list-style-type: none"> Support of creation of MGEA Requirement of MGEA recognition. 	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> none. 	<ul style="list-style-type: none"> Financial support for CGC. Requirement of CGC certified installers.
	Training	<ul style="list-style-type: none"> Past financing of training. 	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> none. 	<ul style="list-style-type: none"> None.

QUANTITATIVE METRICS



Caveats and Notes:

- **MH 200708 loans vs. MH 200708 claimed:** MH claimed savings are based on the number of geothermal systems installed in the province compared with a projected baseline scenario that assumes the Earth Power program is not present. This approach accounts for the long term market effects of MH's efforts to date.
- **Residential markets:** we used 2006 Census figures for single family detached homes for Manitoba and Quebec, reducing Quebec's share by 24.8% to approximate the number of electrically heated homes. For DMEA, we used a conservative estimate of the total number of DMEA residential accounts.
- **Savings/installation and savings/\$:** We don't present savings per unit here since they are climate dependent. We cannot meaningfully compare savings/\$ since MH's program recovers its costs via interest rates and DMEA's program is now a revenue generator for the utility, although we should note that in both cases these low or negative costs are a major strength compared to a customer rebate approach.

Analysis: The key insight from a comparison of installations/residential customer is that DMEA's program is reaching a substantially larger percentage of its customer base than Earth Power, supporting the argument that the loop tariff approach is more successful than a combination of generous financing and customer incentives. Hydro-Québec's low market share likely reflects Québec's higher costs and more limited financing options, as well as the fact that Hydro-Québec itself defines its efforts as a niche program.

ANALYSIS

Barriers:

See Appendix 3 for definitions of key market barriers to energy efficiency.

- **Access to capital/first cost:** This is a key barrier to the adoption of geothermal systems. Manitoba Hydro addresses this with its low-interest long term financing, as did DMEA's former CO-Z Energy loan and incentives. Hydro-Québec addresses this partially with its incentives and points customers to TD Bank's loan program (marketed via installers, who have the option of buying down interest). DMEA's loop tariff approach and incentives eliminate this barrier almost completely, bringing the cost of a geothermal system down to a price that is comparable with equivalent alternatives. The loop tariff model also eliminates the secondary barrier of customer reluctance to take on additional debt. DMEA's experience in transitioning from the financing model to the loop tariff model suggests that this barrier is significant: in 2008, the cooperative offered both models and 100% of customers chose the loop tariff approach. It seems likely that, although financing (and in particular on-bill financing) substantially reduces this barrier, DMEA's approach is more effective.
- **Performance uncertainties:** Manitoba Hydro addresses this barrier with an extensive consumer education campaign, supported by long-term monitoring of results from 10 actual installations. Hydro-Québec also addresses this via marketing and indirectly supports the CGC's educational efforts as well. DMEA also uses the marketing and consumer education approach, and greatly reduces uncertainty by retaining ownership of the most complex portion of the system. Both approaches seem effective and complementary, although again, ground loop ownership removes the barrier more completely.
- **Poor quality installations (*Asymmetric Information and Opportunism*):** The geothermal industry across North America has been plagued in the past by poor quality installations and "fly by night" installers responding to utility and government incentive programs. Manitoba Hydro and Hydro-Québec have used a similar approach to overcome this problem, by supporting the development of independent installer associations with rigorous standards and quality control programs, and then requiring installation by recognized contractors. According to MH, this approach has mostly eliminated the problem from the province, although some poor quality installers still likely work in the new construction market, where MH and federal programs are less relevant. The CGC believes poor-quality installers are still a major issue in Canada but that efficiency program requirements for accredited installers are an effective approach to overcome the problem in the long term. DMEA has taken a completely different approach, initially by creating its own subsidiary and now by installing and owning ground loops. This approach eliminates the issue within DMEA territory but does not transform the broader market.
- **Builder –Buyer split incentive:** On-spec home builders installing a geothermal heating system incur a substantial incremental cost and take on the risk that their product will be less competitive due to increased cost, while homeowners receive all energy savings. Manitoba Hydro's program does not deal with this issue, although its marketing and education campaigns do indirectly address it by raising consumer awareness. Hydro-Quebec's incentive for new home buyers reduces this barrier but does not overcome it. DMEA's CO-Z Energy Program dealt with this issue somewhat, via builder incentives and short term financing to reduce risks, once again, its current loop tariff approach has largely eliminated the barrier.

Overall conclusions re barriers: Manitoba Hydro compares well with case studies. The Earth Power program overcomes most barriers, although DMEA's loop tariff approach eliminates the issue of consumer reluctance to take on debt.

Measures: non-applicable as this is a single measure program.

Program design:

The three programs we compare break down into two approaches, when complementary federal and third party programs are included:

- **Customer incentives, customer financing and quality control:** Home-owners in both Manitoba and Quebec have access to substantial incentives and financing. MH's on-bill financing program is simpler and more attractive to customers than the third-party financing available in Québec, in particular with its new lower interest rates. Incentive levels are similar in the two provinces, although less generous for non-electric heating customers in Québec. Both provinces require rigorous third party accreditation and support industry associations.
- **Loop tariff model:** DMEA's new loop tariff model completely circumvents most barriers to geothermal energy by integrating ground loops into its own infrastructure, but does not address the transformation of the broader market.

There is no question that Manitoba Hydro is a pioneer and a leader in utility geothermal programs. Manitoba was frequently cited as a North American leader by our sources during our research on geothermal best practices. Its substantial, low-interest and on-bill loans are innovative and go further than most programs. Its upstream approach has largely eliminated fly-by-night installation in the province.

DMEA's work on geothermal is similarly innovative and comprehensive. On the downstream side, the loop tariff model has brought geothermal first costs in line with other alternatives and eliminated almost all customer barriers. Its upstream approach has the disadvantage of not transforming or fostering the independent installer community, but does successfully eliminate quality and availability issues. It has also created a new, high margin source of revenue for the utility.

Hydro-Québec's model is somewhat less comprehensive but does address most barriers. Financing is the biggest missing piece for the program, since the TD financing is not low-interest and does not offer the advantages of on-bill loans.

Overall conclusion re program design: Manitoba Hydro compares well with case studies and has a comprehensive approach to geothermal.

Lessons from other programs:

There are relatively few dedicated geothermal energy programs offered by utilities – many programs we reviewed as potential case studies essentially offered incentives with no industry support or customer education. Manitoba Hydro's efforts go beyond most utilities in their comprehensiveness.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Explore the loop tariff model: The loop tariff model is a powerful tool for bringing geothermal energy into the mainstream. It is beyond the scope of this study to analyze its applicability to the Manitoba context, but it is likely relevant. In particular, DMEA's recent experience suggests that its new model can overcome barriers that even generous customer rebates and financing leave in place, principally consumer reluctance to take on debt and the split incentives between home builders and home buyers.

Consider builder incentives: If Manitoba Hydro maintains its current approach rather than the loop tariff model, it should consider incentives for on-spec builders to reduce split incentives.

COMMERCIAL AND INDUSTRIAL PROGRAMS

PRESCRIPTIVE PRODUCTS (COMMERCIAL KITCHENS)

SUMMARY

How does Manitoba compare?

STANDARD

- **Overcoming market barriers:** Manitoba Hydro addresses first cost barriers but does not completely address information and hassle/transaction barriers, unlike California.
- **Measure coverage:** Manitoba Hydro covers several major categories (fryers, steamers, refrigeration) but is missing opportunities such as ovens, griddles, ice machines and ventilation.
- **Program design:** Manitoba Hydro's approach is typical for prescriptive programs – it offers incentives and conducts general marketing campaigns. What is missing is the intensive outreach (both to end-users and upstream market actors) and on-site audits necessary to capture participant attention and remove hassle/transaction barriers. In many instances, Manitoba Hydro's customers seek out programs to determine eligibility for enrolment; whereas exemplary programs actively engage prospective customers through third party market actors, training and outreach.
- **Lessons learned from other programs:** Manitoba Hydro's approach is similar to standard, non-leading programs, where limited customer support and auditing are available.

What works?

- Covers large portion of installed costs, makes participation appealing
- Clear distinction between technologies covered by each program alleviates confusion
- Quality control ensures proper continued use of efficient technology

What are the challenges?

- Rigid eligibility criteria make certain cost-effective projects ineligible
- Vetting emerging technologies
- Establishing incentives that properly drive the market

Opportunities

Manitoba Hydro should explore the following options further:

- **Scale** – Opportunities exist to reach out to certain segments of commercial class in a more comprehensive manner, particularly with commercial food service establishments and other service industry businesses. Combining a host of covered products and services into one overarching efficiency program could help to coordinate efficiency upgrades by taking a systems-wide approach to project planning and implementation.
- **Outreach and Education** – Customers have finite resources in determining whether to install efficient technology, particularly in industries like commercial food service. To maintain competitiveness, many food services businesses install used and/or inefficient equipment to minimize up-front costs. By Overcoming first cost barriers and demonstrating the value of efficiency investments in terms of increased cash flow and profit margins could greatly increase the level of interest in the commercial food industry and uncover even greater savings.

DEFINITION OF PROGRAM AREA

Prescriptive programs offer straightforward, per-product incentives, along with other services, to encourage the selection of more efficient equipment during natural replacement decisions. Many of Manitoba Hydro's C&I programs fall into this category. Rather than evaluate each program against a similar measure-specific case study program, we focus in this section on one example, commercial kitchen products.

Prescriptive programs targeting commercial kitchens will generally include a large variety of appliances, commercial kitchen equipment, HVAC, refrigeration, ventilation controls, and other measures used for commercial production. The general approach is to offer incentives for smaller appliances both in retrofit and lost opportunity applications. For larger projects (i.e. new restaurants), investment opportunities may be explored often with financing options and incentives available to make the efficiency improvements cost-effective. Because the target markets for these programs are usually high-volume, low margin industries with high employee turnover, it is extremely important for these programs to focus on reducing first costs and maintaining proper operation of installed efficient equipment.

CURRENT MANITOBA HYDRO APPROACH

Manitoba Hydro approaches the commercial kitchen products market through 3 different but related programs. They each have their own criteria for eligibility and restrictions apply as outlined on the application forms.

- **Refrigeration Program:** Provides Qualified Equipment catalogue. In addition, Manitoba Hydro arranges to provide customers with setup, stocking, and operating tips, maintenance and prevention tips, provides equipment controls and features to consider and employee education and training. Pre-inspection of facility arranged by Manitoba Hydro, and pre- approval is required prior to project initiation. Post inspection walk-throughs are arranged by Manitoba Hydro.
- **Kitchen Appliance Program:** under this program, two measures are included: fryers and steamers. Only natural gas fryers are eligible and must be used no less than 5,840 hours per year. Steamers must be used no less than 2,920 hours per year, and the replacement steamer must use the same fuel as the original. Post-installation inspection may be arranged prior to issuance of incentive check.
- **Rinse& Save Program:** Introduced in 2008, this program offers pre-rinse spray valves that are installed by a technician free of charge to restaurants and other food service businesses.

CASE STUDY SUMMARIES

We examined one case study for this program area, summarized below.

California Statewide Food Services Equipment Program: California's four investor-owned utilities (IOUs)* jointly launched the program in 2006 as a means to provide a consistent and comprehensive incentive program to the energy-intensive food services industry. In California, there are 90,000 independent and chain restaurant locations. Owners are typically very cost-conscious consumers in a low-margin, low-survival rate, high volume business. Consequently, the food services industry is noted as a first-cost driven market where customers purchase inefficient or used equipment in order to assure profitability. Because the food services industry is very labour-intensive, customer awareness of commercial kitchen equipment energy use is extremely low. Thus, identifying and educating key decision-makers is a critical aspect to the success of this statewide efficiency effort.

Utility account executives actively target food services trade organizations, and the sales distribution networks that serve the food industry. Program administrators and implementation contractors actively participate in food service & hospitality expos/conferences, the largest of which typically attracts 15,000 industry professionals and 650 exhibitors. The program has developed a web presence at each of the participating IOUs to direct end users and participating distributors to services offerings and to a comprehensive list of eligible equipment and rebate amount.

Each utility is responsible for the day-to-day operations of their program. However, regularly scheduled coordination meetings are held to ensure that the message to and support of the food services industry is consistent and comprehensive. In addition, an important aspect of the program is the so-called Food Service Technology Center ("FSTC") administered by Pacific Gas & Electric. The FSTC is operating third-party vendor—Fisher Nickel, Inc.—and is noted as an industry leader in commercial kitchen efficiency and appliance performance testing. The FSTC acts as a clearinghouse of information on equipment performance, and provides expert advice with respect to ventilation, lighting, glazing and HVAC systems for the food services industry.

* Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison and Southern California Gas Company.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	California
	Program Integration	<ul style="list-style-type: none"> Limited set of measures integrated from other programs 	<ul style="list-style-type: none"> Multiple utilities covering over a dozen measure categories, with hundreds of different models under 1 program.
	Custom vs. Prescriptive	<ul style="list-style-type: none"> Prescriptive 	<ul style="list-style-type: none"> Prescriptive
Customer	Energy Audit	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes
	Recommendations	<ul style="list-style-type: none"> Only through the customer's contractor 	<ul style="list-style-type: none"> No-cost (operations and maintenance) Low-cost (inexpensive retrofits and lost opportunity) Investment (early retirement of inefficient equipment)
	Direct Install	<ul style="list-style-type: none"> Free direct installation of spray valves. 	<ul style="list-style-type: none"> No (but provides direct installation of lighting through a separate program)
	Incentives	<ul style="list-style-type: none"> Incentives for various efficient appliances 	<ul style="list-style-type: none"> Comprehensive list of efficient technologies covered by incentives
	Financing	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Contractor Selection & Management	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Help selecting contractor to implement efficiency investments correctly (approved list of certified technicians to perform measure installations and facility audits).
	Quality Control	<ul style="list-style-type: none"> Inspections up to 3 years after project completion 	<ul style="list-style-type: none"> Training on proper equipment maintenance and usage as well as periodic follow-up audits to ensure equipment is being used correctly
	Training	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Extensive customer training in effective use of efficient equipment
Contractor/upstream	Training	<ul style="list-style-type: none"> Yes Training provided to dealers and retailers 	<ul style="list-style-type: none"> Contractors and market actors may attend seminars on installing/maintaining efficient refrigeration
	Equipment	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Certification	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Incentives	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Marketing	<ul style="list-style-type: none"> Applications available on website as well as at retail and wholesale outlets 	<ul style="list-style-type: none"> Up-stream market actors enlisted to market at tradeshow, conferences, etc. as well as through direct marketing opportunities

ANALYSIS

Barriers:

- First Cost:** It is common for low margin, low survival rate businesses to pay little attention to efficiency opportunities, especially when energy costs represent a relatively small percentage of overall expenses. As result, business owners tend to invest in used and inefficient equipment to help decrease up-front costs. While this may seem short sighted, it is often difficult for customers to

chose efficient options due to high first costs, high employee turn-over (which translates to incorrect use of efficient equipment), and small improvements in profit margins compared to the extra work and cost associated with efficiency. Overcoming this barrier requires program administrators to offer a wide variety of measures that can be easily installed, applicable in almost any location and combined with an appropriate financing package that makes sense for the customer's needs.

- **Information:** Business owners should not be expected to research efficiency services or even to install equipment; rather, program staff or implementation contractors must take over most, if not all, of the incremental tasks associated with identifying savings and installing measures. The California food services program takes an aggressive approach to reduce customers' decision-making, or lack thereof, by providing on-site audits and restaurant plan reviews targeting all relevant commercial kitchen measures. Manitoba Hydro could improve their program significantly by adopting this approach.
- **Hassle or transaction costs:** Business owners in the service industry are busy. Unless there is an easy way, they are unlikely to participate. Successful programs end up at the customers business offering comprehensive savings opportunities with significant cost coverage.

Overall conclusion re barriers: Manitoba Hydro's incentives address first costs using a similar approach and comparable incentive levels to California, and completely eliminates first cost as a barrier for spray rinse valves. However, it does not address information and hassle costs because of its lack of on-site audit. Fully addressing information barriers may also extend the reach of programs into additional business operations. Increasing outreach efforts would also help to reduce existing barriers.

Measures:

Manitoba Hydro programs cover the following technologies: refrigeration, fryers and steamers and spray valves. Customers can also take advantage of non-industry specific programs for HVAC equipment, building insulation, lighting, and custom opportunities.

Key measure categories targeted by the California Food Services Statewide Program include but are not limited to:

- Ovens
- Fryers
- Griddles
- Steam Cookers
- Refrigeration Systems
- Ice Machines
- Ventilation
- Food holding cabinets

Audits also consider additional, non-industry-specific measures available under standard C&I product programs, such as insulation, water heating systems, HVAC equipment and lighting.

Overall conclusion re measures: Manitoba Hydro targets several of the kitchen equipment categories targeted by California but is missing opportunities such as ovens, griddles, ice machines and ventilation. Manitoba Hydro also covers most measures in the non-food industry categories however they are addressed by the commercial lighting and commercial custom programs, which require a separate application process. There is significant room to include additional measures under the existing

Manitoba Hydro kitchen equipment programs. Adding a more concerted effort to customize a package of measures and services aimed at the barriers exhibited by the market would increase penetration.

Program design:

Increased marketing and outreach, particularly within the commercial food services industry, would enhance brand awareness and likely increase the frequency of customer interactions with Manitoba Hydro. Because the primary target of program marketing is not end-user customers, there is a disconnect between the target market awareness of efficiency options and potential electric and gas bill savings associated with these options. Furthermore, there is no incentive offered to up-stream market actors to proactively promote efficient equipment. If service industry professionals and business owners aren't being made aware of this program and concerns over profit margins predominate the views of food service operators, it may be difficult to increase the effectiveness of Manitoba Hydro's programs.

Although Manitoba Hydro's incentives may be easily understood, the current design expects too much from customers. Manitoba Hydro's approach assumes customers already possess a sophisticated understanding of energy efficiency. Most customers are poorly equipped to identify and make rational decisions regarding energy efficiency investment opportunities. Manitoba Hydro does not appear to encourage energy audits, even though it may be on-site implementing direct install measures (i.e. Rinse&Save program). When direct install contractors are on site they have an opportunity to audit the rest of a customer's operation. Manitoba Hydro could potentially be missing significant savings opportunities here.

Marketing bundled measures to commercial businesses, especially food services operations, would provide for greater opportunities to coordinate delivery of services and install more measures per site. Combining measures under one program delivery structure would also reduce the number of customer contacts and therefore reduce administration expenses.

In many respects, comparing Manitoba Hydro programs to the California Food Services program may be unfair. California has a much larger pool of resources than Manitoba Hydro, and a much larger food service industry to facilitate a comprehensive suite of efficiency services. Nevertheless, the approaches to the Food Services market in California suggest that other jurisdictions could adapt aspects of the California program to suit their local market conditions. There are a host of approaches that the California program employs in targeting savings. Regardless of the size of the program, the "3 option" approach (i.e. no-cost, low cost, and investment options) to efficient product installation is one of the keys to the success of the program as it allows customers to evaluate a variety of easy to install options and decide which best fit with their business model, allowing them to maintain their focus on running a productive business.

Overall conclusion re program design: Manitoba Hydro compares unfavourably to the California program. In our view, this is mostly due to two major factors: the lack of on-site audits and targeted outreach. Those that contact Manitoba Hydro about enrolling may have already decided to undertake the projects and would essentially be free-riders. Manitoba Hydro can improve its depth of savings in this market by creating a more comprehensive suite of services tailored to the needs of customers in industries where investments in efficiency are often very low priorities.

Lessons from other programs:

The case study selected for our report reflects best practices as described by ACEEE. The California Food Service Network program was awarded exemplary status for, among other reasons, its coordination efforts among four IOU's. Because of its coordinated approach, food service businesses are well supported throughout California. Customer outreach and education tools were also developed by the California program to help busy customers access a clearinghouse of efficiency information so they can review investment options at their own pace. Non-leading programs typically limit services to the geographic territory served by one local power company. Customers served by a different power company are, therefore, barred from participating in cost-effective efficiency programs. Often times, non-leading edge programs require customers to complete several prescriptive forms rather than allow customers to apply for multiple measures with one application or by placing a single phone call. MH's programs provide prescriptive forms covering relatively standard measures for small to medium businesses, including food services organizations. Similar to the non-leading programs, MH's customers are also required to navigate through a maze of prescriptive forms and services by themselves. Because many customers are too busy managing their day-to-day business affairs, they are less likely to spend the time to investigate efficiency opportunities unless assisted. Consequently, many efficiency opportunities are lost.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Coordination: There are opportunities to integrate program features, measures and services to create a more comprehensive approach to addressing the efficiency needs of customers. Housing the current group of Manitoba Hydro programs in one over-arching program would streamline the application process. Combining that approach with an auditing service would allow a wide variety of efficiency solutions to be proposed and installed which could be tailored to individual customer needs.

Outreach and Education: Because the industries that benefit from these particular programs are ones in which energy costs makes up a small portion of overall operating expenses, but equipment makes up a very large portion, it is difficult to prioritize efficiency above other investments. With the correct approach to explaining the benefits of efficiency to a business' bottom line, combined with several turn-key solutions to efficiency opportunities, it is possible to convince business owners dealing with even the slimmest of profit margins of the benefits of investing in efficiency.

Expanding the list of measures: Including a greater number of measures (such as ovens, ice machines and ventilation) would increase the opportunities for Manitoba Hydro's customers to realize additional savings.

PRESCRIPTIVE - LIGHTING

SUMMARY

How does Manitoba compare?

ADVANCED

- **Program Design:** Comprehensive measure list compares favorably to exemplary commercial lighting program and incentive approach is straightforward.
- **Education and Outreach:** Program is well known and highly accepted by customers and vendors.
- **Overcoming market barriers:** Lack of information is addressed by the case study programs quite well by either circumventing the issue by incentivizing vendors and contractors to only sell efficient equipment or by educating customers directly with a project manager. Manitoba Hydro does neither of these things actively.
- **Measure coverage:** Measures covered by Manitoba Hydro are standard for most commercial lighting programs; however, compared to the case study programs, there is a noticeable lack of emphasis placed on design and controls.
- **Program design:** Manitoba Hydro provides for customized lighting projects that include combinations of measures but there is not an active engagement of up-stream market actors to transform the market.
- **Lessons learned from other programs:** Case studies are typical of leading programs.

What works?

- Straightforward approach, each measure is combined with a known incentive.
- Large market presence; program is very well understood by vendors
- High level of quality control and interaction with vendors and contractors promotes high level of acceptance of the program
- Incentive options based on wattage reductions
- Design incentives

What are the challenges?

- Overcoming several significant market barriers; lack of sufficient information in certain sections of commercial and industrial customer class, high first costs, and mitigating risk of investment in lighting projects
- Barriers to participation for more complicated custom projects
- Design needs of lighting projects to avoid one for one replacements
- Limited incremental cost coverage can result in higher free-ridership rates

Opportunities

Manitoba Hydro should explore the following options further:

- Further distinguishing this program from competing commercial programs, including educating customers about the applications of specific terminology like renovation, optimization, prescriptive vs. custom measures.
- Improve support and information on incentives for controls and lighting design

DEFINITION OF PROGRAM AREA

Commercial lighting programs target savings in both new construction and retrofit applications by assessing all aspects of lighting systems from lamp technologies to overall lighting system design. Key measures associated with lighting programs are lamp and ballast technology (CFLs, LEDs, electronic ballasts, etc.), lighting controls (daylight dimming, occupancy sensors, timers, etc.), and lighting design, which attempts to look at lighting systems holistically and assess the appropriateness of the selection and placement of lighting technology and its interaction with other systems. Programs typically offer customers site audits, as well as incentives based on the number of approved pieces of lighting technology installed or watts per square foot reductions. Most commercial lighting programs focus on market transformation by offering information and training, certification, marketing opportunities and in some cases, performance based incentives to vendors and contractors. Exemplary programs offer dual track prescriptive programs for individual technologies and for reductions in power density.

CURRENT MANITOBA HYDRO APPROACH

Manitoba Hydro targets this market with its Commercial Lighting Program, run through the PowerSmart for Business Program

The program includes a long list of applicable lighting and control technologies including linear florescent and CFLs, LED, occupancy controls, and HID applications. The combination of eligibility requirements is fairly daunting. There is a list for eligible products with incentives for both existing and new applications. The biggest difference between existing and new is that existing lighting projects allow the inclusion of T-8 systems as an efficiency measure in renovation projects. New construction projects can only receive incentives for T-8 dimmable and 8 foot ballasts. Incentives are limited in that they cannot exceed the cost of the equipment (they do not include labor). Incentives are based on incremental cost assumptions whether applied in new or existing conditions.

Lighting systems may be looked at on a custom basis if the lighting system or technology is not included in the prescriptive form. Custom application baselines are calculated by taking the lighting levels of properly operating systems, not necessarily the existing condition (some weighting of T-12 in the baseline could be included). Manitoba Hydro reserves the right to hire a third party to analyze projects. The program is not applicable to hotel rooms or multifamily buildings. There are a host of administrative hurdles for customers to navigate if they are trying to understand the program. At the end of the calculated incentives portion of the website there is a sentence that reads: "Renovation incentives may be reduced depending on existing lighting equipment".

CASE STUDY SUMMARIES

We examined three case studies for this program area, summarized below.

New Brunswick: Bright Ideas Commercial Lighting: The objective of the program is to help businesses reduce energy costs and improve lighting quality by introducing new, reliable efficient lighting

technologies in the province. However, because efficient lighting was not readily available on retail shelves nor stocked by electrical distributors, ENB pursued an upstream approach to recruit retail outlets and encourage distributors to stock efficient lighting. To increase inventories, financial incentives were paid to participating distributors for each unit of qualifying lighting equipment sold for installation in a non-residential facility. The amount of the incentive was based on the average incremental cost of each technology in order to reduce first cost barriers for the customer and increase the benefits for the distributor to participate. In many instances, the incentive reduced the cost of efficient lighting equipment to the cost of less efficient technologies.

The program is an excellent example of the power of market research. It was found that prior to the program's rollout, many distributors and customers were unfamiliar with efficient lighting products and therefore unavailable, for the most part. By providing electrical distributors with an incentive to participate, ENB enrolled all of the major distributors in the province. Implementing an upstream distributor incentive program allowed ENB to enter the lighting market cost effectively by leveraging the staff and expertise of the existing lighting market players. Thus, ENB avoided the cost of developing a larger in-house administrative support structure to process thousands of end-user customer rebate forms.

New York: New York Energy Smart Small Business Commercial Lighting: Initiated in 2000, the program was awarded exemplary status by ACEEE in 2008 for its innovative efforts to transform the small commercial market and overcome the limitations of poor lighting designs typically found in small businesses. The program is marketed through a third-party vendor under "THE RIGHT LIGHT"SM brand. The emphasis of the program is to encourage the installation of effective lighting by demonstrating that efficient products can meet the needs of businesses for quality lighting. Market transformation efforts are aimed at recruiting and educating lighting professionals. Program operations focus the attention of trade allies on program and project requirements developed in an extensive "*Technical Guide for Effective Energy-Efficient Lighting*". The guide outlines both program and project goals that trade allies need to pursue as a participant in the program. More importantly, the Technical Guide provides a comprehensive set of minimum lighting performance criteria for each project that a trade ally must attain and document in order to receive financial incentives. Supporting upstream market participants (trade allies) with technical resources, active account management and comprehensive lighting design education, ensures that the program is able to positively influence the end-users in a market that has typically been hard to reach i.e. less sophisticated customers with facilities smaller than 25,000 sq feet. Further, the on-going efforts have helped to correct misperceptions that energy-efficient lighting means poor lighting quality. High start-up costs, and intensive program management is required. Program requires extensive outreach and daily engagement with market actors. New education material needs to be constantly updated to reflect changes in designs and products. According to the ACEEE report, the start-up costs have proven to be a worthy investment as benefits far out weight program costs. For the 2000-2005 period, a total resource cost test yielded a benefit-cost ratio of 2.5, without including non-energy benefits (3.8 with NEBs).

Minnesota: Lighting Efficiency: This program is noted for its strong brand awareness and comprehensive list of services. The program is a significant source (approximately 13%) of Xcel Energy's total energy savings from all programs and initiatives.

Five customer-focused initiatives make up the Lighting Efficiency program. These initiatives include:

1. Retrofit rebate program (prescriptive)—offered to existing customers of any size. One-to-one rebates help offset the incremental cost of installing efficient products. *
2. New Construction Program (prescriptive)—available to new facilities or those undergoing a major renovation. List of measures is not as comprehensive, and the incentives are lower. †
3. Custom Efficiency—available for lighting projects that are not currently available under the prescriptive forms. Application for Custom projects must be completed and pre-approved prior to purchasing equipment. Depending on the cost/benefit tests, customers may receive rebates of up to \$200/kW saved.
4. Lighting re-design studies—the program rebates help to offset 50% of the lighting evaluation costs (not to exceed \$15,000) when the customer installs the recommended technologies. In addition, the program provides for rebates on recommended technologies which may potentially amount to \$400 kW of saved energy. Rebate requires pre-approval.
5. One-Stop Efficiency Shop—implemented by a third-party vendor, this initiative offers incentives up to 60% of the installed costs, free lighting audits with cost savings recommendations, and start-to-finish oversight of lighting upgrade projects. This retrofit program is offered only to commercial customers with 400 kW or less of peak summer demand.

Because the program has been in existence for so long, it has developed brand awareness in the commercial sector. Additionally, Xcel AE and contractors have developed a reputation for providing expert advice and solutions for serving the commercial sector. Customers may access the program in multiple ways depending on their specific needs. Irrespective of which path is chosen, a program representative provides assistance and guidance for the customer. Further, customers pursuing complex projects are able to access custom rebates through the same program.

* See <http://www.xcelenergy.com/SiteCollectionDocuments/docs/BusLightingRetrofitRebateAppMN.pdf> for complete list of currently available measures.

† See <http://www.xcelenergy.com/SiteCollectionDocuments/docs/BusLightingNewConstructionRebateAppMN.pdf> for complete list of currently available measures.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	New Brunswick	New York	Minnesota
	Program Integration	<ul style="list-style-type: none"> Only 1 program 	<ul style="list-style-type: none"> Only 1 program 	<ul style="list-style-type: none"> Only 1 program 	<ul style="list-style-type: none"> 5 Customer focused initiatives
	Custom vs. Prescriptive	<ul style="list-style-type: none"> Predominantly prescriptive (custom projects are possible but are reviewed separately) 	<ul style="list-style-type: none"> Prescriptive (list of products for up-stream market actors) 	<ul style="list-style-type: none"> Mostly custom projects, prescriptive incentives offered for certain technologies 	<ul style="list-style-type: none"> Covers both prescriptive and custom projects
Customer	Energy Audit	<ul style="list-style-type: none"> After applications are submitted a site walkthrough is completed Technical assistance study is mandatory for custom projects 	<ul style="list-style-type: none"> none 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Offset 50% of evaluation costs (capped at \$15,000)
	Recommendations	<ul style="list-style-type: none"> Made by Manitoba Hydro lighting specialist 	<ul style="list-style-type: none"> Indirect recommendations for efficient technologies through design professionals 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Third party vendors offer recommendations for retrofits only
	Direct Install	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Incentives	<ul style="list-style-type: none"> List of qualifying measures and incentives 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> List of qualifying measures and incentives Retrofit gets different incentives than lost opportunity applications 	<ul style="list-style-type: none"> List of qualifying measures and incentives Retrofit gets different incentives than lost opportunity applications
	Financing	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Available on a custom basis
	Contractor Selection & Management	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> No selection, but nearly all lighting contractors managed by ENB (outreach) 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Offered for custom projects
	Quality Control	<ul style="list-style-type: none"> Post installation walkthroughs Certificate of Electrical Inspection is required 	<ul style="list-style-type: none"> No monitoring of individual projects 	<ul style="list-style-type: none"> No monitoring of individual projects 	<ul style="list-style-type: none"> No monitoring of individual projects
	Training	<ul style="list-style-type: none"> Some training on explanation of merits of program 	<ul style="list-style-type: none"> Free training and inventory audits for distributors, vendors, contractors and lighting design professionals 	<ul style="list-style-type: none"> Overall goal to train allies to promote efficient lighting and quality lighting as mutually inclusive 	<ul style="list-style-type: none"> Training on the intricacies of the 5 different programs

Services	Manitoba Hydro	New Brunswick	New York	Minnesota
			<ul style="list-style-type: none"> Technical Reference Guide outlines goals and corresponding incentives 	
Equipment	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
Certification	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Retain "certified" contractors and design professionals
Incentives	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Incentives offered for program participation and keeping efficient technology in inventory 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Incentives vary depending on which of the 5 program areas the project falls under
Marketing	<ul style="list-style-type: none"> Some up-stream marketing but little on controls or design. 	<ul style="list-style-type: none"> Direct marketing to distributors and vendors Outreach programs for contractors and design professionals 	<ul style="list-style-type: none"> Marketed through 3rd party vendor 	<ul style="list-style-type: none"> Xcel does direct marketing to customers and vendors to promote use of efficient products

ANALYSIS

Barriers:

- Lack of information/hassle/risk:** Although lighting programs typically face the fewest market barriers, Manitoba Hydro has invested heavily to elevate its brand awareness in an effort to alleviate market barriers found elsewhere. There is still a significant amount of technical information that Manitoba Hydro customers must review and process to receive financial incentives, which requires a significant amount of knowledge of efficient lighting technology. In New York, there are similar issues but the program attempts to minimize the customer's hassle factors by recruiting lighting professionals into the program and having them provide help with the enrolment process. New Brunswick and Minnesota have very different approaches, but similarly high success in overcoming the information/hassle barrier. Minnesota has an extremely comprehensive and well supported program structure as well as clearly defined program areas which help to clarify how incentive structures work and informs people of their installation options. New Brunswick has elected to go as far up the market channel as they can go by offering incentives to the majority of distributors in the province. They have effectively communicated the benefits of the program to all necessary market actors who have the greatest opportunity to influence end user purchasing decisions. The upstream approach has been so successful in New Brunswick that efficient lighting and fixtures dominate the store shelves. Thus, if a customer wants to buy a lighting system, the options are limited to the most efficient technologies.
- Split incentives:** Manitoba Hydro does little to address this beyond attempting to provide incentives directly to building owners. New York similarly does not address this barrier specifically. In New Brunswick the barrier is not specifically addressed, but by providing incentives to lighting

distributors so that efficiency options dominate the shelving space, there are few other alternatives for building owners besides efficient equipment.

Overall conclusion re barriers: There are significant savings that are not being captured as a result of the information/hassle barrier. Unlike the New Brunswick and Minnesota programs, Manitoba Hydro does not target incentives to up-stream market actors to leverage their customer outreach initiatives. As a result, customers do not know enough about new lighting efficiency technologies (i.e. controls, LEDs) that could significantly increase savings and vendors are not adequately incentivized to actively promote efficiency options.

Measures:

- **Fixtures:** Super T8s, T5s, LEDs, other efficient lighting fixtures and bulbs are all covered adequately by Manitoba Hydro program compared to case studies.
- **Ballasts:** Electronic ballasts are covered adequately by Manitoba Hydro program in comparison to the case study programs.
- **Controls:** Daylight dimming, occupancy sensors, timers. These measures are not given the same attention that fixtures and ballasts are compared to the case studies. There is an opportunity here for Manitoba Hydro to improve its coverage of measures like occupancy sensors, dimming controls, etc., in an effort to increase their penetration rates.
- **Design:** High-bay lighting, reflectors. This category is not simply a list of specific measures, but an extension of design professionals' expertise. These measures and effective use of expertise are not given the same attention that fixtures and ballasts are compared to the case studies. There is ample room here for Manitoba Hydro to improve incentives for efficient lighting design. Arguably, this can be considered part of program design; improving customer management and engaging customers to improve lighting design with in-house design professionals, however, improving incentives for 3rd party design professionals can help improve the savings captured per project.

Overall conclusion re measures: Manitoba Hydro has good incentive coverage for fixtures and ballasts, but lacks sufficient incentive coverage for controls and design compared to the exemplary programs. It is one of the fastest growing areas for capturing savings as fixture and ballast technologies are more difficult to make increasingly cost-effective and efficient simultaneously. Manitoba Hydro's program results indicate that the vast majority of program savings come from linear florescent lighting fixtures. The case study programs focus equally on fixtures and ballasts, and design and controls.

Program design:

Lighting systems may be looked at on a custom basis under the Manitoba Hydro program only if the lighting system or technology is not included in the prescriptive form. Custom application baselines are calculated by taking the lighting levels of properly operating systems not necessarily the existing condition. Minnesota has an extremely comprehensive and well supported program structure as well as clearly defined program areas which help to clarify how incentive structures work and inform people of their installation options. New Brunswick has elected to go as far up the market channel as they can go and by incentivizing the majority of distributors in the province. They have effectively communicated the benefits of the program to all necessary market actors who have the greatest opportunity to influence end user purchasing decisions. The upstream approach has been so successful in New Brunswick, that

efficient lighting and fixtures dominate the store shelves. Thus, if a customer wants to install a lighting system, the options are limited to the most efficient equipment before a project even reaches the planning phase.

As noted above, the exemplary programs attempt to insert implementation contractors or other market actors into any lighting project as early in the process as possible. Many of the contractors influence lighting layouts with the intention to reduce the need for lighting fixtures without compromising lighting density factors i.e. task lighting or passive natural lighting. To accomplish this goal, the exemplary programs have been designed to provide comprehensive training to lighting designers, architects, and building engineers. Additionally, guidebooks provide extensive tips to these market actors to help them address each customer's unique lighting needs cost-effectively.

Overall conclusion re program design: Manitoba Hydro's commercial lighting program design compares favourably to the case study programs. The program offers incentives that help to facilitate early retirement of functioning systems, especially T-12's still in place. Each of the case studies takes a slightly different approach to program design, but the results are all similar. New Brunswick and Minnesota exemplify the success of an up-stream approach to market actor engagement, while New York shows that good customer outreach can also capture savings effectively. All of the case studies exemplify good customer management as well. In the case of New Brunswick, case management is demonstrated through extensive training of 3rd party contractors and lighting system designers. This is a weak area for Manitoba Hydro, and the reason for our standard rating. There are some issues with lack of a strong auditing component to the program (particularly with cost coverage) and dissemination of information about efficiency, however, given the strong brand recognition that Manitoba Hydro has garnered for its lighting program, there is the potential to capture extensive savings with some improvement to the customer management component of the program, particularly outreach, auditing, and project management.

Lessons from other programs:

Our case studies are reflective of other exemplary programs in North America. Best practices for lighting programs emphasize a wide range of measures, including controls, and actively recruit upstream market actors to influence purchasing decisions. In addition, other leading-edge programs actively participate in code development and enforcement to ensure that today's innovative lighting products become baseline lighting technologies tomorrow. MH's lighting program offers a wide range of fixtures, lamps and controls. However, an effort to recruit lighting professionals into lighting designs appears not to exist. To improve the program, MH may consider active recruitment of upstream lighting professionals (i.e. architects, lighting specialist) who help design lighting systems that best suit the needs of the customers without over-lamping facilities.

OPPORTUNITIES FOR MANITOBA HYDRO

***Caveat:** The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.*

Measures: Significant opportunities may result by extending or increasing incentives for control technologies and lighting design. Most exemplary programs focus resources equally on lighting design,

lighting hardware (fixtures and ballasts) and control technologies. There are significant savings to be gained from installation of lighting controls and efficient lighting design, especially designs that amplify reliance on natural lighting and task lighting. Further, customers can exercise a greater level of control over their lighting system when it is designed and controlled properly, which leads to greater customer satisfaction.

Customer Services: For any custom commercial lighting project, Manitoba Hydro requires an energy audit to enroll in the commercial lighting program, but the customer must pay the full cost of the audit, before there is any indication of incentive amounts, or even whether or not the proposed project will qualify for enrolment at all. While some custom projects are large projects for which the cost of an audit is negligible, there are also small custom projects for which the added up-front cost could be a significant barrier to overcome.

Upstream Approach: The programs examined in the case studies section all report significantly lower costs per MWh saved than does the Manitoba Hydro commercial lighting program. One major reason for this is the upstream approach that the case study programs have adopted. They have all elected to actively engage wholesalers, vendors and contractors to participate in the program. Incentives are offered not only for installing efficient technologies but also for stocking them on shelves and promoting them to customers.

COMMERCIAL CUSTOM PROGRAM

SUMMARY

How does Manitoba compare?

STANDARD

- **Overcoming market barriers:** Compared to exemplary programs, the information barrier to custom projects in Manitoba Hydro service territory remains high. This is so because all but the largest customers are required to seek out Manitoba Hydro to enroll. Case study programs run active outreach programs and aggressively recruit industry-trained market actors. Information barriers are exacerbated by Manitoba Hydro's policy of requiring customers to pay their share of a feasibility study up front, with an option to cover partial cost after an audit has been performed (which does not guarantee feasibility).
- **Measure coverage:** Measure coverage is similar across programs; however, bundling prescriptive measures with custom projects does not appear to be an option for Manitoba Hydro.
- **Program design:** Manitoba Hydro approaches retrofit opportunities correctly by distinguishing between quick, easy-to-reach savings with a short term payback and longer-term payback investments. However, combining measures and project components into a suite of efficiency services that address a customer's whole-building needs would enhance the comparability of Manitoba Hydro custom program to our case studies.
 - **Incentives:** Unlike leading programs, incentive levels are based on set \$/KWh or \$/m3 rates, which do not address variance in customer measure costs...
 - **Coverage:** Certain segments of retrofit market (i.e. early replacement) may be omitted due to rigid program design
 - **Achieved energy and demand savings goals,** but 64% of energy savings were a result of one project. Need to expand marketing efforts to reach more customers/projects.
- **Lessons from other programs:** Most leading programs offer technical support by a single point of contact. Many use a more flexible incentive structure, leading to more retrofit projects. Manitoba Hydro could benefit from adopting both of these approaches.

What works?	What are the challenges?
<ul style="list-style-type: none"> • Consistent presence in marketplace gives programs wide recognition • Screening approach identifies projects that are most cost-effective • Opportunity to offer customers two tracks: comprehensive custom and prescriptive programs 	<ul style="list-style-type: none"> • Difficulty in determining incentives for custom projects early on in process • Administrative hassles associated with enrolling custom projects results in higher free-ridership rates • Providing personnel to determine cost effective efficiency opportunities for more customers

Opportunities

Manitoba Hydro should explore the following options further:

- **Differentiation** – Consider distinguishing commercial prescriptive programs from custom programs. Drawing brighter lines between easy-to-reach savings and deeper savings per customer site requires a comprehensive set of tools including richer incentives to reduce market barriers to deeper savings in the commercial retrofit market. For example, enrolling commercial customers in a prescriptive lighting program may, at best, reduce consumption by 10-15%, but if

Manitoba Hydro can demonstrate positive cash flows from custom multisystem projects, energy consumption may be reduced by 25% or more. This level of energy savings would make the programs exemplary.

- **Education** - Address the lack of information which causes many customers to view enrolment in utility programs as a hassle. Opportunities exist to provide more customer management combined with assessment and contractor recommendations to offer customers an understanding of what constitutes energy efficiency and how it is undertaken.
- **Incentives** – Removing uncertainties about incentives, especially for custom projects, is important for enrolling customers when cost-effectiveness is less obvious or more difficult to achieve.

DEFINITION OF PROGRAM AREA

Commercial renovation and retrofit programs are designed to identify unplanned or postponed projects that would result in increased energy savings but would not go forward unless additional incentives were available. The specific program strategies vary widely from branding of efficient buildings, to direct installation of efficient technologies, to encouraging energy managers to maintain optimal energy performance levels in commercial buildings. The most active—and successful—programs employ program outreach staff that actively seek out renovation/retrofit projects, provide significant technical and administrative support, and offer customized incentives and services that meet the particular needs of the customer. Aggressive approaches reduce many of the more significant market barriers that exist – lack of time and inexperience or lack of knowledge. Where strategies and program goals are less aggressive, programs may target upgrading the efficiency level of market events, those already underway.

CURRENT MANITOBA HYDRO APPROACH

Manitoba Hydro targets this market with multiple programs:

- **Measure-specific prescriptive products programs:** Manitoba Hydro has several end-use-specific prescriptive programs (building envelope, commercial clothes washers, refrigeration, lighting, kitchen equipment, HVAC and parking lot controllers) that target many of the market driven/natural replacement opportunities available in the commercial custom program area.
- **Commercial Custom:** This program targets all measures outside of the available prescriptive incentives via a subsidized feasibility study and set per-kWh calculated incentives.
- **Power Smart for Business – Commercial Optimization Program:** This program is designed to help customers realize significant savings potential by identifying and updating measures with less than a 2 year payback. A project review and site walkthrough with a Manitoba Hydro optimization specialist or another approved implementation contractor is used to identify all potential efficiency measures and discuss the best optimization plan. There is a required customer pledge to invest in energy efficiency measures under a one year payback and program incentives that kick in for measures over two years.
- **Energy Manager for Schools Program:** This program provides a three-year amortization of the cost of maintaining an Energy Manager position for schools. The purpose of this position is to have an

individual on site that can identify efficiency projects, and through education and assessment both affect operational behavior and characterize energy efficiency upgrades for investment consideration. Once in place, the Energy Manager goes through the existing program channels to link projects with the appropriate program and incentive.

- **Power Smart Design Standards:** This program establishes design criteria through which a building may achieve “Power Smart” status. The criteria include both custom and prescriptive components and take a building envelope approach to incorporate as many separate systems as possible. Efficiency ratings are taken from a variety of sources including national standards as well as manufacturer recommendations and Manitoba Hydro’s own criteria.

CASE STUDY SUMMARIES

We examined 3 case studies for this program area, summarized below.

Connecticut: Energy Opportunities Program: The Energy Opportunities Program is run jointly by Connecticut Light and Power and United Illuminating. This program is primarily a retrofit program and helps customers replace, or modify, existing inefficient equipment—lighting, HVAC, chillers, motors, controls, water heaters and commercial cooking equipment—with high efficiency alternatives at the time of retrofit/renovation design. The program attempts to assess efficiency investment opportunities before it tries to match them with incentives, which gives a more custom feel to projects, allowing them to be tailored to the exact needs of the customer, as opposed to selecting and mixing prescriptive incentives off a list of measures and fitting them together into a project. Retrofit services include, but are not necessarily limited to: co-funded cost effectiveness studies of potential measures proposed by customers, studies of emerging technologies to determine whether such technologies qualify for rebates, cash incentives to cover the cost of project implementation. Incentives are the lesser of:

- 50% of the installed cost
- Utility monetary cap on proposed efficiency measure
- Any applicable prescriptive amount.

Bonus incentives are also provided to customers installing multiple measures. CL&P also offers low-rate financing opportunities.

Idaho, Utah, Washington: Energy FinAnswer and FinAnswer Express: Both of these programs are administered by Pacific Corp in each of its western service territories with slight variations depending on specific market conditions and regulatory requirements.

The FinAnswer program is a comprehensive “all-in-one” program for more complex, multi-measure whole-building projects that may require up-front energy analysis and/or building design reviews for new construction or retrofit. In the retrofit market, program incentives provide for vendor-neutral technical services tailored to the specific project at no cost to the end user customer. Technical services include energy analysis and project scoping. In the lost-opportunity sector, design assistance is provided in order to help the customer’s project design team incorporate energy efficiency in the building at the appropriate project planning time. For either a retrofit or lost-opportunity project, Rocky Mt. Power, a

division of Pacific Corp., requires the customer to also have projects commissioned upon project completion.

FinAnswer Express is designed for smaller, straightforward projects that do not require any initial building designs to go forward. The program offers many prescriptive incentives for common technologies such as lighting, HVAC and premium efficiency motors.

New York: Flexible Technical Assistance and Existing Facilities Program: New York Energy Research and Development Authority (NYSERDA)'s Technical Assistance Program is designed to cost share energy feasibility studies to increase the efficiency of energy use, make process and productivity improvements, minimize waste and identify aggregation of energy efficiency opportunities. In addition, program administrators may provide long-term energy planning, retrocommissioning, peak load reduction and rate and load shape analyses. Customers with electric utility bills less than \$75,000 annually may be eligible for energy audit program which provides for low-cost, walk-through energy audits.

Rebate amounts for feasibility studies are negotiated to generally reflect either “percent of project costs”, not-to-exceed amounts, and other repayment requirements. Typically, rebate amounts are shared 50:50 with the end user up to \$500,000. For Con Ed Customers, rebates may amount to \$1,000,000. Also, NYSERDA implementers consider the economic feasibility of CHP applications or renewable generation opportunities. The Existing Facilities program offers calculated per-kWh and per-KW incentives.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	Connecticut	Idaho, Washington	Utah,	New York
	Program Integration	<ul style="list-style-type: none"> Multiple programs, all linked together by a common target market 	<ul style="list-style-type: none"> Multiple programs merged under 1 brand 	<ul style="list-style-type: none"> Two separate programs, but one is designed to alleviate pressure on the other 		<ul style="list-style-type: none"> One program
	Custom vs. Prescriptive	<ul style="list-style-type: none"> Both 	<ul style="list-style-type: none"> Both 	<ul style="list-style-type: none"> Both 		<ul style="list-style-type: none"> Both
Customer	Energy Audit	<ul style="list-style-type: none"> Required, depending on the program Certain portion of cost is covered after audit is completed 	<ul style="list-style-type: none"> Co-funded 	<ul style="list-style-type: none"> Included in project scoping 		<ul style="list-style-type: none"> Cost sharing of feasibility studies, optimization plans and retrocommissioning audits. Small customers may be eligible for low-cost walkthrough audits.
	Recommendations	<ul style="list-style-type: none"> After audit completion, a list of mostly prescriptive incentive opportunities is highlighted 	<ul style="list-style-type: none"> Comprehensive set of efficiency investment opportunities 	<ul style="list-style-type: none"> Comprehensive lists of efficiency investment opportunities 		<ul style="list-style-type: none"> Consultant develops scope of projects for incentive review (audit not required)
	Direct	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	

	Services	Manitoba Hydro	Connecticut	Idaho, Washington	Utah, New York
	Install				
	Incentives	<ul style="list-style-type: none"> Various prescriptive incentives \$0.20/kWh, \$0.30/m3 custom program. 	<ul style="list-style-type: none"> 30-50% of total installed cost. 	<ul style="list-style-type: none"> \$0.12/kWh +\$50/kW, (Washington); 	<ul style="list-style-type: none"> \$0.12-\$0.16/kWh, +\$300-\$600/kW
	Financing	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Low-interest options 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Contractor Selection & Management	<ul style="list-style-type: none"> After project is approved, support is offered to contractors 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Several energy engineering companies partner with the program 	<ul style="list-style-type: none"> List of qualified firms, or referral form filled out to work with own contractor
	Quality Control	<ul style="list-style-type: none"> Manitoba Hydro can inspect project for up to 3 years once complete 	<ul style="list-style-type: none"> 3rd party evaluation 	<ul style="list-style-type: none"> After project completion, commissioning audit completed 	<ul style="list-style-type: none"> Review and evaluation upon project completion
Contractor/upstream	Training	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Extensive training available 	<ul style="list-style-type: none"> For consulting firms under contract
	Equipment	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Certification	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Informal qualifications for contractors 	<ul style="list-style-type: none"> None
	Incentives	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Marketing	<ul style="list-style-type: none"> Limited effort to engage up-stream actors 	<ul style="list-style-type: none"> All programs marketed under one title 	<ul style="list-style-type: none"> Extensive work with up-stream actors to market programs 	<ul style="list-style-type: none"> Extensive outreach to up-stream market actors and years of service have created "brand awareness"
	Other	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">

ANALYSIS

Barriers:

- First Costs (particularly for retrofit/early retirement):** Investment costs are a significant barrier to the adoption of energy efficiency measures, in particular for the retrofit market, where participants face the full cost of measure installation. Manitoba Hydro and case study programs address this barrier via incentives, in three cases set at per-kWh/per m3 levels, and in the case of Connecticut based on a percentage of installed costs for all programs. Connecticut's approach is arguably the most effective since installed costs for a given measure can vary widely between customers, depending on their size, purchasing power and internal resources. Set per-kWh incentives, on the other hand, can be unnecessarily generous for some clients but do little for others.
- Risk and transaction costs/hassle:** Although Manitoba Hydro shares the cost of a feasibility study with the customer, there remains a high degree of customer uncertainty as these costs are not covered upfront. This makes it difficult for the customer to determine the amount of energy savings and financial incentives or whether the project is cost-effective until after an initial investment has been made. To reduce customer risks, exemplary programs actively manage accounts, providing

auditing and project scoping at minimal or no cost to the customer. Specialists are engaged with end users' facilities managers and understand both the operation and the capital budgeting criteria. This level of engagement, coupled with a multi-measure, whole-building assessment approach enhances confidence that efficiency projects have been identified and will result in meaningful, cost-effective savings.

- **Information:** It is important for Manitoba Hydro to help customers understand differences in efficiency investment strategies to make the programs themselves more effective at capturing the widest variety and depth of savings achievable. Exemplary program administrators couple renovation/retrofit programs with retro commissioning activities for facilities managers – although Manitoba Hydro offers both of these options, they are presented as separate programs. Exemplary programs also provide extensive, customized support to minimize information search costs for participants.

Overall conclusion re barriers: To reduce customer risks, exemplary programs take steps to increase the customer's confidence in both the benefits of investing in efficiency and the efficacy of the different strategies those programs offer to pursue investments. The exemplary programs actively manage accounts to increase the customer's confidence level that the cost of feasibility studies is worth their money, or by helping cover those costs up-front. They also provide a comprehensive analysis of all efficiency investment opportunities available to the customer. Manitoba Hydro programs lack a single point of contact and a customer education strategy to consider when planning projects. The case study programs approach multiple barriers simultaneously by doing extensive customer management at minimal or no cost, from the audit to the implementation of efficiency upgrades; all the customers have to do is chose the options that best suit their needs.

Measures:

Custom programs generally target all available cost-effective measures. Both exemplary programs and Manitoba Hydro programs essentially use this approach; however, Manitoba Hydro relies more heavily on prescriptive incentives. While exemplary programs do use prescriptive incentives, custom programs are generally more about providing a service that helps customers identify and then execute energy plans. For the case study programs, the focus is on reducing customer consumption and transforming customer perceptions about their energy habits. This requires extensive account management and sometimes richer incentives, on a case-by-case basis. While Manitoba Hydro's programs manage an extensive measure list. Some measures overlap between the custom program and other Power Smart programs; i.e. insulation, HVAC, windows, and lighting. Such measures are typically included in each of the case studies. The Energy Manager program, however, does not specifically pay for measures.

Overall conclusion re measures: While Manitoba Hydro focuses more on its relatively extensive list of prescriptive measure incentives, exemplary programs tend instead to rely more on their broader custom approaches. Furthermore, the structure of Manitoba's custom program, which essentially channels customers into specific prescriptive program silos, creates an administrative barrier to program entry.

Program design:

Manitoba Hydro takes a similar approach to its custom programs to that used by NYSERDA and the FInnAnswer programs, in the sense that it offers a combination of feasibility study incentives and

calculated per-KWh or per-m³ incentives, complemented by prescriptive incentives programs. The Manitoba Hydro programs break projects into three areas: quick savings, minimal investment projects, and long term large investment projects. The Optimization program is designed to acquire easy-to-reach savings. Optimization targets projects with a maximum 2 year payback. Prescriptive programs and the custom program target both minimal and long term investment projects. Lastly, the Power Smart Design Standard program creates long term investment projects by creating a set of criteria for labeling buildings with a Power Smart design standard. The criteria include measure lists covering everything from lighting controls to HVAC systems. Note that unlike case studies, Manitoba Hydro customers are faced with multiple programs.

One factor that is lacking in Manitoba Hydro's approach to this market, with the exception of the energy manager program*, is the assignment of a technical specialist and account manager to a facility or project. Under the case study programs, that specialist is tasked to provide turnkey solutions or all-in-one services to the customer. Essentially, the specialist becomes the point person for the customer and/or the customer's agents (i.e. contractors or facility managers) to resolve project – specific issues. One of the distinguishing attributes of the exemplary programs is that technical specialists take a systems approach to identify efficiency opportunities rather than look at individual technologies/measures. A systems approach can result in substantial non-energy benefits such as increased worker productivity, fewer accidents and higher quality products.

Another important characteristic of case study programs and other leaders is their proactive market outreach. Convincing customers to invest time and resources into feasibility studies and efficiency measures requires customized marketing and incentives, and account managers who have the time to explain the relevance of efficiency projects to a particular customer's needs. Manitoba Hydro is unable to provide this level of extensive one-one-one marketing and support to most commercial clients.

As mentioned in our barriers discussion, installed costs can vary widely between customers. This creates a serious problem with set per-KWh incentives, which many leading jurisdictions overcome by setting incentive levels as a percentage of installed costs. Combined with customized customer support and aggressive outreach, this approach can successfully reach a much broader range of customers.

Overall conclusion re program design: Manitoba Hydro is missing many of the key elements for successful commercial custom programs. It creates administrative barriers by relying on multiple prescriptive programs instead of a single broad program, does not have the resources for aggressive customer outreach, and uses set incentives rather than a more customized approach. As demonstrated by the case study programs, customers need additional help understanding how the full suite of efficiency program offerings and measures work together to meet the specific needs of customers proposing custom projects. Additionally, customers need assistance with designing action plans that develop a roadmap to deep, verifiable and persistent savings. Effectively providing multi-measure solutions, a simplified application approach, and additional technical support would also foster greater enthusiasm for investing in efficiency.

Lessons from other programs:

* The Energy Manager program (available for schools only) puts an auditing expert in position to promote an efficiency agenda for a specific building type. The energy manager, once in place, scopes a variety of efficiency upgrades and operational practices for school buildings and connects those potential projects with the appropriate Manitoba Hydro programs.

The programs reviewed for our report reflect many of the best practices of leading efficiency programs in North America. Programs considered exemplary by ACEEE offer comprehensive “all-in-one” services by a technical specialist and/or account manager, often with experience in the customer’s industry. One exception is the use, by two of our studies, of pre-set \$/kWh or \$/m³ incentives. Preset incentives do not adequately reflect the customer’s actual costs; therefore, the total amount of financial incentive fails to persuade customers to pursue good efficiency projects. Addressing first cost barriers to retrofit projects requires richer incentives. Other leading-edge custom programs, for example in Vermont, Connecticut and Long Island, offer incentives for discretionary, retrofit projects based on a percent of incremental costs. Even though such incentives may still be capped, the incentives reflect the customer’s project-related costs. As a result, projects have a greater probability of being completed without paying too much for expected energy savings. MH’s custom program relies on a standard incentive offering (\$0.20/kWh) for both retrofit and market-driven projects. This formulaic approach enables MH to acquire relatively easy-to-reach savings but not much more. Deploying technical specialist to work with customers on a one-on-one basis, coupled with negotiated retrofit incentives may result in a greater number of projects and increase energy savings opportunities.

OPPORTUNITIES FOR MANITOBA HYDRO

***Caveat:** The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.*

Increased Account Management: As stated previously, removing market barriers requires active account management. Oftentimes, undertaking custom projects means that production facilities need to be taken off line, or scaled back. At a minimum, retrofit projects cause disruptions, and create hassles. Account executives must be able to manage complications involved in project design and project management so that the business/facility owner can concentrate on their day-to-day operations. Coordination of prescriptive measures with custom projects by a single point of contact removes many of the hassles for end users and keeps efficiency projects on track toward completion. In addition, many customers need to be convinced that retrofitting systems that are working but inefficient makes economic sense. This also requires outreach by dedicated account managers.

Differentiation – Consider distinguishing commercial prescriptive programs from custom programs. Drawing brighter lines between easy-to-reach savings and deeper savings per customer site requires a comprehensive set of tools including richer incentives to reduce market barriers to deeper savings in the commercial retrofit market. For example, enrolling commercial customers in a prescriptive lighting program may, at best, reduce consumption by 10-15%, but if Manitoba Hydro can demonstrate positive cash flows from custom multisystem projects, energy consumption may be reduced by 25% or more. This level of energy savings would make the programs exemplary.

Education - Address the lack of information which causes many customers to view enrolment in utility programs as a hassle. Opportunities exist to provide more customer management combined with assessment and contractor recommendations to offer customers an understanding of what constitutes energy efficiency and how it is undertaken.

Incentives – Removing uncertainties about incentives, especially for custom projects, is important for enrolling customers when cost-effectiveness is less obvious or more difficult to achieve.

INDUSTRIAL PROCESS PROGRAMS

SUMMARY

How does Manitoba compare?

ADVANCED

(largest customers)

BASIC

(other customers)

- **Overcoming market barriers:** Manitoba Hydro has done a good job of overcoming market barriers for large industrial customers. The smaller industrial customers, however, often do not receive the same amount of active customer management and must seek out Manitoba Hydro to get efficiency projects approved. The exemplary programs provide a similar level of customer management to all customers, regardless of which rate class they belong to.
- **Measure coverage:** Most measures are covered under other Manitoba Hydro programs; thus the industrial process program covers other unique measures like large compressed air systems, waste heat recovery, large motors and drives and other process systems. The ability for all but the largest customers to bundle measures and services together with one application to resolve unique project challenges is limited under this program. Multiple applications are required to combine measures for different system optimizations which then ultimately rely on a final approval with an incentive capped depending on the types of measures installed. The exemplary programs provide more comprehensive and flexible application of incentive levels to create projects that meet customer needs.
- **Program design:** Manitoba Hydro's program design is structured in a straightforward way. Key Account Managers (KAMs) work with the very largest customers on almost a one-to-one basis. Project scoping is available through audits and studies through cost sharing. Once a project begins, large customers have access to technical assistance in a variety of disciplines. The technical services staff can even act as project designers if other market actors are not available to do the work. This level of service falls off quickly, however, as the account relationship moves to Major Account Executives who often have up to 50 customers under their supervision. From the customer's perspective, the services offered sound similar but the customers' application and needs may not receive the attention needed due to limited access to staff.
- **Lessons learned from other programs:** Case studies are representative of other exemplary programs. Manitoba Hydro compares well with most leading programs but offers the program to a relatively limited customer segment.

What works?

- Exceeding energy and demand savings goals
- Addressing lost opportunities that are not eligible for prescriptive rebates.
- Soliciting and training trade allies
- Providing incentives that reflect customer conditions – incremental vs. installed cost
- Moving beyond lighting. – comprehensive projects

What are the challenges?

- Expanding number of participants
- Diversifying EE investments across all rate classes (i.e., providing account management personnel for medium sized customers).
- Broad access to applicable technical assistance
- Implementation training and capacity

Opportunities

Manitoba Hydro should explore the following options further:

- **Make account managers accessible to customers:** Many customers want to invest in efficiency but do not have the resources or the time to explore their options fully. Providing account management from Manitoba Hydro personnel can help to make those investments in efficiency tangible for customers.
- **Recruit qualified market actors:** increasing efforts and resources to develop a network of market actors who have the ability to influence the purchasing decisions of customer would likely lead to a greater number of projects.
- **Market segmentation** to target key decision makers.
- **Turn-key services:** Active account management would reduce market barriers for many customers who are simply too busy managing their internal operations to navigate through the administrative barriers of program enrolment procedures.

DEFINITION OF PROGRAM AREA

Industrial process programs are designed to address the unique needs of the largest institutional and industrial customers. In almost all cases, customer needs include special projects and/or measures that are not offered under any other program areas by the EE administrator. Custom analysis is also used when energy efficiency measures have costs and benefits that may partially cancel out, e.g., space heating energy input gain versus efficient lighting energy loss. Projects are scoped out by professional engineers who identify efficiency and waste-reduction opportunities. Projects typically focus on compressed air, motors, lighting retrofits but can include water, operation and maintenance savings, and any other monetized benefit or cost. However, the majority of the industrial load is process-related. Technical assistant staff develop baseline conditions to estimate potential savings. Upon completion of the baseline study, incentives are set based on a pre-determined rate per kWh or kW. Oftentimes, rebates bring down the customer's payback period to around 1-2 years. At specified intervals for both project scoping and project completion, a third-party M&V contractor is called on to verify the installation of measures and the savings potential. In many cases, programs offer commissioning services to inform customers of appropriate design and, after completion, operating and maintenance procedures.

CURRENT MANITOBA HYDRO APPROACH

Performance Optimization Program: Large customers (or their engineers or contractors) are contacted by Manitoba Hydro outreach staff for review and analysis of existing facilities. Manitoba Hydro's first review of proposed projects is to determine whether any project components may be better addressed within existing prescriptive program. If this is not the case, Manitoba Hydro will consider an analysis of a customer's project. The customer then supplies Manitoba Hydro with project information including costs and benefits. Projects that meet the minimum threshold move on to the Manitoba Hydro-funded feasibility study phase, the cost of which are partially offset by Manitoba Hydro. Customer incentives are provided for projects that are expected to exceed minimum verified threshold savings (15,000 kWh for electric, 7,500 m³ for natural gas savings). Customer project incentives are determined by the amount of expected electrical or natural gas savings – for electric projects the total incentive equals \$0.10 per kWh annual energy, plus \$200 per kW winter and summer demand; for natural gas projects the total incentive equals \$0.30 per m³ saved. Under both services, the custom incentives are capped at the lower

of 50% of the total project costs or the amount required to reach a one-year payback. Customers are also required to meet certain eligibility requirements, i.e. they must remain a Manitoba Hydro retail customer for at least 36 months after the project completion.

CASE STUDY SUMMARIES

We examined three case studies for this program area, summarized below.

Focus on Energy (Wisconsin): This program is a statewide, collaborative effort that seeks to develop “champions” of energy efficiency at each participating facility as a means to ensure lasting energy savings long after project completion. Offers continuous Practical Energy Management (“PEM”) training to facility managers to increase awareness of energy efficiency opportunities and highlight emerging trends, and to ensure that efficiency initiatives become part of the business’ normal mode of operation. Wisconsin segmented the large commercial market into “Clusters” to allow for easier identification of essential market actors with the ability to influence the purchasing decisions of end users. Within each cluster, the program develops case studies in order to showcase a unique customer’s application of the EE projects and program services. Industry-specific clusters included the pulp/paper industry, food processing, water/wastewater facilities, universities, or manufacturing.

Production Efficiency (Oregon): The program provides industrial customers with a “Personal Program Delivery Contractor” (PDC) who directly interacts with the customer on a regular and routine basis. By making available highly personal, direct services by industry-specific specialists, customers are able to identify and capitalize on a variety of energy savings opportunities. Services are provided through qualified third party contractors paid for performance and results. Industry-specific specialists provide customers with greater level of comfort that projects will be implemented successfully and result in positive internal rates of return.

Non-Residential Custom (Iowa): Designed to provide customers with the maximum amount of flexibility and to introduce first-time customers to MidAm’s portfolio of energy services. Technical assistance to move projects along is free-of-charge to participating customers. Equipment incentives vary depending on the nature of the project. In all cases, incentives are structured to buy down the customer payback to two years (1 ½ years for tenant occupied buildings). To encourage the most cost-effective projects, incentives are capped at three years paybacks. This program is aimed at customers that may not be interested in participating in energy audits but need technical assistance to identify and initiate viable projects. Because incentives are offered for measures that are not included under other non-residential programs, the program serves as a testing ground. Measures installed that have provided verifiable, long-term energy savings are assessed for inclusion under prescriptive programs. In lieu of rebates, customer may choose competitive financing offered by MidAm (or a combination of rebate and financing). Where applicable, implementation contractors conduct whole-building assessments of electric and natural gas savings opportunities.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	Wisconsin	Iowa	Oregon
	Fuels	<ul style="list-style-type: none"> Electric/Natural Gas 	<ul style="list-style-type: none"> Electric/Natural Gas 	<ul style="list-style-type: none"> Electric/Natural Gas in select service areas* 	<ul style="list-style-type: none"> Electric/Natural Gas
	Program Integration	<ul style="list-style-type: none"> Yes, customers steered toward prescriptive programs, if appropriate. 	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes, encouraged to pursue additional program benefits 	<ul style="list-style-type: none"> No
Customer	Feasibility Studies	<ul style="list-style-type: none"> 50% for first \$15,000, 25% for remaining amount. Cap at \$15,000. 	<ul style="list-style-type: none"> Up to 50% grant 	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> provides scoping studies free of charge.
	Financing	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> No
	Contractor Selection	<ul style="list-style-type: none"> No, Contractor organizations posted on Manitoba Hydro Website 	<ul style="list-style-type: none"> Third parties contractors 	<ul style="list-style-type: none"> Customer selects 	<ul style="list-style-type: none"> Third party contractor (PDC)
	Quality Assurance	<ul style="list-style-type: none"> Third-party E,M & V 	<ul style="list-style-type: none"> Third-party E,M & V 	<ul style="list-style-type: none"> Third-party E,M & V 	<ul style="list-style-type: none"> Third-party E,M & V
	Incentives	<ul style="list-style-type: none"> \$0.10 per kWh, plus \$200 per kW winter & summer peak \$0.30 per m³ Limited to 50% of total project costs Min. One year payback 	<ul style="list-style-type: none"> No more than 30% of project costs, Capped at \$250,000 per project Min. 1.5 simple payback 	<ul style="list-style-type: none"> Min 2 year payback (owner occupied) 1 ½ year payback for tenant occupied space. Three year cap 	<ul style="list-style-type: none"> \$0.20/kWh or 50% of total project costs
	Customer Training/Commissioning	<ul style="list-style-type: none"> Limited to the largest customers 	<ul style="list-style-type: none"> PEM training 	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
Contractor/upstream	Active Recruitment	<ul style="list-style-type: none"> Limited to the largest customers 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes
	Training	<ul style="list-style-type: none"> provided for compressed air systems and pumping systems 	<ul style="list-style-type: none"> 26 best practices sessions (2007) on common systems/technologies 	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes
	Financial incentives	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes, paid for performance 	<ul style="list-style-type: none"> Performance based payments 	<ul style="list-style-type: none"> Performance based payments
	Certifications	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> P.E. 	<ul style="list-style-type: none"> P.E. 	<ul style="list-style-type: none"> P.E.
	Cooperative marketing/outreach	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Yes

* MidAmerican provides both Electric and Natural Gas distribution services in portions of its service territories. In other communities, the company provides either electric or natural gas services but not both.

ANALYSIS

Barriers:

- **Customer knowledge and hassle factor (*Information/Search Costs*):** Project identification appears to be a critical barrier to achieving greater savings. Most small to medium-sized customers bring projects to the attention of Manitoba Hydro. Many industrial customers that have not previously been involved with efficiency projects may not have a sufficient understanding of how to identify potential energy savings, nor how to cost-effectively reduce energy consumption. Thus, many savings opportunities are not assessed and the return on investment is never realized.
- **Recruiting Qualified Market Actors (*Split incentives*):** Qualified and familiar design/build engineers are not actively recruited, nor provided with financial incentives. As a result, Manitoba Hydro is not actively involved to influence process designs that result in energy efficiency. Oregon relies on contracted third-party engineers to ensure all efficiency opportunities are identified. Wisconsin's active training sessions for facilities managers and contractors informs participants of the best practices to follow.
- **First costs:** Programs provide various levels of rebates to buy down the initial cost of projects. For the most part, rebates are limited to 50% of total project costs. Iowa addresses first cost hurdles by offering the customer a choice between upfront rebates, financing or a combination of the two.

Overall conclusion re barriers: Manitoba Hydro compares poorly to the case study programs for all but the largest customers. This is mainly a result of Manitoba Hydro not aggressively pursuing projects that address small and medium-sized customers. Further, opportunities to leverage program benefits are missed by not recruiting additional market actors to advise industrial customers. On the other hand, Manitoba Hydro compares very favourably for large industrial customers given the nearly 1-to-1 KAM/customer ratio.

Measures:

The table below summarizes the key measures targeted by each program.

Manitoba	Wisconsin	Iowa	Oregon
Measures not already included under prescriptive programs. Examples include but not limited to: Waste heat recovery systems Replacement of inefficient natural gas water/space heating systems	Tier One – \$0.04 /kWh, \$125/peak kW and \$0.40/therm Custom lighting projects except LED, HVAC, Building envelope, Domestic water heating <90%, energy star computer servers. Tier Two – \$0.06 /kWh,	low-E windows, refrigeration systems, energy management systems, building control systems, complex lighting systems, heat-recovery systems i.e. ground source heat pumps over 135 million BTUh, premium motors and	Offers a broad array of industrial end use technologies including: Pumps, Compressed Air, Fans, Material transport, Refrigeration, Controls for industrial processes, motors, Lighting

Manitoba	Wisconsin	Iowa	Oregon
Compressor systems Solar air/water systems Industrial processes Incentives are noted above	\$200/peak kW and \$0.60/therm HVAC, EMS, Central plant boilers coupled with economizers, Central plant boilers coupled with combustion mgt system, Boilers ≥90%, Combustion mgt system DCV, Chillers, GSHP, Refrigeration, Ozone laundry, DHW, Thermal storage systems – cool, Data center / IT technology, LED lighting	large process boilers.	

Overall conclusion re measures: Manitoba Hydro provides incentives for most measures that are covered by the case study programs. We are unclear, however, as to what constitutes a Manitoba Hydro custom industrial project and that which is really just a compilation of prescriptive incentives with a \$/kWh cap applied.

Program design:

The Manitoba Hydro programs and case studies reviewed offer 2 common approaches to acquiring energy savings:

Customer Flexibility: For unique customer needs and projects, each program offers eligible customers a path toward energy savings and, in a few cases, increased productivity. All programs allow customers to submit proposals for measures or projects that do not easily fit into any other program category. Calculating rebates for individual projects are relatively straightforward and allow the customer to know in advance how much of an incentive will be available subject to successful project completion and verification.

Electric/Gas Integration: each program relies on a whole-building approach to providing energy services and financial incentives. This approach allows customers to address both electrical efficiency opportunities and heating/cooling requirements. Such an approach reduces the amount of confusion in the marketplace and streamlines the customer's projects to a greater extent.

The key difference between exemplary programs and Manitoba Hydro is that Manitoba Hydro is actively engaged with large scale industrial customers (3 phase customers) but essentially requires smaller

industrial customers to contact them to enroll in the program. The exemplary programs actively reach out to *all* customers in the industrial class to provide energy audits and offer different options for investments in efficiency. Customers can then work with the utility and other contractors on implementing projects that result from audit findings

Overall conclusion re design: By not actively engaging customers at their places of business, and providing on-site energy surveys, potential savings are lost. Compared to large industrial customers, medium commercial and industrial customers have limited time and resources to put towards improving the efficiency of their operations. The case study programs do an excellent job of identifying potential savings and then working closely with small to medium-sized customers to help decide which components they would like to pursue. Manitoba Hydro works in a similar manner with the largest customers; smaller accounts however could be more actively managed to gain additional savings.

Lessons from other programs:

Our case studies reflect many of the best practices found in the US. These programs earned exemplary status primarily as a result of dispatching industry specialists to the customer's site and conducting comprehensive energy surveys that lead to large energy savings projects. The technical specialists work with customers from project initiation to completion and then on to verification. Other leading-edge program administrators pursue similar strategies as the exemplary programs but also provide a similar level of service to a wider range of businesses, not just the largest customers. Manitoba Hydro industrial process programs reflect many of the same attributes of the exemplary programs we reviewed in terms of the scope of services and customer interactions. Expanding the pool of eligible customers would likely lead to an improved rating.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Account management for small and medium-sized customers: As stated previously, Manitoba Hydro does a truly excellent job of managing the energy needs of their largest customers. There is an opportunity to provide this type customer management for their smaller and medium sized customers. Many of those customers can benefit significantly from facility audits, engagement of their facilities managers concerning their options for improving efficiency (where feasible) and general information on the suite of options that are available to them under the industrial process program. Many smaller customers do not have the available resources to procure those services or obtain that information. As a result, Manitoba Hydro could be failing to capture substantial savings for those customers.

Upstream Market Actor Recruitment: Active engagement of outside engineering and architects would greatly expand the reach of the Industrial Process program. Currently, projects are brought to the attention of Manitoba Hydro program managers for an initial review of the project concept. If considered a viable concept, Manitoba Hydro provides the customer with incentives to conduct a feasibility study. Actively recruiting credible market actors with credentials would be in a better position to identify many more viable projects, each with potentially deeper savings per site location. Further, upstream specialist are more likely to have a better understanding of emerging technologies to consider of program implementation due to their intimate involvement in the field.

Market Segmentation- Consider segmenting the market into key market areas in order to identify decision-makers within organizations. Develop additional case studies around key market segments in order to increase awareness of similarly-situated customers. This may prompt participating customer's competitors to consider EE projects in order to remain cost-competitive.

Turn-key operations: Oregon program managers provide customers with turn-key advice for projects, allowing the customers to remain focused on their business. Much of the project scoping, documentation and project oversight is performed by the third party contractor. Such services would encourage more customers to participate and help to reduce the hassle factor that many face.

AGRICULTURAL PROGRAM*

SUMMARY

How does Manitoba compare?	
<div style="border: 1px solid black; background-color: yellow; padding: 5px; display: inline-block; margin-bottom: 10px;">STANDARD</div> <ul style="list-style-type: none"> • The Power Smart for Farms program serves as a gateway to Manitoba Hydro's efficiency services, which are provided through several commercial and residential program offerings. Access to these programs is facilitated by a qualified engineer who helps farm operators assess the feasibility of multiple technologies to reduce consumption in homes and work environments. The challenge however, is converting a greater number of inquiries into projects on medium and small farms. • The agricultural heating pad program is marketed through up-stream market actors and according to customers, is very accessible. • Overcoming market barriers: Manitoba Hydro provides some trade ally education about the benefits of investing in efficiency; however this initiative could be expanded considerably in light of the effort that the case study programs expend on upstream market actors. • Measure coverage: Unlike the case studies, which combine measures into a comprehensive agricultural program, Manitoba Hydro offers measure-specific incentives within program silos. • Program design: Expanding the range of service options offered to farmers and agricultural market actors would greatly extend the reach of the program. Such expanded services may include energy audits, dealer incentives to encourage their participation and custom project services. • Lessons learned from other programs: Manitoba Hydro's program is typical of average industry programs, targeting a narrow set of measures well but not using a comprehensive approach. 	
What works?	What are the challenges?
<ul style="list-style-type: none"> • Dedicated staff who manage the flow of inquiries and direct customers to other programs • Customer account relationship management of large operations. • Efficient heat pad technology is both practical and far more efficient than baseline technologies • Simple incentive structure makes the program easily accessible and understandable 	<ul style="list-style-type: none"> • Product line limits the reach and effectiveness of Manitoba Hydro broader goals of reducing energy consumption in the agricultural sector. • Capitalizing on other related opportunities , especially retrofits, with proper incentives and services
Opportunities	
<p><i>Manitoba Hydro should explore the following options further:</i></p> <ul style="list-style-type: none"> • Growth/Diversification – Capitalize on other savings potential/opportunities available in the farming industry; fans, motors, processes - e.g. milk processing – developing segment-specific efforts wherever cost-effective. • Retrofits – Achieve further savings by targeting early replacement retrofit market 	

* Although Agricultural operations are eligible to participate in the Bio-Optimization program, this study did not conduct a review of large-scale CHP programs.

DEFINITION OF PROGRAM AREA

Agricultural businesses are buffeted by factors largely beyond their control, such as world commodity prices (notwithstanding pool structures like the Canadian Wheat Board), weather, and energy prices. As profit margins fluctuate widely from year-to-year in accordance with such factors, first costs become the primary barrier to investments in efficiency. Demonstrating and proving quick customer paybacks or a positive cash flow are therefore essential to the success of agricultural programs. Leading programs offer a suite of efficient products and services (i.e. direct installation, energy audits) that help to identify and implement multiple energy savings opportunities. Unlike many other agricultural programs, Manitoba Hydro agricultural program appears to overlook many potential agricultural-related savings opportunities because its offering to farm operations (exclusive of residences) is focused squarely on heat pads alone.

Aside from product/service offerings, programs build customer awareness through outreach efforts than focus on up-stream market actors. Partnering with upstream market actors helps push efficient technologies into the marketplace as a few key actors (usually distributors and vendors) influence the purchasing decisions of end-use customers.

CURRENT MANITOBA HYDRO APPROACH

Through its Power Smart program for farms, Manitoba Hydro provides efficiency services to the agricultural sector. Under this program, a Manitoba Hydro representative offers to guide farm operators through Manitoba's suite of efficiency services. The Power Smart program for Farms mimics, for the most part, the delivery approach and marketing of the Power Smart Commercial and Residential programs. By offering technical assistance and advice, farm operators are informed about the potential for energy savings on their farms and at home, as well as any other current promotional offerings and incentives for new construction or renovation projects. In certain instances, farm operations are large enough to be eligible for benefits and services under the Performance optimization program.

From its website, farm operators interested in pursuing efficiency projects are directed to all of Manitoba's efficiency program details. Financial assistance is provided under each of the pertinent prescriptive programs. In addition, the Power Smart for farms program provides related information pertaining to solar energy greenhouses and farm energy cost calculations.

Manitoba also provides financial assistance to hog farm operations for a single opportunity: the switch from heat lamps to electrically charged heat pads in farrowing barns.

Incentives are as follows:

- \$50 single pad, \$100 double pad – up to 75 watts.
- \$30 single pad, \$60 double pad—76 watts to 100 watts.

Typically, the initial investment in heat pads is greater than heat lamps. However, the operating costs of heating pads are one-third that of heat lamps, and last up to 15 years compared to average 1-2 years of

heat lamp operation. For a typical application, participants reduce their electric bills by \$42-\$46 per pad annually.

The program is administered by the Power Smart Commercial Programs Supervisor. After an application is completed and pre-approved, customer may proceed with purchasing heat pads from a participating dealer and installation.

See Appendix 1 for complete profiles of Manitoba Hydro programs.

CASE STUDY SUMMARIES

We examined two case studies for this program area, summarized below. See Appendix 2 for complete profiles of each case study.

Dairy Farm Efficiency Services (Vermont): The program provides an integrated set of efficiency services. At the customer's request, a farm-energy specialist conducts an on-site inspection of the farm operation to determine cost-effectiveness of potential efficiency improvements, free of charge to the customer. Inspection reports include recommendations for replacing equipment and operating systems. Efficiency Vermont (EVT) negotiates rebate amounts with customers based on estimated savings up to a maximum of 60% of the total cost of properly installed equipment (incentives must also meet cost-effectiveness requirements).

Oftentimes, an energy audit results in custom projects tailored to the specific needs of the farm operation. However, measures and systems predominantly consist of the following categories: lighting, space heating and hot water along with heat recovery systems, variable frequency drives, and ground water pre-cooling systems and variable speed transfer systems for milk processing.

Agricultural Energy Efficiency (Iowa): The program provides customers with options to pursue energy savings projects through either prescriptive forms or custom projects. By intently working with a wide assortment of market actors, the program has had broader (spillover) impacts such as affecting non-participants who hear about the program's benefits and apply energy-savings measures in their own operations independent of program participation. The program is comprised of the following services:

Farm energy audit: IPL provides audits to identify energy inefficiencies on farm operations free of charge to the customer. Program focuses on providing energy efficient equipment and system design recommendations. This service is also intended to increase program awareness. Where appropriate, energy audits form the basis for grant applications to the US Department of Agriculture for additional low/no-cost funds for energy efficiency projects.

Prescriptive: The program provides a broad range of energy efficiency incentives targeting lighting, ventilation, water heaters, irrigation systems, tractor motor heating, efficiency motors, dairy-specific equipment, and high-efficiency clothes washers. Rebates pay for a portion of the incremental cost of the new equipment but are generally limited to 50% of the total cost of the equipment.

Dealer Incentives: Participating dealers receive commission amounts that range between 5 and 20% of the customer's rebate amount.

Custom: Program offers custom rebates for projects that do not qualify for prescriptive rebates due to the size, scope of unique features of the project or energy-efficient equipment. Agricultural representatives promote custom projects directly to farm-family businesses, and calculate the estimated energy savings from proposed projects. Custom incentives are based on dollars per kWh saved and vary depending on the savings level.

New Equipment Comparisons: Agricultural representatives provide participating customers with analysis demonstrating life-cycle energy consumption of various equipment options and equipment models. Agricultural representatives also inventory proposed equipment customers are considering and make recommendations for higher efficiency equipment.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	Vermont	Iowa
	Program Integration	<ul style="list-style-type: none"> Yes, although more active integration could be initiated 	<ul style="list-style-type: none"> Several approaches to different technologies all under 1 program 	<ul style="list-style-type: none"> Several distinct services under 1 program
	Custom vs. Prescriptive	<ul style="list-style-type: none"> Both 	<ul style="list-style-type: none"> Both 	<ul style="list-style-type: none"> Both
Customer	Energy Audit	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Mandatory once inquiry is made 	<ul style="list-style-type: none"> Comprehensive auditing process for both retrofit and lost opportunity situations)
	Recommendations	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Extensive list of turn-key solutions to efficiency opportunities 	<ul style="list-style-type: none"> Extensive
	Incentives	<ul style="list-style-type: none"> Farm operators directed to applicable prescriptive incentives under Power Smart Commercial and Residential Programs. \$50 Single pad, \$100 Double Pad – up to 75 watts. \$30 Single pad, \$60 Double Pad—76 watts to 100 watts 	<ul style="list-style-type: none"> Detailed incentive structure Limited to 60% of installed costs 	<ul style="list-style-type: none"> Detailed incentive structure Limited to 50% of installed costs Streamlined applications for federal 9006 funding
	Financing	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Low/no-interest options 	<ul style="list-style-type: none"> Low/no-interest options
	Contractor Selection & Management	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Quality Control	<ul style="list-style-type: none"> Certificate of Electric Inspection 	<ul style="list-style-type: none"> Post-project completion inspection 	<ul style="list-style-type: none"> Projects subject to evaluation and oversight by Iowa Utilities Board
Contractor/ upstream	Training	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Equipment	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Certification	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
	Incentives	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Dealer receives 5-20% of customer's rebate
	Marketing	<ul style="list-style-type: none"> Extensive community outreach and online advertising 	<ul style="list-style-type: none"> Various methods of dispersing information to vendors 	<ul style="list-style-type: none"> Extensive community outreach and trade alliance forming

ANALYSIS

Barriers:

- **Information:** Manitoba Hydro partially mitigates the information barrier by relying heavily on up-stream marketing agents (or actors) with respect to Heat pads. Such an approach, however, does not guarantee that all segments of the AG industry will have sufficient access to information about efficiency savings opportunities to make an informed decision about whether to enroll in Manitoba Hydro programs. Direct marketing, or a more proactive engagement process with end users through, for example, conferences or other events may help to ensure the agricultural community is well informed of other program's benefits, but it is not the only method that should be employed. In Vermont, program managers are engaged directly with customers, offer energy audits and perform on-site inspections. At such visits, implementation staff leave behind data on programs and expected savings from a variety of standard measures to help farming industry customers understand the benefits of investing in efficiency.
- **First Cost:** Farmers are very much driven by their bottom lines. They operate in an industry with very low margins where first costs can greatly affect whether investments get made in certain technologies. Investments in efficiency often compete with investments in other farm infrastructure and equipment, all of which can carry significant first costs. Often times when older, less efficient equipment can be run or purchased in place of newer, more efficient equipment, a farmer will opt for a slight increase in operating costs in return for large savings on capital investments. It is a major challenge for any utility, and certainly Manitoba Hydro, to overcome this barrier. The case study programs offer comprehensive analysis of a farmer's options, each with the most creative and comprehensive funding package available. Both case study programs offer low/no-interest financing options for large projects and will cover up to 50% or 60% of the installed cost through incentives.
- **Hassle or transaction costs:** Farmers are busy. Unless participation is easy, they are unlikely to participate; in many cases. Efficiency staff need to be prepared to step in as project managers to see that efficiency projects are implemented rather than leave such duties to the farm operator. Successful programs offer comprehensive savings opportunities with significant cost coverage.
- **Performance uncertainty:** Given the significant business-related risks they already face, farmers are risk-averse on non-core business investments, especially where the overall performance of new technology is uncertain. Manitoba Hydro overcomes this barrier for heat pads through its demonstration projects and extensive outreach.

Overall conclusion re barriers: Unique barriers affecting the agricultural market could be addressed more proactively by offering turn-key solutions that comprehensively address the needs of farmers. Conducting energy audits (where justified) and identifying all efficiency opportunities that can be cost-effectively acquired either through prescriptive measures or within a custom program is the most direct way to capture high levels of savings in the agriculture industry.

Measures:

- **Agricultural heating pad:** Manitoba Hydro program focuses on this one measure, which is not explicitly covered by either of the case study programs.
- **Lighting:** Manitoba Hydro covers certain measures under its commercial lighting program, but they are not marketed to farmers specifically, as they are under both case study programs.

- **Variable frequency drives:** Manitoba Hydro covers certain measures in its industrial process programs, but they are not marketed to farmers specifically, as they are under both case study programs.
- **Space heating and hot water:** Manitoba Hydro covers certain measures in its commercial custom programs, but they are not marketed to farmers specifically, as they are under both case study programs.
- **Milk pre-cooling and variable speed milk transfer systems:** Manitoba Hydro does not cover these measures under any program. They are covered under both case study programs.

Overall conclusion re measures: Manitoba Hydro does very well at promoting and implementing efficient heat pads for hog farming. In fact, it is the only program we found that covers this measure. However, it is difficult to make comparisons with exemplary programs on the basis of this specific measure alone. While the farming community is targeted under the Power Smart for Farms initiative, this initiative appears to simply redirect farm operators to a host of prescriptive forms that are also offered under other program initiatives. This marketing and delivery approach most likely makes it overly difficult for farmers, especially smaller operators, to pursue efficiency projects in a comprehensive fashion, leads to confusion and raises frustration levels. Expanding services to include comprehensive energy audits, turnkey services and even direct installation of low cost measures would likely extend the reach of Manitoba Hydro's program into this important segment.

Program design:

Manitoba Hydro's Power Smart for Farms approach is similar to that of the Power Smart programs for residential and commercial markets. Manitoba's energy efficiency specialists provide assistance and act as a guide to the Farm operator so they can navigate through Manitoba's other offerings. Larger operations are eligible to participate in the Performance optimization programs. Additional advice on solar greenhouse construction and energy cost calculations is also offered. With respect to the Ag Heat pad market, Manitoba appropriately seeks to recruit upstream actors to promote savings in a similar manner as some of the exemplary programs in the US. Manitoba Hydro offers a simple, plug-in solution to farmers interested in reducing energy consumption in the hog farrowing industry. However, because the Ag Heat program does not provide comprehensive energy surveys while on site to help farmers potentially realize further savings throughout their operation, it is difficult to conclude whether Manitoba Hydro's programs is cost-effectively reducing consumption as much as it could. The case study programs perform a complete audit of a farmer's operation and offer a comprehensive list of efficiency opportunities for a farmer to consider. Whether a farmer chooses to invest in efficiency is ultimately his or her decision, but the case study programs come up with a host of solutions to first cost barriers through, for example, creative financing which aims to protect a farmer's bottom line.

Overall conclusion re program design: Because of the unique nature of the farming industry in Manitoba, it is important to offer a program that is distinguishable from Manitoba Hydro's C&I programs. To extend the reach of its hog farm-oriented program to include other farm-related operations, the specific needs of farmers need to be identified so that applicable solutions can be offered in a way that is cost-effective and accessible.

Lessons from other programs:

The case studies included in this report are representative of the leading programs in the US and Canada. Each case study program bundles together several measures from which farmers can choose from and provide turnkey services. This approach makes participation in the program easy. Unlike the case study programs, however, other non-leading agricultural programs that we are aware of offer one or two measures that do not adequately address to entire farm operation. Moreover, these programs require the farmer to determine how their operation complies with the program's requirements, rather than the program managers trying to determine how they may best serve the interests of their customers. Attributes of MH's agriculture program reflect those of latter group of efficiency programs rather than the exemplary programs we reviewed.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Diversification: There is ample room for this program to expand the range of measures covered to include technologies necessary for other aspects of hog farming, or any other types of farming that take place in the Manitoba Hydro service territory. There are a variety of technologies for which there are cost-effective applications which can help farmers reduce their operating expenses and improve their profit margins in addition to installing efficient heating pads. The more complicated the list of measures becomes, the more the need for some type of analysis arises. Energy audits are useful for helping farmers to understand the full energy efficiency potential of the different systems their farm employs, to gain knowledge of current and emerging technologies that are used in their particular farming industry, and to get information about investing in infrastructure improvements for their operation. Combining audits with follow up services aimed at achieving a significant level of the efficiency potential identified at positive cash flow, will result in multiple benefits for Manitoba Hydro: higher participation, increased savings, and a more vibrant farm economy.

Retrofits: By offering program partners the option of installed cost-based incentives, Manitoba Hydro could improve the market penetration not just of efficient heating pads, but all agricultural technologies. It is unclear from Manitoba Hydro's program descriptions whether or not there is a significant proportion of early replacement retrofits being undertaken; removing bulbs as well as fixtures and controls, which can have a 20-year measure life, in favor of heat pads. Typically in a program with an incentive structure such as this one, which is designed to replace existing technology at any point in its life cycle based purely on energy savings, there is no obvious distinction between replacing inefficient equipment before the end of its useful life and replacing it *at* the end of its useful life. It would be useful to evaluate the baseline technology at hog farms to see to what extent heat pads have become standard practice and whether farmers are capitalizing on incentives for projects that they would have undertaken regardless of the incentives' offering.

EARTH POWER – COMMERCIAL

SUMMARY

How does Manitoba compare?	
<p>LEADER</p> <ul style="list-style-type: none"> • GSHP support infrastructure: Continuous support of the program has led to the development of qualified design/installation workforce infrastructure. • Quality assurance: Eleven step application-to-completion project processes ensure systems are designed and installed for lasting energy savings and building comfort. • Overcoming market barriers: Manitoba Hydro compares favorably to case study. Incentives are comparable to other programs, and help to reduce first costs. • Measure coverage: similar to the case study, Manitoba Hydro includes incentives toward heat pump equipment, and loop fields. • Program design: Manitoba Hydro compares favorably on account of the customer’s option to elect to conduct a feasibility study if their facility is electrically heated. • Lessons from other programs: Relatively few programs target geothermal heating specifically; Manitoba Hydro’s program is a leader among those that do. 	
What works?	What are the challenges?
<ul style="list-style-type: none"> • Consistent presence in the market has led to brand awareness of the program among builders and engineers. • Training sessions have helped to expand qualified workforce. 	<ul style="list-style-type: none"> • Overcoming significant market barriers • Identifying and adopting new technologies to increase cost-effectiveness • Avoiding Winter load building from natural gas customers installing GSHP
Opportunities	
<p><i>Manitoba Hydro should explore the following options further:</i></p> <ul style="list-style-type: none"> • Integration: include comprehensive whole-building assessments to foster near-net-zero-energy facilities, especially with new construction. 	

DEFINITION OF PROGRAM AREA

Assistance is provided to offset the cost of feasibility studies and system installation incentives help offset the capital cost of the geothermal system.. While most technologies may be cost-effective, many programs are challenged with developing the local design and installation workforce. Consequently, efforts are expended to continuously recruit and train qualified GSHP technicians and designers.

CURRENT MANITOBA HYDRO APPROACH

Commercial Earth Power Program is the only Manitoba Hydro program that specifically addresses this market, although Power Smart Account executives may provide customers or market actors with information and assistance across the portfolio of efficiency programs, including Earth Power program details. This program mainly addresses the electrically-heated C&I "retrofit" market, although in reality it appears that most activity is market-driven (according to the "Option 2" plan, financial incentives average roughly 30% of the incremental cost of product costs). Program seeks to increase participation levels by relying on the existing network of trade allies to promote GSHP benefits in general, and Manitoba Hydro's financial incentives in particular. Manitoba Hydro offers partial incentives to conduct a feasibility study (optional for "electric sector" customers, mandatory for Natural Gas sector customers) and directs customers to competitive fixed rate loans to offset first costs.

Incentives are provided under the Commercial Earth Power program for new construction and replacement of conventional electric heating systems. Incentives are provided to offset the cost of a Feasibility study-- 50% of the first \$5,000, and 25% of the remaining amount of the cost. The maximum grant is no more the \$10,000 for a feasibility study. In addition, the program provides a system installation incentive equal to \$1.25 per sq foot, or \$60 per million BTU/hour installed geothermal heating capacity. Also provides customers access to fixed rate loans.

Pre-approval is required prior to the installation or the purchase of geothermal heat pump system. Post inspection and approval required prior to issuance of incentive check. Feasibility study is optional for electric heat customers, mandatory for natural gas heat customers. As a result, natural gas sector customers face additional uncertainty prior to installing systems. This makes it possible that a high percentage of natural gas sector customers are free riders.

CASE STUDY SUMMARIES

Because there are few utility-sponsored commercial GSHP programs, it was difficult to find exemplary programs comparable with Manitoba Hydro's commercial Earth Power program. Consequently, we examined one case study for this program area, summarized below.

Geothermal Program (Black Hills Power Co., South Dakota)

Black Hills Power Co's (BH) program was initiated in 1994. Following a five year promotion period, the program is not now actively promoted but system installations are still being incentivized. Black Hills provides electric service to approximately 65,000 customers, and has provided incentives on 15 Commercial systems.

Financial Incentives are intended to encourage customers to install efficient equipment, offset the cost of installing loop fields, and improve the utility's generation capacity. Qualifying customers usually enroll in the "energy storage rate" tariff which provides on average a 25-30 % discount from customary commercial electric rates on the separately metered GSHP system. The combination of the energy storage rates and financial incentives promote off-peak energy usage. As a result, the utility's generation capacity may improve marginally.

The company's efficiency programs will be under review in summer 2009. Also, program managers are in the process of researching the impact, if any, from the economic stimulus funding availability on the program (research efforts include reviews of other EE/RE programs as well). Program revisions may be forthcoming in 2010.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	Black Hills
Customer	Program Integration	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Custom vs. Prescriptive	<ul style="list-style-type: none"> Prescriptive 	<ul style="list-style-type: none"> Prescriptive
	Feasibility Study	<ul style="list-style-type: none"> Electric – no natural gas—yes 	<ul style="list-style-type: none"> No
	Energy Audit	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Incentives	<ul style="list-style-type: none"> Feasibility study-- 50% of the first \$5,000, and 25% of the remaining amount of the cost. ~ maximum grant is no more the \$10,000 for a feasibility study. \$1.25 per sq foot of building space, or \$60 per million BTU/hour installed geothermal heating capacity. access to fixed rate loans 	<ul style="list-style-type: none"> SEER=\geq 13.0 <p>New Pump installations:</p> <ul style="list-style-type: none"> 150 per ton, plus \$125/ton for loop fields. Maximum incentive: \$2500-\$7500 per customer site <p>Replacement Pumps:</p> <ul style="list-style-type: none"> \$50 per ton <p>~maximum incentive: \$800 per customer</p> <p>Energy Storage Rate:</p> <ul style="list-style-type: none"> 2.70cents/kWh – off peak energy 4.35 cents/kWh –on peak energy \$0.00/kW –off peak \$6.50/kW –on peak
	Financing	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> No
	Contractor selection & Management	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Informal
Contractor/ upstream	Quality Control	<ul style="list-style-type: none"> Mandatory COP Min. Full load heating requirements Multi-step application process, Post inspections, 	<ul style="list-style-type: none"> Mandatory SEER rating (13.0) Post inspection, optional
	Training	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Infrequently
	Certifications	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Registered PE only
	Incentives	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Joint marketing	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes

ANALYSIS

Barriers:

- **First Costs:** Although Manitoba Hydro's program has reached its savings goals, upfront capital costs are considerably higher than conventional heating/cooling equipment which prevents the program from achieving even higher energy and demand savings. Additionally, at the time decisions are made with respect to space heating technologies, most customers' purchasing criteria are heavily influenced by the initial investment rather than operating efficiencies and net present value analysis. To help overcome first cost barriers, Manitoba Hydro offers customers access to fixed rate financing terms at competitive rates.

Similar to Manitoba Hydro's program, Black Hills also seeks to overcome first costs barriers but does not recommend financing options. In addition, program managers provide a customer payback analysis as a means to demonstrate the benefits of GSHP technologies.

- **Building Design:** It is cost prohibitive to redesign buildings or make architectural changes to ensure GSHP are effective in reducing heating/cooling loads, unless GSHP technologies are incorporated into the building's design at the very beginning. To overcome building design barriers, PS account executives seek to intervene early in the design phase of new construction or renovation projects.
- **Design/Installation Workforce infrastructure:** Expanding the reach of the program will require additional development of the design and workforce infrastructure. In metropolitan/suburban areas, the supply of qualified designers and installers may be sufficient. However, studies have shown that the cost of GSHP can be 100 to 400 percent higher in areas where qualified workers are not available. Both BH and Manitoba Hydro provide some training and outreach to help build the pool of qualified design and installation workers.

Overall conclusion re barriers: Manitoba Hydro relies on a series of mechanisms to reduce market barriers, especially assisting customer with locating fixed rate financing to deal with first cost barriers. Additionally, Manitoba Hydro proactively reaches out to designers as a means to promote early intervention into a building's design rather than attempt to integrate GSHP into existing construction projects or facilities. Overall, Manitoba Hydro has a much better approach to customer management than BH.

Measures:

- Feasibility studies – Manitoba Hydro provides financial incentives for feasibility studies, BH does not.
- Qualified Heat Pumps – both programs provide incentives toward the cost of heat pumps.
- Load coil installations—BH program provides a specific incentive targeted at the installation of load coils, Manitoba Hydro program sets the total amount of the incentive based on the square footage of the building in the case of electrical sector customers (and MB/h for eligible natural gas heat customers).

- Access to Fixed Rate financing: BH does not provide access to financing or make specific recommendation to the customer.

Overall conclusion re measures: Manitoba Hydro compares very well again to BH. They provide cost sharing for feasibility studies, which BH does not, and they base their incentive calculation on square footage rather than number of installed units. Both programs cover the same technology, however.

Program design:

Manitoba Hydro's program and Black Hills have designed their GSHP programs in a straightforward manner. Customers or their contractors contact program managers, provide project specifications and complete the necessary applications (in the case of Manitoba Hydro). Once approved, the project may proceed. Upon project completion, program manager reserve the right to inspect the facility and make any appropriate adjustments based on an audit of the project specifications.

Overall conclusion re program design: Manitoba Hydro compares favorably to the case study program. It is easy for Manitoba Hydro customers to obtain program information, locate qualified contractors and the streamlined approval processes reduce the customer's hassle factor.

Lessons from other programs:

There were relatively few utility-sponsored programs that supported commercial geothermal/ground source heat pump technologies. Our case study reflects our best judgment of how utilities might deliver cost-effective services to their customer base. Both Manitoba Hydro and our case study provide sufficient incentives to help reduce first cost barriers to installing GSHPs but this technology is still cost-prohibitive for many customers, and runs the risk of potentially increasing energy loads rather than reduce them if the program is not designed properly. Manitoba Hydro's criteria for screening eligible projects ensures that such systems do not result in increased electric load by barring, for example, building retrofits that convert natural gas fuelled heating systems to GSHP which tend to increase electricity consumption.

In our view, improvements can be made in program delivery by incorporating a whole-building approach to determining the heating and cooling needs of commercial buildings. Such an approach may identify more cost-effective opportunities which can be added to the benefits of installing a GSHP.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

Integration: Consider integrating the program into the Commercial Optimization and custom programs to acquire deep savings per facility, and reduce the administrative cost of the entire portfolio of programs. A whole-building approach increases energy savings opportunities and helps to reduce the number of customer "touches" resulting in lower administrative costs across the spectrum of services.

Workforce development: Continue educational efforts to expand the supply of qualified GSHP designers and installers. Determine whether access to qualified installers is limited in outlying areas of the province. If it is, then consider additional training and outreach. Such efforts may reduce installation costs. Increasing customer access to a pool of qualified GSHP workforce will help reduce installation costs.

Utility-owned GSHP infrastructure: To rapidly increase the number of GSHP installations, consider utility-owned GSHP loops. Since loops outlive buildings and heat pumps, proponents of GSHP argue that utility-owned loop plant will substantially reduce first cost market barriers and improve customer economics. According to an Oak Ridge Laboratory report^{*}, increased penetration of GSHP results in societal benefits as GSHP have a positive effect on load shapes and reduce peak demand. Ultimately, the loop ownership strategy is meant to ensure that loops are treated consistently with transmission and distribution lines, as both are vehicles to transmit energy to a customer's side.[†]

^{*} Hughes, Patrick, *Geothermal Heat Pumps: Market Status, Barriers to Adoption, and Actions to Overcome Barriers*, Oak Ridge National Laboratories, December, 2008

[†] Determining whether such a strategy would be appropriate for Manitoba Hydro would require additional research into its applicability to local conditions and resources. We are not necessarily recommending utility ownership of loop plant but are merely providing information with respect to alternative financing options that could increase the market share of GSHP systems.

NETWORK ENERGY MANAGER PROGRAM

SUMMARY

How does Manitoba compare?

STANDARD

- **Overcoming Market Barriers:** Manitoba Hydro has taken steps to overcome the information/hassle barrier. There is an advertising campaign as well as up-stream market actor partnering with software developers to promote efficiency in IT and server management.
- **Measure Coverage:** There isn't really a measure to compare. It is an appropriate software as well as effective management of servers, which relies on human diligence.
- **Program Design:** The Manitoba Hydro program is quite different from the EPA program. The EPA program simply gives out the information, software and relevant training for free to anyone who wants it. The Manitoba Hydro program actually requires applications for software packets, a competitive structure of eligible software products as well as a working knowledge of server efficiency management.
- **Lessons learned from other programs:** non-applicable – no other programs found for this specific area.

What works?

- Partnering with software providers creates opportunity for them to spread word about efficiency while simultaneously marketing their product
- Opportunity to capture very high level of savings in a market that is otherwise not dealt with

What are the challenges?

- Many misconceptions about limitations on server usage while running power saving software
- Lack of coordination between IT personnel and budget personnel (those who pay the electric bill)
- Fine line in efficacy between incentives for compliance and regulatory action (is this the responsibility of power companies?)

Opportunities

Manitoba Hydro should explore the following options further:

- **Regulation** – Manitoba Hydro has the opportunity to explore the feasibility of regulatory action and outreach as opposed to offering incentives for maintaining efficient servers. While there are significant savings achievable from proper server management, it is arguable whether or not it is the role of energy service providers to pay customers to use already efficient equipment as it was meant to be used.
- **Education** – There is a large opportunity for further education about the benefits of running energy saving software on institutional servers. There is often times a disconnect between the people who pay for the energy use at a company or institution and those who maintain the servers and IT network. It is important that the connection between the two be made so that the importance of efficiency does not go unheeded and the effects of efficiency do not go unnoticed.

DEFINITION OF PROGRAM AREA

The target market for network energy management programs consists mainly of office, educational and other large institutional computer networks. Programs typically focus on organizations that leave PC's and servers running 24 hours a day and that do not run energy saving software on their networks.

CURRENT MANITOBA HYDRO APPROACH

The Power Smart Commercial Network Energy Management Program is a software-technology based, prescriptive program, aimed at commercial customers utilizing personal computers (PCs) in a network setting. Savings will be achieved by promoting software programs eligible through the Manitoba Hydro Power Smart program, while raising awareness to the customer of associated energy and other benefits.

The Program will aim to capture approximately 50% of the target market in a five year time frame which represents nearly 175,000 PCs. Although the Program will focus on installing the programs on existing PCs in an organization, replacement and newly added PCs will also be eligible.

The Program will inform all customers about the savings and benefits associated with energy saving software programs. The software programs being offered will provide participating customers with reduced energy use, network-level control over system power states, the ability to apply different power settings to various user groups, flexible work and shut down schedules, reports on energy consumption, reduced operating costs, and the ability to shut down PCs at night while still installing IT patches and updates.

Promotion will include sector-specific marketing (direct mail, association presentations, trade shows, conference presence, business and association publications, and newsletter advertisements) by Manitoba Hydro in partnership with the software providers. Additional advertising will be done by the providers and their partner companies independent of Manitoba Hydro's efforts. Internal promotion will consist of comprehensive training for all involved functional areas.

Manitoba Hydro will provide a rebate to the customer pursuant to the purchase and installation of eligible software. The rebate will cover 100% of the software, installation and technical support costs to a maximum of \$15 per computer.

CASE STUDY SUMMARIES

We examined one case study for this program area, summarized below.

US Environmental Protection Agency (EPA): Energy Star Power Management: EPA's power management initiative is primarily an information awareness campaign addressed toward network administrators. Free software and on-line tips to reset factory-established power management devices

are provided to help network administrators manage energy usage even while enterprise-connected PC’s may be operational 24/7.

No direct cash incentives are offered to end users. EPA provides a free on-line savings (excel spreadsheet) calculator to determine energy savings depending on the number of PC’s and “sleep-mode” settings for PCs. Additionally, open-source software to enable PCs’ to “wake” on local area networks is provided free of charge, as well as free on-line training sessions. According to EPA’s Website, organizations may save up to \$50 per PC annually by following EPA’s power management advice.

Participating customers may also join EPA’s Low Carbon IT Campaign by completing an on-line application. As a member, an organization is entitled to free technical expertise (pertaining to determining the best way to activate power management features in a company’s IT environment), an estimate of potential savings, a certificate of recognition and possibly national recognition.

COMPARISON OF SERVICES

	Services	Manitoba Hydro	EPA
	Program Integration	<ul style="list-style-type: none"> Only one program 	<ul style="list-style-type: none"> Only one program
	Custom vs. Prescriptive	<ul style="list-style-type: none"> Prescriptive only 	<ul style="list-style-type: none"> Prescriptive only
Customer	Energy Audit	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Recommendations	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes
	Direct Install	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Incentives	<ul style="list-style-type: none"> \$15 per computer, which is equal to 100% of the cost of eligible software (including installation) 	<ul style="list-style-type: none"> No (all services and software are free)
	Financing	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Contractor Selection & Management	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Quality Control	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> No
	Other	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">
Contractor/upstream	Training	<ul style="list-style-type: none"> Training for software companies on program; training for IT personnel on efficiency 	<ul style="list-style-type: none"> Yes
	Equipment	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Free Software
	Certification	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Yes
	Incentives	<ul style="list-style-type: none"> \$15 per computer 	<ul style="list-style-type: none"> No
	Marketing	<ul style="list-style-type: none"> Up-stream market actors (software companies, computer wholesalers, IT professionals) 	<ul style="list-style-type: none"> Up-stream market actors (software companies, computer wholesalers, IT professionals)
	Other	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">

ANALYSIS

Barriers:

- **Information:** There is a considerable lack of information concerning the energy efficiency strategies appropriate for IT and server management. There are a host of misconceptions about the functionality of servers that are running efficiency software, about the processing power available, the integrity of system security and concerns over access during off-peak usage times. Many IT managers are also not involved in covering the cost of the power that servers use and so efficiency improvements are inconsequential to them.

Measures:

- **IT efficiency software:** Both Manitoba Hydro and the EPA cover this market with comparable measures. However, because this program is actually only one measure, it is not recognized as a true efficiency program by the EPA, rather as a governmental regulatory agency outreach program. There is no RIM calculation or incentive structure, the EPA simply gives out the information and technology to anyone who can use it, free of charge. Participants in the program can also receive additional information, technical support and recognition among peers with certification by becoming members of the Low Carbon IT Campaign.

Program design:

The approach Manitoba Hydro has taken in addressing the market for IT savings is commendable. There is a high savings potential, as is clearly demonstrated by Manitoba Hydro calculations on potential program savings. Manitoba Hydro has also addressed cost barriers by effectively bidding power saving software companies against one another by offering creatively set incentives to customers. However, it doesn't address a larger question, which is: what is a utility's role in promoting efficiency within a specific industry which already has a national minimum efficiency standard? In effect Manitoba Hydro is paying customers to optimize settings in their computers which are mandated by Energy Star Canada. This is not a case of bringing a wide range of complicated municipal building codes up to an acceptable efficiency baseline with incentivized efficiency upgrades, it is a specific piece of technology with a nationally mandated suite of efficiency features. The capability is already in place for servers to run at a much higher level of efficiency, as mandated by the Energy Star rating system, however, it is the job of IT personnel to optimize system function. EPA targets those savings through free education, Manitoba Hydro offers incentives for installing and running the software, but not the extensive education on why and how to use it.

Lessons from other programs:

Non-applicable - our review of the literature found no other comparable programs targeting this specific opportunity, beyond the US EPA Energy Star power management program.

OPPORTUNITIES FOR MANITOBA HYDRO

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, further analysis would be recommended before adopting program design changes.

No opportunities identified.

Strategies for the Low-Income Rental Market

INTRODUCTION AND CASE STUDIES

As part of this broad strategic review, we were asked by Manitoba Hydro to conduct a more specific review of strategies used by other jurisdictions to reach the low-income rental market and overcome the unique and acute barriers it presents to energy efficiency opportunities.

The following sections outline the key barriers particular to low-income rental housing, as well as typical strategic options used by low-income programs to overcome them. We also look at additional program design issues related to this market. Although we illustrate this discussion with profiles of six programs, we also draw on interviews with several other low income program implementers, and on our previous research and experience with effective low-income program design.

Manitoba Hydro also asked that we investigate the potential for enabling a more permanent transformation of low income rental markets. We address this question at the end of the chapter.

As part of this review, we profiled six low-income programs, chosen in part (though not always) because of their experience and leadership, and in part (again, not always) because of similarities with Manitoba's context.*

- **California: Energy Partners (Pacific Gas & Electric):** PG&E's Energy Partners is a longstanding program following a standard state-wide design mandated by their regulator. The program is open to both tenants and homeowners paying electric and/or gas bills. It is delivered by 17 regional weatherization contractors coordinated by an administrative contractor. Participants receive all cost-effective measures with no cap on spending per home. Eligible measures include insulation, air sealing, heating and cooling system replacement, lighting and light measures, and appliance replacement. Measures are installed at no charge by program contractors, irrespective of building ownership.
- **Pennsylvania: Low Income Usage Reduction Program (Peco):** The Low Income Usage Reduction Program (LIURP) is offered by a combined gas and electric utility, PECO. The program follows a general universal low income program design as determined by the state Public Utility Commission. It targets high-use, lower-income customers and offers a comprehensive set of measures, at no cost, based on a whole-house energy audit. Homeowners can receive CFLs, light DHW measures, one-on-one education, insulation and air sealing, HVAC replacement and appliance replacement. Tenants in single-family homes are not eligible for HVAC and appliance replacement, and tenants in multi-family buildings are only eligible for CFLs, light DHW measures, and education. See also our section on low-income programs.

* For example, we chose not to present New York's Assisted Multifamily Program because of the prevalence of very large multifamily buildings comprising hundreds and even thousands of residential units, a far cry from Manitoba's multifamily housing stock.

- **New Jersey: Comfort Partners (NJ Clean Energy Program):** Comfort Partners is a state-wide program overseen by gas and electric utilities and contracted out to three third-party administrators. Eligible customers receive a home audit and free installation of cost-effective envelope, HVAC, domestic hot water and baseload measures, up to a spending cap determined by prior household energy use. Tenants are not eligible for heating system or hot water heater replacements. See also our section on low-income programs.
- **Vermont: Weatherization Assistance Program / EVT / VGS Programs:** The WAP program is managed by the state Department for Children and Families and implemented by five non-profit community action agencies (CAAs). Efficiency Vermont supplements the WAP's envelope measures with additional funding for electric efficiency measures, and works directly with a number of multifamily building landlords outside of the WAP process. Vermont Gas funds gas measures delivered by the WAP. The program offers turnkey installation of envelope measures, HVAC replacement and repair, DHW replacement and repair, lighting and appliance replacement. Both renters and homeowners are eligible for all measures. Landlords are asked to contribute to costs in some cases, but the program is otherwise 100% subsidized.

Efficiency Vermont also has a standalone program for multifamily buildings (both low-income and non-low-income), generally negotiated on a case by case basis, possibly including a significant (>25%) landlord co-pay. The program emphasizes an “account management” approach favouring long-term relationships with landlords. Measures can include envelope work, lighting and appliance replacement, light DHW measures and conversion of electric heating or DHW to oil or gas systems.

- **Saskatchewan: Saskatchewan Home Energy Improvement Program (provincial government):** SHEIP provides grants for homeowners and landlords for insulation, air sealing and heating system efficiency upgrades. Participants must first pass through the Saskatchewan Energuide for Houses (SEGH) program (working in sync with ecoENERGY) and then apply for SHEIP grants, which are set amounts per household or per multifamily building unit. Landlords and homeowners are eligible for the same measures but grant levels differ. Although the program is open to multifamily buildings, to date only single-family building owners have participated.
- **New Brunswick: Energy Efficiency Retrofit Program for Low-Income Households (provincial government):** The EER program, started in 2006, is co-delivered with the federal-provincial repair program (FPRP)* – most participants also receive substantial FPRP funds for non-efficiency retrofits. Landlords participate rather than tenants. Participants receive a free ecoENERGY audit and a proposed package of measures provided by program staff. Incentives are based on measure costs and are capped per home, with additional low-interest financing available. In theory, participants must find their own contractors, who provide the program manager with sealed bids; the program manager chooses the contractor.† The program does little marketing and has a waiting list. Although it has focused to date on developing its offerings for single family homes, it has substantial rental property participation due to co-delivery with the longstanding FPRP program. The program receives ecoENERGY incentives directly and integrates these funds into the general budget.

See our profiles section in Appendix 2 for more details on each case study.

* Also known as the Residential Rehabilitation Assistance Program (RRAP).

† In practice, the Department of Social Development provides significant “hand-holding” to assist in obtaining quotes.

ADDRESSING BARRIERS

Programs targeting energy efficiency retrofits in rented low-income homes face three levels of barriers: barriers to efficiency retrofits in general, barriers unique to low-income households, and barriers unique to rented housing. The table below sums up these barriers.

General Retrofit Barriers	Low-income barriers	Low-income Rental barriers
<ul style="list-style-type: none"> • Hidden costs or benefits <i>(e.g. need to add ventilation to compensate for better air tightness)</i> • Performance uncertainties <i>(e.g. extent of bill savings to expect)</i> • Information or search costs <i>(e.g. to find cost-effective opps)</i> • Information asymmetry <i>(e.g. re. quality installation)</i> • Service unavailability <i>(e.g. no experience in installing GFX)</i> • Hassle or transaction costs <i>(e.g. finding qualified contractors)</i> • Access to financing/capital • Split incentives <i>(e.g. re. future homeowners)</i> 	<p>More severe*:</p> <ul style="list-style-type: none"> • Hassle or transaction costs • Access to financing/capital <p>New*:</p> <ul style="list-style-type: none"> • Contractor lack of interest 	<p>Less relevant**:</p> <ul style="list-style-type: none"> • Access to financing/capital <p>New**:</p> <ul style="list-style-type: none"> • Landlord-tenant split incentives • Landlord business models • Landlord reluctance

*in comparison to the general retrofit opportunity market

**in comparison to the general low-income owner-occupant retrofit opportunity market

Our analysis will focus mainly on unique rented housing barriers. See our sections on residential retrofits and low-income retrofits for more detail on barriers facing those program categories.

In the following sections, we provide an overview of each barrier, strategic options for overcoming them, and a summary of how our six case studies address – or fail to address – these barriers.

ACCESS TO FINANCING/CAPITAL (LESS RELEVANT)

One of the most important justifications for standalone low-income efficiency programs is the relatively greater difficulty low-income households face in paying for efficiency retrofits. To overcome this barrier, programs offer very high levels of incentives – typically 90-100% of all costs. However, when a program targets rental housing, this barrier becomes less relevant. Landlords of low-income tenants, in principal, face the same barriers faced by all residential landlords: whatever difficulties they face around access to capital are similar (though perhaps more pronounced – see our later discussion on business models) to those faced by landlords with non-low-income tenants.

This difference raises the question: *should landlords, who are not low income, still receive the generous incentives offered to low-income homeowners?* Most programs choose to continue offering high levels of incentives, but for different reasons. The three new barriers discussed below (landlord-tenant split incentives, landlord business models and landlord reluctance) replace access to capital as the drivers behind high incentive levels. The split incentives barrier is the most significant of these three, and most programs therefore limit participation to rental units where landlords are not responsible for energy (or at least heating) costs. Where landlords pay energy bills, they largely face the same barrier as landlords of non-low-income tenants, and can often be more appropriately targeted, with some nuances, by general efficiency programs.

We should note that access to capital is still a significant barrier where low-income tenants are responsible for measure costs. Typically, this includes purchasing light bulbs, small appliances, and in some cases larger appliances such as refrigerators and freezers, but rarely includes such measures as comprehensive air sealing, insulation and heating / hot water systems.

LANDLORD-TENANT SPLIT INCENTIVES

A split incentive occurs when efficiency investment benefits and costs don't accrue to the same actor. In rented housing, one of several situations can occur:

- **Tenants pay electricity bills, landlords pay heating bills:** This situation is only relevant for non-electrically-heated homes (in electrically-heated homes, this is a "tenant pays all energy bills" situation – see bullet below). In most cases, this situation presents the lowest level of split incentives.* Landlords pay for and obtain benefits from envelope and heating system improvements, while tenants pay for and receive benefits from using efficient light bulbs, appliances and room air conditioners, as well as benefitting from any electricity conservation behaviour. Split incentives are still present for heating energy conservation behaviour, lighting fixtures and any appliances owned by landlords.
- **Landlords pay all energy bills:** this situation also has a low level of split incentives. Landlords stand to reap any benefits from investments in the building's envelope, HVAC systems, and DHW systems, and are also responsible for paying for these investments. On the other hand, split incentives are present for lighting, appliances and behaviour: where tenants purchase appliances and light bulbs, there is a split incentive since costs are paid by tenants and benefits accrue to landlords. Similarly, any energy-saving behaviour by tenants (turning down thermostats, taking short showers, etc.) only benefits the landlord.

* Insofar as "hard" efficiency opportunities are concerned. This context does however create a significant barrier for behaviour-related savings opportunities.

- **Tenants pay all energy bills:** this is the most difficult situation for rental units. Where tenants pay all energy bills, owners have little interest in spending their own money to lower utilities.*

Impact on programs: The biggest impact of this barrier on programs is landlord and tenant reluctance to pay for measures in cases where they do not receive any benefits. It also reduces tenant interest in energy conservation *behaviour*.

Options: As a general rule, case study programs address these barriers through incentive levels (compensate barriers) and mechanisms to distinguish between bill paying and non-bill paying tenants.

- **High incentive levels:** Generally, programs use high incentive levels to overcome split incentives where applicable. As mentioned earlier, split incentives essentially replace homeowner lack of access to capital as one of the main drivers for high incentive levels.
- **Require tenant bill payment:** Most utility programs limit participation to buildings where tenants pay energy bills, based on the logic that this is where the highest level of split incentives occur.†
- **Differentiation:** Some programs vary their measure offerings based on who pays which utility bills, whether by varying applicable measures or landlord contributions.

The summary table below provides a snapshot of how our case studies use these strategies. Essentially, we can see that our four utility-funded programs (CA, PA, NJ and Efficiency Vermont) cover 100% of measure costs but only offer the program where tenants pay energy bills. On the other hand, the three state-funded programs (Vermont WAP, SK and NB) all cover low-income tenants regardless of bill payment, likely due to a focus on social goals beyond the energy savings and ratepayer equity goals that drive most utility programs.‡

* This is a simplified point. In fact, owners have other reasons to invest in energy efficiency, including minimizing turnover, increasing rental value and improving the capital for resale. See the “business model” discussion for further consideration of these drivers and their applicability to this market segment.

† Although lower incentives may still be required where split incentives are less of an issue (for the same reason that incentives are offered to home and business owners).

‡ Ratepayer equity refers to the need to ensure that all ratepayers are equally able to participate in programs funded by rates, because ratepayers are all contributing to the cost of these programs. According to this argument, if low-income households are contributing to programs via rates, but can't participate because they face unique barriers, then specific strategies need to be offered that overcome those barriers. Most utility low-income programs are focused on ratepayer equity and energy savings opportunities.

On the other hand, low-income programs can also be developed to meet many social goals, in particular poverty alleviation and redistribution of resources. Here the argument for a low-income efficiency program is generally that lower-income households spend a disproportionate amount of their income on heating and cooling bills and face comfort and health and safety concerns because of poor quality housing. Many government-sponsored programs, such as the US Weatherization Assistance Program, were created with a focus on social goals.

Program	High incentive levels	Tenants must pay at least one utility bill	Differentiation Strategies
CA: Energy Partners (PG&E)	Yes (100% of cost)	Yes	
PA: LIURP (Peco)	Yes (100% of cost)	Yes	Insulation/air sealing in SF homes only available if gas bill paid
NJ: Comfort Partners (NJCEP)	Yes (100% of cost)	Yes	
VT: WAP/EVT/VGS programs	Yes (80%-100% of cost)	WAP: No EVT: Yes	Higher landlord co-pay where landlord pays bills.
SK: SHEIP/ecoENERGY (SK gvt)	Yes (higher than non-low-income retrofit)	No	No
NB: EER (NB gvt)	Yes (higher than non-low-income retrofit)	No	No

LANDLORD BUSINESS MODELS

In addition to lowering their own utility costs (when split incentives are not an issue – see previous discussion), landlords may have at least three other drivers to invest in the energy efficiency of their buildings:

1. To reduce turnover
2. To increase rental value
3. To increase resale value (intrinsically linked to the former point)

The interest in reducing turnover depends largely on economic and housing market conditions, although some landlords may attribute value – though limited in the absence of significant energy efficiency “sales” efforts – to this opportunity.

Beyond reduced utility bills and turnover, the most common reason for landlords to invest in efficiency is to increase rental and resale values. Unfortunately, this driver is less relevant in the low-income market, since the combination of rent controls and limited disposable incomes place severe restrictions on the ability to increase rental values significantly.

A further barrier to efficiency in the low-income rental market has to do with landlord business models. Indeed, anecdotal evidence suggests that many landlords of predominantly low-income private housing tend to invest minimally in housing renovations and improvements: low rents (and sometimes rent controls) often translate into a “buy cheap and hold” – not reinvest – business model.

For all these reasons, programs generally find it necessary to compensate these barriers through higher incentives.

LANDLORD RELUCTANCE

Landlords of low-income tenants can be reluctant to participate in programs for multiple reasons. Beyond the inconveniences of the program itself, which are faced by all participants, landlords may be reluctant out of concern that energy audits will identify other issues that require expensive renovations, or because of obligations imposed by the program, such as limitations on rent increases or resale.

Options: Programs can address landlord reluctance by keeping any obligations simple and as limited as possible (although this can conflict with other program goals). Programs can also offer to cover part or all of health and safety related costs, especially insofar as additional funding from other government agencies may be available. Finally, high incentive levels are often used to overcome landlord reluctance.

Case study use of strategies: As the table below illustrates, most programs cover at least minor health and safety measures. All of our case studies require a commitment regarding rental increases, and two programs require a partial payback of funds if the building is sold within a short period of time, or program terms are violated. Only the latter two programs have enforcement mechanisms in place (liens) to deal with non-compliance.

Program	H&S coverage (if required for EE)	H&S coverage (non-EE related)	Landlord obligations
CA: Energy Partners (PG&E)	Yes	Yes (minor)	Basic: No rent increase
PA: LIURP (Peco)	Unknown	no	None
NJ: Comfort Partners (NJCEP)	Yes (minor)	Yes (minor)	Basic: No rent increase or eviction
VT: WAP/EVT/VGS programs	Yes	Yes (minor)	No rent increase; 3-year lien*
SK: SHEIP/ecoENERGY (SK gvt)	No	No	Basic: No rent increase
NB: EER (NB gvt)	Yes – covered by sister program.	Yes – covered by sister program.	No rent increase; 10-year lien [†]

* Landlord required to pay back program costs as followed if house is sold: 75% if sold within 1 year; 50% if sold within 2 years; 25% if sold within 3 years; 0% thereafter.

[†] Landlord required to pay back program costs if program terms violated or house is sold: 10% of costs forgiven per year.

OTHER CHALLENGES

As we discussed previously, different low-income programs may not always share the same objectives. Some programs are aimed primarily at securing cost-effective energy savings opportunities. Their focus is therefore on ensuring that they overcome the unique and heightened barriers this market segment faces in order to contribute to *the utility's (or society's) overall energy efficiency goals*. Other programs are borne of a concern for equity – ensuring that low-income customers who contribute to the overall energy efficiency budgets can also benefit from the savings opportunities they generate – or of a desire to use energy efficiency as a tool for poverty reduction. These programs give more weight to ensuring that *benefits flow to low-income customers*, relative to achieving energy efficiency *per se*. Ultimately, programs face a tradeoff between maximizing overall energy savings and maximizing the share of related benefits that accrue to low-income customers.

Programs that are concerned with equity (or poverty reduction) – and therefore with ensuring that benefits accrue to low-income customers – face two unique challenges:

- 1. Linking up-front incentives to low-income participants:** some programs are concerned that incentives may be provided unnecessarily to non low-income customers, e.g. to landlords.
- 2. Linking long-run benefits to low-income participants:** many programs are concerned that the benefits of the program may not accrue to those who need it the most. The reader should note that this concern is strictly one of social equity, and has little bearing on energy savings per se.

Below we discuss the options (and tradeoffs) for addressing each of these challenges, and present the choices made by our case studies.

1. LINKING UP-FRONT INCENTIVES TO LOW-INCOME TENANTS

In our experience, there is a common misconception with low-income programs: the confusion between incentives (meant to encourage a decision-maker to make different choices) and support subsidies (meant to ensure a minimum quality of life for those who cannot meet their own needs).

A low-income *energy efficiency* program for multifamily buildings clearly falls into the former category. Incentives (including direct installation of measures) are not meant to support low-income customers directly; rather, they are meant to encourage or ensure that those with decision-making authority – whether they be landlords or tenants – adopt energy efficiency measures. Those measures can then result in benefits that accrue to tenants, whether bill reductions or improved comfort, health and safety (see the following section).

In this regard, effective programs ensure that incentives are aimed at those with decision-making authority. In the case of building envelope measures – and in some cases appliances as well – this means

providing incentives to building owners, not tenants. Where tenants are responsible for purchasing lighting and/or appliances, incentives should flow to them.

From an equity standpoint, however, the challenge for all programs is to ensure that incentives are “just right”: in this case, neither too generous as to unduly benefit landlords, nor too weak as to miss opportunities for cost-effective or otherwise advantageous energy savings.

Options: Many low-income programs are especially concerned with not providing undue incentives to landlords. Incentives are “undue” if we could reasonably assume that landlords – because they pay some energy bills, or for other business reasons (see discussion on split incentives) – would be interested in adopting measures with significantly less incentives. To respond to this concern, two options are available:

- **Exclude measures:** Some programs limit the number of measures available for tenants out of concern that benefits will accrue to landlords. For example, program designers may determine that, since landlords are often responsible for the heating bill, the program should be limited to baseload measures that only reduce a tenant’s electricity bills. This strategy has several important drawbacks: a) the program fails to take advantage of savings from installing all cost-effective measures while auditors and contractors are already onsite; b) it risks missing significant opportunities in those cases where the assumption proves wrong, i.e. where the landlord *does* pay the electric bill as well; and c) low-income tenants would lose the benefits of increase comfort and, in some cases, health and safety as well.
- **Require landlord contributions:** Another solution to landlords benefitting “unnecessarily” is to require landlord contributions. Contributions can be a set percentage of costs or negotiated on a case by case basis, or program incentives can simply be set per unit. Contributions can also vary based on the degree of split incentives present – requiring higher landlord co-payments if landlords pay for both electricity and heating, and being more generous if landlords pay only electricity (or neither). (This option is unavailable for most utility-run low-income programs, in which tenants must pay energy bills to be eligible in the first place.) Another option, applied for example by PG&E, is to require a contribution for some measures (e.g. refrigerator replacement), but not others. The chief risk with any form of landlord contribution is the difficulty, barring one-on-one negotiations as in Vermont, to determine appropriate contribution levels, and setting the bar too low can lead to lost opportunities.

Case study use of strategies

- **Limiting measures:** Only two of our case studies limit measures for tenants. Specifically, Pennsylvania and New Jersey do not offer HVAC and hot water replacements to tenants, and Pennsylvania in fact goes further, offering multifamily households only light measures and education (an approach that has also proven a resounding failure – primarily for cost reasons – in Québec). Our experience with other low-income programs has also found these approaches to be exceptions, not rules: most programs do not limit measures for tenants, preferring the risk that landlords benefit unduly over the risk of missing opportunities that could benefit all parties.
- **Landlord co-pays:** Most of our case studies require little or no landlord co-pay. California requires limited landlord contributions for refrigerator replacements only, but program administrators at PG&E are reconsidering this requirement because of low uptake. Vermont’s WAP program successfully uses landlord negotiation techniques, but reports that in the final analysis, co-pays

average less than 10% of measure costs. The negotiation process is seen as most useful for the leverage it provides the program in encouraging additional landlord non-monetary contributions – for example, co-pays are often waived in exchange for landlord work such as clearing out attic spaces or installing simple health and safety measures beyond the scope of the program. SHEIP and ENB both offer set incentives, which in theory could require landlord contributions; however, in practice, both programs report that landlords rarely install measures at their own expense.

This pattern also fits with the results of other research we have conducted on low-income programs – of more than thirty programs we reviewed in 2007, only 6 required a landlord contribution, and even those were minor in scope.* Again, program administrators generally felt that obtaining a degree of landlord co-payment wasn't worth the risk of reduced participation and the added complexity in program management. That being said, some programs using Vermont's negotiated approach have reported success, again citing leveraged landlord effort as a benefit. We should also point out that other factors can make it easier to obtain landlord contributions – for example, in New York State, NYSERDA is able to obtain high participation levels in its *large* multifamily building program despite requiring 60-80% co-payment rates, because the program piggybacks on other state regulations that require landlords to renovate their buildings.

Program	Exclude measures	Landlord co-pays
CA: Energy Partners (PG&E)	No	\$200 for refrigerator replacement
PA: LIURP (Peco)	Yes – SF renters not eligible for HVAC, DHW and appliance replacement. Multifamily units receive only light measures.	None
NJ: Comfort Partners (NJCEP)	Yes – no heating or DHW replacement	None
VT: WAP/EVT/VGS programs	No	Negotiated (0-20% of costs, higher where landlords pay energy bills)
SK: SHEIP/ecoENERGY (SK gvt)	No	Set per unit incentives [†]
NB: EER (NB gvt)	No	Set per unit incentives [‡]

On the whole, we do not believe that experience justifies excluding measures, especially insofar as energy savings remain at the heart of the program's logic. As for requiring landlord contributions, the jury is out: while there may be opportunity to leverage landlord interest, the cost of missed opportunities may outweigh any actual benefits.

* Among other programs, we reviewed 18 comprehensive programs profiled in ACEEE, 2005, 8 programs profiled in Chartwell 2007, and 4 programs from ACEEE 2003.

[†] Landlords reportedly rarely spend beyond program funding.

[‡] Landlords reportedly rarely spend beyond program funding.

2. LINKING LONG-RUN BENEFITS TO LOW-INCOME TENANTS

A second, more common concern is that of ensuring that low-income tenants *retain* the long-run benefits of reduced utility bills. This concern is borne of two scenarios:

- Low-income tenants’ income levels increase soon after participation. For example, students or unemployed individuals obtain or return to full-time work; and
- Low-income tenants are replaced by non-low-income tenants soon after program participation, either by eviction, sale of the building, or natural (or incited) turnover.*

Options: No programs we have reviewed attempt to limit eligibility to avoid “temporary” low-income customers (students, unemployed), except insofar as asset indicators (e.g. expensive house and car) may provide evidence that a household is clearly middle- or upper-class. Students are generally accepted as valid “low-income” targets since, from an energy efficiency barriers (not social equity) perspective, they are unlikely to invest in the buildings they occupy, and buildings that house students often retain that primary vocation despite high individual turnover. Furthermore, insofar as this *may* generate some free ridership, program managers we have spoken with believed it was either too difficult to control, or that control would result in too many missed opportunities from an energy savings perspective.

As for issues regarding turnover to non low-income customers, programs generally address these issues by requiring commitments from landlords that they will not raise rents or evict tenants. Some programs may develop procedures to enforce these provisions.

Case study use of strategies

All of our case studies, except PECO (which limits available measures in the first place), require a landlord agreement. Only two of the programs, Vermont WAP and NB, have enforcement mechanisms. None have reported significant issues with landlords raising rents *or* evicting tenants.

Program	Landlord commitments	Enforcement mechanism
CA: Energy Partners (PG&E)	Agreement re rental increases and evictions.	None
PA: LIURP (Peco)	None	None
NJ: Comfort Partners (NJCEP)	Agreement re evictions	None
VT: WAP/ EVT / VGS	Agreement	3-year lien [†]
SK: SHEIP/ecoENERGY (SK gvt)	Agreement	None
NB: EER (NB gvt)	Agreement	10-year lien [*]

* One scenario is that landlords might attempt to charge tenants higher rents because of improvements installed by the program. However, rent controls, combined with proper information provided to low-income tenants, best address this issue.

[†] Landlord required to pay back program costs as followed if house is sold: 75% if sold within 1 year; 50% if sold within 2 years; 25% if sold within 3 years; 0% thereafter.

* Landlord required to pay back program costs if program terms violated or house is sold: 10% of costs forgiven per year.

3. MULTIFAMILY BUILDINGS: ELIGIBILITY AND PROOF OF INCOME

All low-income programs must decide on income-cut offs or other criteria for participation, as well as a method for proving eligibility. Multifamily rental units create two new wrinkles. Firstly, if programs address measures that affect the entire building (envelope, heating system and common areas), they need to find a way to ensure program funds are indeed targeting low-income households – either by requiring that a minimum percentage of tenants meet income criteria, by setting funding levels per low-income unit or through other mechanisms. Secondly, where a minimum percentage of tenants need to be low-income, collecting proof of income to determine if a building is eligible can be time consuming. A simple method is to require landlords to obtain proof of income, but this can lead to privacy issues if tenants are reluctant to share income information with landlords.

Program strategies: As mentioned, programs have several options to ensure funds are tied to low-income retrofits, each with its own tradeoffs: setting a minimum percentage of tenants who must meet income criteria (though obtaining proof of income can be difficult), linking funding levels to the number of income-eligible units (although the latter approach will necessarily reduce total incentive levels unless most or all of a building is eligible), limiting eligible measures to those (baseload) linked strictly to individual units within multifamily buildings (although this obviously leads to missed opportunities), or entrusting program staff or contractors with a subjective “judgment call” based on neighbourhood incomes or other factors.

Case study use of strategies: LIURP simply does not target multifamily envelope and HVAC opportunities. CA, NJ and VT all set minimum percentages for buildings as a whole. SK and NB both provide funds on a per unit basis. CA, PA, NJ and VT WAP all use auditors to collect proof of income, despite the additional cost and complexity. SK and NB rely on landlords to collect proof but make the process relatively simple, requiring only a signed declaration of eligibility. Efficiency Vermont has developed an interesting proxy, using rent levels to judge eligibility rather than income levels.

Program	Minimum % low-income tenants	Proof of income	Collection of proof
CA: Energy Partners (PG&E)	80% <i>(for envelope and HVAC)</i>	Other programs, varied, auditor judgment	Auditor
PA: LIURP (Peco)	n/a	Other programs, varied.	Auditor
NJ: Comfort Partners (NJCEP)	50%	Other programs, varied.	Auditor
VT: WAP/ EVT / VGS	50%	WAP: other programs, varied Utility: Via rents, not income	WAP: auditor Utility: Landlords
SK: SHEIP/ecoENERGY (SK gvt)	n/a (grants per unit)	Signed declaration	Landlord
NB: EER (NB gvt)	n/a (grants per unit)	Signed declaration	Landlord

Ultimately, options for determining (and proving) eligibility can vary tremendously, and may depend on local context. Manitoba Hydro could consider whether local conditions – postal code based income pockets, for example, and/or provincial-government data sharing – could provide simpler alternatives to collection of individual proofs of income.

TRANSFORMING LOW-INCOME RENTAL RETROFIT MARKETS

In the energy efficiency context, a market is said to have transformed when permanent changes to the market have reduced barriers to the point that targeted efficiency programs are no longer necessary. In other words, consumers and market actors are installing societally cost-effective energy efficiency measures of their own volition. For example, many jurisdictions have in the past used advertising campaigns and incentives to try to convince consumers to buy Energy Star dishwashers. Today, over 90% of dishwashers sold in North America meet Energy Star requirements without program incentives; the market has been transformed.

To answer the question of whether or not low-income rental retrofit markets can or are being transformed, we need to assess possible strategies for reducing the market barriers in place. In the two-page table below, we provide an overview of barriers – and potential strategies – as they pertain to energy efficiency renovations in the general homeowners' market, as well as additional barriers that apply to low-income customers in general and to low-income rental markets in particular.*

As the table illustrates, the general (non-low income) home retrofit market is unlikely to ever be fully transformed, although government legislation could eliminate several key market barriers. Indeed, obligatory home energy ratings and similar "time-of-sale" legislation can be used to create a permanent market for energy audits, provide homeowners with information on the opportunities and savings available for their home, and to some extent bring efficiency into the home-buyer decision-making process.

Remaining barriers related to the availability and quality of contractors could also be reduced, though not eliminated. Improved building codes that include mandatory energy modelling and inspection of insulation, air sealing and HVAC sizing could address quality issues, if applied to home renovations as well as new construction. A review of trades standards and certification requirements could ensure that effective air sealing, insulation, HVAC sizing and other efficiency practices are

Resource Acquisition vs. Market Transformation

Energy efficiency programs are sometimes categorized – simplistically – as either "resource acquisition" programs or "market transformation" programs.

Resource acquisition programs are focused on obtaining savings by directly encouraging the installation of energy efficiency measures. Typical strategies include consumer rebates and turnkey installation programs.

Market transformation programs, on the other hand, try to create self-sustaining changes to market conditions that permanently reduce market barriers. These programs might focus on improving codes and standards, influencing manufacturers to provide more efficient products, or training contractors on more efficient practices.

Ultimately, resource acquisition programs are often key to enabling market transformation, strategies for the latter – including regulations – providing an "exit strategy" for programs themselves.

* In this table, we limit "solutions" to those that can successfully *eliminate* barriers and *transform* the market – in keeping with the purpose of this section – as opposed to programs that can *temporarily overcome* barriers.

integrated in trade school curricula, and increased market demand via obligatory home ratings and building code requirements could motivate contractors to adopt these practices.

That being said, the legislative changes we have described are far reaching and would require substantial resources and political will to put into place. No single jurisdiction we are aware of has yet to systematically adopt such far-reaching legislative changes.

Eliminating barriers to low-income homeowner markets is substantially more difficult still. The biggest barrier faced by low-income homeowners (and low-income tenants installing baseload measures) is access to capital and financing. There is simply no way to eliminate this barrier outside of comprehensive social and economic policy. The same goes for contractor disinterest.

Transforming low-income rental markets is yet more daunting. While aggressive legislation can address some key split incentives, it would create new ones as well. Similarly, legislation requiring building efficiency upgrades at key trigger moments – at sale, for example, or at the time of major renovations –, while increasingly considered in other regions, is unlikely to be adopted quickly and raises other issues and potential unintended consequences worthy of serious prior consideration.

By and large, market transformation in the low-income rental market, while conceivable to a certain extent, cannot be achieved easily nor merely by energy efficiency programs. Such programs can generate cost-effective energy savings in the short-term, but long-run market transformation is best addressed through a comprehensive legislative effort.

Table 10 Assessing the potential to transform the low-income residential retrofit market

	Barriers	Example	Elimination strategies	Potential to eliminate
Typical homeowner markets	Hidden costs and benefits	Customers are unaware that weatherization reduces HVAC loads and required equipment capacity / cost at the next replacement	Extensive training, certification a/o regulation to ensure proper HVAC sizing using building simulation software, and to help contractors explain sizing benefits when discussing with owners.	Low: information would hit against performance uncertainty; transforming HVAC industry is costly and complex.
	Performance uncertainties	Homeowners can't easily evaluate how much money and energy they will save from retrofits.	Obligatory energy ratings: required energy ratings could provide all homeowners with a market incentive (resale value) for retrofit measures. Development of energy auditor industry: The development of the energy auditor industry via ecoENERGY and its provincial equivalents has reduced this barrier.	Medium: an energy auditor industry already exists in Canada and an obligatory rating scheme would help; however software tools are inadequate to accurately predict real home energy savings.
	Information or search costs	Homeowners don't have an easy way to identify what work needs to be done, and obtaining the information is costly a/o time-consuming.	Obligatory energy ratings: required ratings, if linked to audits with measure recommendations, could provide homeowners with appropriate information. Information: develop, maintain a/o integrate other analysis tools (including B/C tools) into audits.	High: an energy auditor industry already exists in Canada and an obligatory rating scheme, including advanced analysis tools, could go a long way toward reducing this barrier.
	Information asymmetry	Homeowners can't evaluate the quality of contractors' work and can't always distinguish good contractors from bad.	Independent contractor certification: Rigorous certification standards backed up by quality control mechanisms can address this barrier (Manitoba's geothermal industry may be a case in point). Stringent building codes backed by inspections: This approach has been used successfully for other markets, most notably in California, where virtually all new construction passes through an energy audit that will in the future include full inspection of insulation and air sealing.	Medium: Energy codes for building could have a major impact if applied to renovation projects. Building code changes are however notoriously slow and require substantial political will. Contractor certification schemes are effective but depend on market demand and can be extremely difficult to apply to the market for home renovation contractors.
	Service unavailability	There are not enough qualified contractors to provide sufficient energy audits, turnkey efficiency retrofits, and quality air	Critical mass via efficiency programs: One of the goals of most retrofit efficiency programs is to build market demand leading to a critical mass of skilled auditors and contractors. Obligatory energy ratings: ratings would create a	High: Energy rater infrastructure is already well developed and improved contractor standards could successfully create an infrastructure for trades. However, without market demand (generated, for

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	Barriers	Example	Elimination strategies	Potential to eliminate
		sealing and insulation.	permanent market demand for audits, and lead to increased demand. Contractor training and standards: Increased building science content and testing in trades standards can ensure all standard contractors have the skills necessary for retrofits.	example, by obligatory energy ratings and stringent building codes), infrastructure is unlikely to develop fully.
	Hassle/transaction costs	Organizing a retrofit is time consuming and disruptive.	None	None
	Split incentives	Homeowners don't receive the full benefit of measures if they sell the home before the end of the measure payback period	"Time of sale" obligatory energy ratings: If sellers are required to include energy ratings in home listings, it becomes more likely that home buyers will pay for efficiency.	High: limited experience with existing energy rating policies suggest that buyers are willing to pay a significant premium for efficient homes when accompanied by a market-wide rating scheme.
+ low-income	Access to financing/ capital	Homeowners don't have the liquidity to spend on retrofits and are unable/reluctant to obtain credit.	None	None
	Contractor lack of interest	Contractors are less interested in working for lower-income customers.	None	None
+ LI rental market	Landlord-tenant split incentives	Landlords (or tenants) pay for measures but don't receive energy savings benefits	Regulation: In theory, legislation could require landlords to assume heating bill responsibility for all rental properties.	Low: the legislative approach could address this, but create or increase split incentives around baseload measures and energy conservation behaviour.
	Landlord business models	Landlords of low-income housing tend to invest less in buildings	Regulation: Minimum building efficiency or upgrade standards at defined triggers (e.g. at time of sale).	Low: Legislation would likely be difficult to adopt without prior adoption of time of sale disclosure requirements, and could generate unintended consequences.
	Landlord reluctance	Landlords are reluctant to participate if programs place restrictions or trigger health and safety retrofits.	N/A (<i>this barrier is specific to programs, not markets</i>)	N/A

LESSONS FOR MANITOBA HYDRO

The most important dynamic for this program area is the tension between overcoming split incentives (and other barriers) and ensuring program benefits flow to low-income tenants. In other words, there is a conflict between ensuring landlord participation and ensuring the flow of benefits to tenants. Most utility programs limit participation to buildings where tenants pay at least one energy bill, to ensure that they are in fact targeting markets where split incentives are significant. Beyond this, most programs weigh in on the side of maximizing participation, providing full incentives and equal access to measures for landlords and tenants alike. They justify this choice by the presence of split incentives and other barriers – landlord reluctance and landlord business models. They also choose this approach because it is simpler to manage, and because landlord contributions are unlikely to be significant.

Where programs do require landlord co-pays, negotiated contributions appear to be more successful than set contribution levels (with the possible exception of large multifamily buildings). Although negotiation requires an additional skill set for program staff (or contractors), it can be used to leverage landlord efforts that might otherwise be impossible to obtain. In particular, where programs do not have budgets or the mandate for preparatory work or health and safety measures, reduced financial contributions can be traded for landlord effort.

There are a few other less common strategies for linking program benefits to split incentive levels and the presence of low-income tenants. These include tying measures to bill payments and not offering all measures to landlords. The problem with these approaches is that they create missed opportunities. Once a program has expended the substantial effort to enrol a participant and audit the home, ideally it should find a means to install all possible cost-effective measures. In the final analysis, low-income renters will not be better off if efficiency benefits – including improved comfort, health and safety – are unduly left behind

The second tension in program design is the conflict between overcoming landlord reluctance and protecting tenants post-program. Landlords are naturally reluctant to participate in programs that place limitations on them, particularly where split incentives mean that benefits accrue mostly to tenants. On the other hand, programs managers want to make certain that the improvements they provide don't lead to eviction or raised rents. The most common compromise is for programs to require basic commitments regarding rent increases, but not to develop onerous liens or other such schemes.

Finally, programs have to decide how to deal with multifamily buildings, where there is likely a mix of low-income and non-low-income tenants. The most common approach is to require that a minimum % of occupants meet income criteria: the disadvantage here is that many landlords may not be able to participate despite facing significant barriers. An alternative, less common approach is to provide incentive levels by unit, although this can make the program less worthwhile for landlords since they require a larger co-payment. Other alternatives involve more subjective judgment, which may be relevant depending on contractor selection and quality control.

The potential for market transformation: As we have discussed above, voluntary programs alone cannot be expected to eliminate barriers and transform the low-income rental market in favour of

energy efficiency. Rather, programs can focus primarily on achieving cost-effective energy savings; they can also collaborate with – and even encourage – legislative approaches with more opportunity for market transformation.

Summary of Recommendations

Caveat: The following suggestions are based on a relatively high level review of program designs. In all cases, our recommendations have focused on suggesting options to consider, and further analysis would be recommended before adopting program design changes.

Portfolio Level

Gap Analysis

Closing program gaps by creating or expanding programs for: multifamily residential housing, manufactured new homes, consumer electronics and office equipment, appliance retirement, commercial new construction, commercial custom retrofits and small commercial retrofits.

Providing market actor training in the residential sector, beginning with a comprehensive review of opportunities and needs for market actor training for all programs.

Using upstream incentives in both residential and commercial/industrial sectors, beginning with a comprehensive review of the potential of upstream incentives in all programs. Market actors - retailers, designers, and contractors – are uniquely situated to help customers overcome several market barriers. Product unavailability can be overcome by increased retailer and contractor stocking, which can be encouraged by stocking incentives and market share incentives. Hassle and transaction costs involved in integrating efficiency into complex building designs can be overcome by offering design incentives through owners directly to their design teams. Product first cost can be more effectively reduced via negotiated cooperative promotions (product buydowns) offered to manufacturers and wholesalers. Sales staff incentives can also be used to ensure customers receive adequate information on product efficiency features..

Regulatory Environment

Consider options for encouraging limited third-party ideas or implementation: Manitoba Hydro should evaluate the effectiveness of a variety of options for encouraging innovation within the specific context of Manitoban opportunities. Third-party set-asides, such as those in California and Minnesota, are one option to consider.

Establish aggressive savings targets: Manitoba Hydro should adopt aggressive savings targets (e.g. 1-2%/yr), in line with those of leading regions, if possible with extensive stakeholder input.

Program Design and Screening

Screen programs by either Manitoba Hydro's (PACT test) or society's (TRC or SCT tests) perspectives: As discussed, the Rate Impact Measure test is likely leading to lost opportunities. We urge Manitoba Hydro to reconsider its screening process as a whole to ensure it is in line with common and leading practice.

Screen alternative program designs on whole-program cost-effectiveness: As discussed, the 'Option 3' incremental approach to considering more aggressive program designs likely leads to missed opportunities. We suggest that all program designs considered should be screened for total program cost effectiveness. Again, we urge Manitoba Hydro to reconsider its screening process as a whole to

ensure it is in line with common and leading practice.

Consider an expert-supported stakeholder advisory group: An adequately funded stakeholder review of energy efficiency plans can lead to better designs and programs, especially where stakeholders are supported by independent experts and the process is non-adversarial in nature. This model needs to be carefully considered and designed to avoid some key pitfalls, however, especially as they relate to potential for micromanagement and for undue influence given to individual intuition and ideology.

Evaluation

Consider independent evaluations for some programs: Independent evaluations can be expensive, but ensure an unbiased review of program accomplishments, increase the credibility of utility claims, and provide insight into program operations. Manitoba Hydro should consider periodically hiring independent evaluators to conduct impact and process evaluations for a portion of its programs, selected using criteria similar to California's (program's relative importance to portfolio; market or program design changes; uncertainty or risk around savings and net to gross estimates).

Residential Programs

Residential Retrofit

Integrate programs further: The current four programs are targeting similar markets and overlap on many measures. Although MH has made it relatively simple to apply to each program, multiple application forms and separate marketing likely create barriers and missed opportunities. Ideally, customers applying for an ecoENERGY audit should be automatically contacted or enrolled in HIP and the Power Smart loan program, and auditors should assist in enrolment on the spot. All HIP and PS loan program applicants should similarly be automatically contacted re the ecoENERGY program.

Consider direct installation of cost-effective measures: Simply 'getting through the door' of a participant requires substantial program effort. Once an auditor is already in the home, it becomes cost-effective to install many measures even with a 75%-100% subsidy. One approach to take advantage of this would be to have ecoENERGY auditors and participating HIP and furnace contractors install CFLs, light domestic hot water measures and possibly air sealing as standard practice, free of charge or for a small fee.

Harness the sales power of contractors: Insulation contractors, HVAC contractors and energy auditors already promote MH programs directly relevant to them, and ecoENERGY auditors receive an incentive for referring customers to the HIP program. At a minimum, however, MH could provide referral incentives for insulation and HVAC contractors for successful referrals to all four programs. At the other end of the spectrum, MH could adopt the auditor-contractor turnkey model used in NYSERDA and Massachusetts (see below).

Improve contractor skills: As mentioned, it is likely that Manitoba faces the same issues with insulation, air sealing and HVAC sizing skills faced by the rest of North America. At a minimum, MH should investigate and consider options (training, increased quality control, certification) for addressing this

problem.

Provide generous incentives for comprehensive air sealing: Comprehensive air sealing in attics and basements will typically cost ~\$2 000 per home.* Current ecoENERGY incentives of \$150-\$300 are unlikely to incent unplanned, comprehensive work, especially because this measure is unpopular among homeowners because of a lack of tangible, immediate benefits. Higher incentives are needed to increase uptake, either as part of the HIP program or as part of a new turnkey program.

Address the “finding contractors” barrier, by one of two means:

- **Using the auditor-contractor turnkey installation model:** As discussed, this model has many advantages over the more traditional audit-and-incentives model, especially when all of the design elements used by NYSERDA are in place. For homeowners, it eliminates one of the biggest market barriers still in place: the difficulty of finding trustworthy, competent contractors. On the contractor side, it supports the development of a new market by reducing barriers to contractor investment. Auditor-contractors also have a strong incentive to market the program.
- **Providing neutral support in evaluating contractor bids:** Phone-based technical support in reviewing and comparing bids, combined with Manitoba's Hydro list of approved contractors, could reduce participant transaction costs and increase their comfort level with the program.

New Construction

Provide incentives to builders rather than homeowners: This addresses the biggest barrier for new construction, split incentives between builders and owners. It is a key feature of all three case studies, which have two to five times the market share of the Power Smart program.

Consider “a la carte” incentives: Additional incentives for optional measures can push builders to go further in achieving savings.

Require improved insulation inspection: The thermal bypass checklist developed by Energy Star could be easily adapted for the Manitoba market, and is seen by all program managers as the only way to ensure quality control on wall insulation and air sealing.

Evaluate the need for contractor training: As mentioned in our suggestions re MH's home retrofit programs, it is likely that Manitoba faces the same issues with insulation, air sealing and HVAC sizing skills faced by the rest of North America. Standard design and construction practices may also offer substantial opportunity for improvement via training. All other programs offer regular and free training sessions for builders and contractors. While Manitoba Hydro offers some training, it is unclear if this is sufficient to transform the building market. At a minimum, MH should evaluate the need for advanced design and installation training for the building community.

* Based on estimates from two Winnipeg-area insulation contractors; these costs are in line with those seen in other jurisdictions. A typical breakout might be ~\$300 for sealing most attic penetrations, \$1 000 for sealing top plates under attic eaves, and \$500-\$900 for sealing basement rim joists.

Low Income Retrofit

Obtain funding for non-gas/electric heating systems: A missing measure for Manitoban low income households is the repair or replacement of oil, propane, and wood heating systems in areas not served by gas. This measure is outside of Manitoba Hydro's electricity and gas efficiency mandate, but could be offered by the LIEEP program, with funding via the provincial government.

Consider new measures: Several commonly cost-effective measures are worth exploring for inclusion in Manitoba's program:

- GFX installation
- Lighting fixtures
- refrigerator and freezer replacement

Consider increasing participation targets to remain among leading programs, which are not aiming for 4-8%/year and in some cases beyond.

Lighting and Appliances

Collect additional data on appliance market share: If feasible, collecting data on market share would allow Manitoba Hydro to track the market transformation impacts of its programs and benchmark its performance against other programs.

Investigate appliance opportunities: Manitoba Hydro should analyze the energy savings potential of efficient dehumidifiers and consider strategies to promote appliances meeting CEE SEHA specifications.

Consider upstream incentives: Manitoba Hydro should consider negotiated cooperative promotions, stocking incentives, market share incentives, sales commissions and advertising co-operative incentives as additional strategies to target the lighting and appliances markets.

Geothermal

Explore the loop tariff model: The loop tariff model is a powerful tool for bringing geothermal energy into the mainstream. It is beyond the scope of this study to analyze its applicability to the Manitoba context, but it is likely relevant. In particular, DMEA's recent experience suggests that its new model can overcome barriers that even generous customer rebates and financing leave in place, principally consumer reluctance to take on debt and the split incentives between home builders and home buyers.

Consider builder incentives: If Manitoba Hydro maintains its current approach rather than the loop tariff model, it should consider incentives for on-spec builders to reduce split incentives.

Commercial & Industrial Programs

Prescriptive – Programs (Commercial Kitchens)

Coordination: There are opportunities to integrate program features, measures and services to create a more comprehensive approach to addressing the efficiency needs of customers. Housing the current group of Manitoba Hydro programs in one over-arching program would streamline the application process. Combining that approach with an auditing service would allow a wide variety of efficiency solutions to be proposed and installed which could be tailored to individual customer needs.

Outreach and Education: Because the industries that benefit from these particular programs are ones in which energy costs makes up a small portion of overall operating expenses, but equipment makes up a very large portion, it is difficult to prioritize efficiency above other investments. With the correct approach to explaining the benefits of efficiency to a business' bottom line, combined with several turn-key solutions to efficiency opportunities, it is possible to convince business owners dealing with even the slimmest of profit margins of the benefits of investing in efficiency.

Expanding the list of measures: Including a greater number of measures (such as ovens, ice machines and ventilation) would increase the opportunities for Manitoba Hydro's customers to realize additional savings.

Prescriptive - Lighting

Measures: Significant opportunities may result by extending or increasing incentives for control technologies and lighting design. Most exemplary programs focus resources equally on lighting design, lighting hardware (fixtures and ballasts) and control technologies. There are significant savings to be gained from installation of lighting controls and efficient lighting design, especially designs that amplify reliance on natural lighting and task lighting. Further, customers can exercise a greater level of control over their lighting system when it is designed and controlled properly, which leads to greater customer satisfaction.

Customer Services: For any custom commercial lighting project, Manitoba Hydro requires an energy audit to enroll in the commercial lighting program, but the customer must pay the full cost of the audit, before there is any indication of incentive amounts, or even whether or not the proposed project will qualify for enrolment at all. While some custom projects are large projects for which the cost of an audit is negligible, there are also small custom projects for which the added up-front cost could be a significant barrier to overcome.

Upstream Approach: The programs examined in the case studies section all report significantly lower costs per MWh saved than does the Manitoba Hydro commercial lighting program. One major reason for this is the upstream approach that the case study programs have adopted. They have all elected to actively engage wholesalers, vendors and contractors to participate in the program. Incentives are offered not only for installing efficient technologies but also for stocking them on shelves and promoting them to customers.

Commercial Custom

Increased Account Management: As stated previously, removing market barriers requires active account management. Oftentimes, undertaking custom projects means that production facilities need to be taken off line, or scaled back. At a minimum, retrofit projects cause disruptions, and create hassles. Account executives must be able to manage complications involved in project design and project management so that the business/facility owner can concentrate on their day-to-day operations. Coordination of prescriptive measures with custom projects by a single point of contact removes many of the hassles for end users and keeps efficiency projects on track toward completion. In addition, many customers need to be convinced that retrofitting systems that are working but inefficient makes economic sense. This also requires outreach by dedicated account managers.

Differentiation – Consider distinguishing commercial prescriptive programs from custom programs. Drawing brighter lines between easy-to-reach savings and deeper savings per customer site requires a comprehensive set of tools including richer incentives to reduce market barriers to deeper savings in the commercial retrofit market. For example, enrolling commercial customers in a prescriptive lighting program may, at best, reduce consumption by 10-15%, but if Manitoba Hydro can demonstrate positive cash flows from custom multisystem projects, energy consumption may be reduced by 25% or more. This level of energy savings would make the programs exemplary.

Education - Address the lack of information which causes many customers to view enrolment in utility programs as a hassle. Opportunities exist to provide more customer management combined with assessment and contractor recommendations to offer customers an understanding of what constitutes energy efficiency and how it is undertaken.

Incentives – Removing uncertainties about incentives, especially for custom projects, is important for enrolling customers when cost-effectiveness is less obvious or more difficult to achieve.

Industrial Processes

Account management for small and medium-sized customers: As stated previously, Manitoba Hydro does a truly excellent job of managing the energy needs of their largest customers. There is an opportunity to provide this type customer management for their smaller and medium sized customers. Many of those customers can benefit significantly from facility audits, engagement of their facilities managers concerning their options for improving efficiency (where feasible) and general information on the suite of options that are available to them under the industrial process program. Many smaller customers do not have the available resources to procure those services or obtain that information. As a result, Manitoba Hydro could be failing to capture substantial savings for those customers.

Upstream Market Actor Recruitment: Active engagement of outside engineering and architects would greatly expand the reach of the Industrial Process program. Currently, projects are brought to the attention of Manitoba Hydro program managers for an initial review of the project concept. If considered a viable concept, Manitoba Hydro provides the customer with incentives to conduct a feasibility study. Actively recruiting credible market actors with credentials would be in a better position to identify many more viable projects, each with potentially deeper savings per site location. Further, upstream specialist are more likely to have a better understanding of emerging technologies to consider of program implementation due to their intimate involvement in the field.

Market Segmentation- Consider segmenting the market into key market areas in order to identify

decision-makers within organizations. Develop additional case studies around key market segments in order to increase awareness of similarly-situated customers. This may prompt participating customer's competitors to consider EE projects in order to remain cost-competitive.

Turn-key operations: Oregon program managers provide customers with turn-key advice for projects, allowing the customers to remain focused on their business. Much of the project scoping, documentation and project oversight is performed by the third party contractor. Such services would encourage more customers to participate and help to reduce the hassle factor that many face.

Agricultural

Diversification: There is ample room for this program to expand the range of measures covered to include technologies necessary for other aspects of hog farming, or any other types of farming that take place in the Manitoba Hydro service territory. There are a variety of technologies for which there are cost-effective applications which can help farmers reduce their operating expenses and improve their profit margins in addition to installing efficient heating pads. The more complicated the list of measures becomes, the more the need for some type of analysis arises. Energy audits are useful for helping farmers to understand the full energy efficiency potential of the different systems their farm employs, to gain knowledge of current and emerging technologies that are used in their particular farming industry, and to get information about investing in infrastructure improvements for their operation. Combining audits with follow up services aimed at achieving a significant level of the efficiency potential identified at positive cash flow, will result in multiple benefits for Manitoba Hydro: higher participation, increased savings, and a more vibrant farm economy.

Retrofits: By offering program partners the option of installed cost-based incentives, Manitoba Hydro could improve the market penetration not just of efficient heating pads, but all agricultural technologies. It is unclear from Manitoba Hydro's program descriptions whether or not there is a significant proportion of early replacement retrofits being undertaken; removing bulbs as well as fixtures and controls, which can have a 20-year measure life, in favor of heat pads. Typically in a program with an incentive structure such as this one, which is designed to replace existing technology at any point in its life cycle based purely on energy savings, there is no obvious distinction between replacing inefficient equipment before the end of its useful life and replacing it *at* the end of its useful life. It would be useful to evaluate the baseline technology at hog farms to see to what extent heat pads have become standard practice and whether farmers are capitalizing on incentives for projects that they would have undertaken regardless of the incentives' offering.

Earth Power

Integration: Consider integrating the program into the Commercial Optimization and custom programs to acquire deep savings per facility, and reduce the administrative cost of the entire portfolio of programs. A whole-building approach increases energy savings opportunities and helps to reduce the number of customer “touches” resulting in lower administrative costs across the spectrum of services.

Workforce development: Continue educational efforts to expand the supply of qualified GSHP designers and installers. Determine whether access to qualified installers is limited in outlying areas of the province. If it is, then consider additional training and outreach. Such efforts may reduce installation costs. Increasing customer access to a pool of qualified GSHP workforce will help reduce installation costs.

Utility-owned GSHP infrastructure: To rapidly increase the number of GSHP installations, consider utility-owned GSHP loops. Since loops outlive buildings and heat pumps, proponents of GSHP argue that utility-owned loop plant will substantially reduce first cost market barriers and improve customer economics. According to an Oak Ridge Laboratory report, increased penetration of GSHP results in societal benefits as GSHP have a positive effect on load shapes and reduce peak demand. Ultimately, the loop ownership strategy is meant to ensure that loops are treated consistently with transmission and distribution lines, as both are vehicles to transmit energy to a customer's side.

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Note: program websites and available documentation were consulted for all programs.

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Vermont Energy Star Homes/Home Base New Construction , Efficiency Vermont/Vermont Gas Systems	ACEEE 2008	Chris Gordon Implementation Specialist Residential Energy Services Vermont Energy Investment Corporation Phone: 888-921-5990 x 1183 cgordon@veic.org Scott Harrington Manager, Energy Services Vermont Gas Systems, Inc.

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<p>Northeast Energy Star Lighting and Appliance initiative, NEEP</p>	<p>ACEEE 2008</p>	<p>David Lis Associate, Regional Initiatives and Appliance Standards Northeast Energy Efficiency Partnerships 781-860-9177, ext. 127 djlis@neep.org</p>
<p>New York Energy Star Appliances, NYSERDA</p>	<p>ACEEE 2008 Quantec LLC and Summit Blue Consulting, 2007. New York Energy Smart Products Program Market Characterization, Market Assessment and Causality Evaluation.</p>	<p>Mark Michalski, Associate Project Manager, Residential Affordability Program, 518.862.1090 x3237 mm2@nyserda.org</p>

Case Study	Written References	Interviews
<p>Mieux Consommer, Hydro Quebec</p>	<p>Hydro Quebec, 2008. Plan Global en Efficacité Énergétique 2009.</p>	<p>Jonathan Grondin Conseiller Commercialisation Mise en Marché Résidentiel Direction Efficacité Énergétique Tél: (514) 879-4100 poste 6585 Courriel: Grondin.Jonathan@hydro.qc.ca</p>
<p>Co-Z Energy Plan/ Builders and Developers program, Delta-Monrose Electric Association (Colorado)</p>		<p>Phil Zimmer Key Accounts Supervisor DMEA 1-970-240-1217 phil.zimmer@dmea.com</p>
<p>Quebec Geothermal Incentives, Hydro Quebec</p>	<p>Hydro Quebec, 2008. Plan Global en Efficacité Énergétique 2009.</p>	<p>Sophie Couture Conseillère commercialisation Direction Efficacité énergétique et services Hydro-Québec 514.879-4100 poste 6568 couture.sophie@hydro.qc.ca</p> <p>Ted Kantrowicz, Vice President, Canadian GeoExchange Coalition, (514) 807-7559</p>

CASE STUDIES: COMMERCIAL AND INDUSTRIAL

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Bright Ideas Commercial Lighting – New Brunswick	Arnold, Gabe (VEIC) and Rocca, Robin (ENB), "A Bright Idea in Commercial Lighting: New Brunswick's Success with an Upstream Incentive Approach", Summer 2008	
New York Energy Smart Small Business Lighting - NYSERDA	www.nyserda.org/SCLP2/index.asp ACEEE 2008	Marilyn Dare mjd@nyserda.org (518)-862-1090 x3348
Lighting Efficiency – Xcel Energy	http://www.xcelenergy.com/Business/SaveEnergy/Money/Pages/Save_Energy_and_Money.aspx	Jessica Peterson Jessica.peterson@xcelenergy.com (612)-330-6850
Energy Opportunities Program – United Illuminating (UI) & Connecticut Light and Power (CLP)	http://www.clp.com/Business/SaveEnergy/Services/EnergyOpportunities.aspx http://www.ctsavesenergy.org/about/index.php http://www.uinet.com/uinet/connect/UI/Net/Top+Navigator/Your+Business/UI+Products+%26+Services/Energy+Opportunities/Incentive+Structure/	
Energy Finanswer and Finanswer Express – Rocky Mountain Power (Idaho) and Pacific Power (Utah, Washington State)	http://www.rockymountainpower.net/Homepage/Homepage75094.html	Jeff Baumgarner jeff.baumgarner@pacificorp.com (503)-813-5161
Flexible Technical Assistance - NYSERDA	http://www.nyserda.org/programs/energyaudit.asp	
Whole Building Assessment	https://www.nationalgridus.com/massele	Anita Hagspiel

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Program – National Grid	ctric/business/energyeff/4_services.asp	anita.hagspiel@us.ngrid.com (508)-521-7221
Business Energy Solutions – Energy Trust of Oregon	http://www.energytrust.org/newbuildings/custom_commissioning.html http://www.peci.org/overview_cr.html	Kim Crossman Crossman@energytrust.org (503)-459-4074
Dairy Farm Efficiency Services – Efficiency Vermont	http://www.veic.org/Business/SavingEnergy/DairyFarms/	Cram, Jennifer Dairy Farm Project Manager Business Energy Services ext: 1053 josgood@veic.org
Ag Energy Efficiency – Interstate Power & Light (Iowa)	http://www.alliantenergy.com/Extras/012773	
California Statewide Food Service Equipment Program - San Diego Gas & Electric Pacific Gas & Electric Southern California Edison Southern California Gas	http://www.fishnick.com/saveenergy/rebates/ http://www.pge.com/mybusiness/energy_savingsrebates/rebatesincentives/ref/index.shtml	SCE Andre Saldivar Andre.sldivar@sce.com (626)-812-7558
Focus on Energy - Wisconsin	http://www.focusonenergy.com/Incentives/Business/OtherIncentives.aspx	
Non-Residential Custom Program – MidAmerican Energy (Iowa)	http://www.midamericanenergy.com/html/energy6d.asp Proceeding to adopt Energy Efficiency Plan before the Iowa Utilities Board, Docket EEP-08-2, April 30, 2008, Volume II.	Les Wilson The Energy Group Implementation Contractor leswilson@theenergygroup.biz 800-318-8915 (800)-762-7077

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Production Efficiency – Energy Trust of Oregon	http://www.energytrust.org/pe/index.html http://www.energytrust.org/library/financial/2009-10_Action_Plan_Budget.pdf	Elaine Prause Elaine.prause@energytrust.org (503)-459-4076
Energy Star Power Management – U.S. Environmental Protection Agency	http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_management http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_implementation_res#tech_assistance http://www.energystar.gov/index.cfm?c=join.join_index	
Black Hills Power Geothermal Program – South Dakota	http://www.blackhillspower.com/cimktg.htm	

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Chartwell, 2007. Low Income Energy Efficiency Programs. Available at: <http://www.energylibrary.com/index.cfm/ID/7/iNewsID/144/>

Appendix 1: Program Strategy Use per Program Area

The tables below compare the use of strategies for each program area for each jurisdiction and highlight where program strategies are typically relevant. They summarize the information used for our gap analysis of program strategy use.

Green boxes = strategy particularly relevant for this program area

Thick border: Manitoba Hydro uses this strategy

RESIDENTIAL PROGRAMS

Markets and opportunities	Segments	Education/Awareness		Free/subsidized Audits/Studies	Technical support	Incentives, rebates		Financing		Shared-savings	Turnkey installation	Cooperative / Joint Marketing	Market outreach / expertise
		Customer	Market actor training and certification			Customer	Upstream actors	On-bill	3 rd party				
New construction	Single-family5		PG&E VT Xcel	VT Xcel MH	PG&E VT Xcel MH	MH	PG&E VT Xcel						
	Multi-family5	PG&E	PG&E VT	VT Xcel	PG&E VT Xcel	MH	PG&E VT Xcel						
	Manufactured	PG&E	PG&E VT		PG&E VT		PG&E VT						
Appliance, lighting and plug load natural replacement			PG&E VT MH			PG&E VT Xcel MH	PG&E VT Xcel					PG&E VT MH	

LEADERSHIP IN ENERGY EFFICIENCY: Comparing Manitoba Hydro's Power Smart with Leading North American Strategies

Standalone HVAC and DHW equipment natural replacement	Single -family		PG&E			PG&E VT Xcel MH	PG&E, VT				PG&E		
	Multi-family		PG&E	Xcel		PG&E VT Xcel MH	PG&E				PG&E		
Home retrofit	Single -family ⁵	VT MH	PG&E VT	PG&E VT Xcel MH	MH	PG&E VT Xcel MH		MH	VT		VT		
	Multi-family ^{1*}		PG&E VT	VT Xcel MH	VT MH	PG&E VT Xcel MH		MH	VT				
	Low-income	PG&E VT Xcel MH	PG&E VT	PG&E VT Xcel MH		PG&E VT Xcel MH		MH			PG&E VT Xcel MH		
Appliance retirement	General					PG&E					PG&E		
	Low-income					PG&E VT Xcel					PG&E VT Xcel		
Geothermal energy	Single-family	MH	MH		MH	Xcel		MH					

* Manitoba Hydro has offered training on air barriers in the past but we have not indicated this here because of the limited level of training offered.

COMMERCIAL PROGRAMS

Markets and opportunities	Education/Awareness		Free/subsidized Audits/Studies	Technical support	Incentives, rebates		Financing		Turnkey installation	Cooperative/Joint Marketing	Market outreach/expertise
	Customer	Market actor training and certification			Customer	Upstream actors	On-bill	3 rd party			
Small commercial - new construction	VT	PG&E VT	PG&E VT Xcel	PG&E VT	PG&E VT Xcel	PG&E VT					PG&E VT
Large commercial/institutional new construction	VT	PG&E VT	PG&E VT Xcel	PG&E VT	PG&E VT Xcel	PG&E VT					PG&E VT
Prescriptive - Products	MH PG&E	MH PG&E VT		MH – limited PG&E VT	MH PG&E VT Xcel	PG&E VT			PG&E	PG&E	MH PG&E VT
Prescriptive - Lighting	PG&E VT	MH PG&E VT	Xcel	MH PG&E VT Xcel	MH PG&E VT Xcel	PG&E VT			Xcel	PG&E	MH PG&E VT
Commercial Custom	PG&E VT	MH PG&E VT	MH PG&E VT Xcel	MH – limited PG&E VT	MH PG&E VT Xcel	VT	MH	VT			MH PG&E VT
Industrial Processes Custom	Xcel	MH PG&E VT	MH PG&E VT Xcel	MH PG&E VT Xcel	MH PG&E VT Xcel		MH	VT			MH PG&E VT Xcel

LEADERSHIP IN ENERGY EFFICIENCY: Comparing Manitoba Hydro's Power Smart with Leading North American Strategies

Small Commercial retrofit			PG&E VT Xcel		PG&E VT Xcel				PG&E VT Xcel		PG&E VT
I/T Savings*				PG&E VT	MH						
Geothermal Systems	MH	MH	MH	MH	MH						MH
Agricultural Programs	PG&E	MH PG&E	MH PG&E VT	MH PG&E VT	MH PG&E VT			VT	PG&E		MH PG&E VT

Appendix 2: Low-Income Rental Market Program Profiles

SELECTION PROCESS

We considered roughly 30 low-income programs from our database – 25 programs recognized by ACEEE and other best practices organizations and 6 Canadian programs (BC, SK, ON, QC, NS, NB). We retained two of the three currently operating Canadian programs, Saskatchewan and New Brunswick, and chose four US programs. We looked for comprehensive programs that included weatherization, dealt with multiple fuels, and offered a mix of 100% incentives and landlord co-pays. Our final selection was:

- **California:** Energy Partners (Pacific Gas & Electric)
- **Pennsylvania:** Low Income Usage Reduction Program (PECO)
- **New Jersey:** Comfort Partners (Clean Energy Program)
- **Vermont:** Weatherization Assistance Program (Department for Children and Families, Efficiency Vermont, Vermont Gas)
- **Saskatchewan:** Saskatchewan Home Energy Improvement Program (Saskatchewan Housing Corporation)
- **New Brunswick:** Energy Efficiency Retrofit Program for Low Income Households (Department of Social Development)

Note that two of these programs (Pennsylvania and New Jersey) are also profiled in our section on low income programs in general.

CALIFORNIA: ENERGY PARTNERS (PACIFIC GAS & ELECTRIC)

Summary: PG&E’s longstanding Energy Partners program follows a standard state-wide design mandated by their regulator. As with all utility low income programs in the state, Energy Partners goes well beyond most programs in terms of absolute numbers of participants and the percentage of the market reached each year. The program is open to both tenants and homeowners paying electric and/or gas bills. It is delivered by 17 regional weatherization contractors coordinated by an administrative contractor. Participants receive all cost-effective measures with no cap on spending: eligible measures include insulation, air sealing, heating and cooling system replacement, lighting and light measures, and appliance replacement. Measures are installed at no charge by program contractors.

Issue	Treatment
Eligibility: building size	All
Eligibility: bill payment	Tenants must pay bills
% of tenants required for multifamily measures	80%
Treatment of electricity-bill paying tenants	Receive all services.
Proof of income	Tenants provide cheque stubs, bank statements or proof of participation in other low-income programs. Auditors can also accept a signed declaration of income in exceptional cases.
Measures	Tenants and homeowners are eligible for the same measures. Appliances are the exception: landlord-owned refrigerator and A/C replacements require a \$200 landlord co-pay.
Incentive and co-pay levels	All measures are free with the exception of appliance co-pays for landlords.
Building audits	<i>Information not available.</i>
Protecting tenants post-program	Landlord approval forms include a provision committing to no rent increases based on retrofit measures, but this is not enforced by the program.
Impacts of landlord requirements	Appliance co-pays have led to low measure uptake by landlords.

Results:

Metric	Results
Total participants/year	~60 000
% of tenants among participants	~60%
Tenant average savings as % of non-tenant average savings	<i>Information not available.</i>

PENNSYLVANIA: LOW INCOME USAGE REDUCTION PROGRAM (PECO)

Summary: The Low Income Usage Reduction Program (LIURP) is offered by a combined gas and electric utility, PECO. The program follows a general universal low income program design provided by the state Public Utility Commission. It targets high-use lower-income customers and offers a comprehensive set of measures, at no cost, based on a whole-house energy audit. Tenants participate rather than landlords.

The program is considering offering additional measures to tenant participants, contingent on a copayment from landlords. CFLs, light DHW measures, one-on-one education, insulation and air sealing, HVAC replacement and appliance replacement.

Issue	Treatment
Eligibility: building size	All
Eligibility: bill payment	Tenants must pay bills
% of tenants required for multifamily measures	No minimum required, but no work on building envelope or HVAC for multifamily buildings.
Treatment of electricity-bill paying tenants	Receive baseload measures only (and some limited space heating measures if their high use is caused by electric space heaters).
Proof of income	Provided by the tenant directly to program staff. Most participants are also receiving bill assistance which automatically qualifies them for the program.
Measures	SF tenants receive CFLs, light DHW, education and insulation/air sealing. MF tenants receive only CFLs, light DHW measures, and education. Homeowners are also eligible for HVAC replacement, DHW replacement and appliance replacement. The program is considering offering tenant appliance replacement with a landlord co-pay.
Incentive and co-pay levels	Measures are free of charge; landlord co-pay being considered.
Building audits	Visual inspection and combustion tests, as per single family.
Protecting tenants post-program	No protocol in place, but none likely needed because of limited measures.
Impacts of landlord requirements	<i>Information not available.</i>

Results:

Metric	Results
Total participants/year	~8 000
% of tenants among participants	46%
Tenant average savings as % of non-tenant average savings	Unknown; likely very low. "Baseload" spending in 2006 was on average \$94/participant compared to \$514/participant overall.

NEW JERSEY: COMFORT PARTNERS (CLEAN ENERGY PROGRAM)

Summary: Comfort Partners is a state-wide program overseen by gas and electric utilities and contracted out to three third-party administrators. Eligible customers receive a home audit and free installation of cost-effective envelope, HVAC, domestic hot water and baseload measures, up to a spending cap determined by prior household energy use.

Issue	Treatment
Eligibility: building size	1-14 units
Eligibility: bill payment	Tenants must pay bills
% of tenants required for multifamily measures	50% or more of tenants must be income-eligible.
Treatment of electricity-bill paying tenants	Receive baseload measures only (lighting, light DHW measures, appliances).
Proof of income	Most participants come from existing bill-assistance programs where proof is already available to the program. Participants who are not from the existing programs provide proof of income to program contractors during the audit.
Measures	Rental properties are eligible for air sealing, duct sealing, insulation, window and door replacement, thermostat replacement, air conditioning replacement, CFL lighting, refrigerator and freezer replacement, and light DHW measures. Unlike owner-occupied properties, they cannot receive heating system or hot water system replacements.
Incentive and co-pay levels	All measures are 100% free.
Building audits	No energy modelling is performed, but blower door tests are used to evaluate air sealing.
Protecting tenants post-program	Landlord commitment to no rent increases or eviction for at least one year; no enforcement.
Impacts of landlord requirements	None.

Results:

Metric	Results
Total participants/year	<i>Information not available.</i>
% of tenants among participants	40%
Tenant average savings as % of non-tenant average savings	<i>Information not available.</i>

VERMONT: WAP, DEPARTMENT FOR CHILDREN AND FAMILIES, EFFICIENCY VERMONT, VERMONT GAS

Summary: The Vermont Weatherization Assistance Program (WAP) is managed by the state Department for Children and Families and implemented by five non-profit community action agencies (CAAs). Efficiency Vermont provides funding to the WAP for electric efficiency measures and works directly with a number of multifamily building landlords outside of the WAP process. Vermont Gas funds gas electricity measures delivered by the WAP.

The WAP program offers turnkey installation of envelope measures, HVAC replacement and repair, DHW replacement and repair, lighting and appliance replacement. Landlords are asked to contribute to costs in some cases but the program is otherwise 100% subsidized.

Efficiency Vermont standalone assistance to multifamily buildings is generally negotiated on a case by case basis and can include a significant (>25%) landlord co-pay. The program emphasizes an “account management” approach favouring long-term relationships with landlords. Measures can include envelope work, lighting and appliance replacement, light DHW measures and conversion of electric heating or hot water heating to oil or gas systems.

Issue	Treatment
Eligibility: building size	All
Eligibility: bill payment	WAP: tenants not required to pay bills; EVT: bill-payment required.
% of tenants required for multifamily measures	50% of tenants must meet income guidelines. Note that Efficiency Vermont eligibility is based on rent levels rather than income levels, to minimize privacy issues and effort levels.
Treatment of electricity-bill paying tenants	No difference (WAP is fuel and bill-payment blind).
Proof of income	The WAP program determines eligibility via either proof of participation in other programs or varied other proof (pay stubs, tax returns). Efficiency Vermont determines eligibility for standalone participants by rent levels rather than income levels. Landlords provide proof of rent levels (lease copies) to program staff.
Measures	Renters are eligible for the same measures as owner-occupiers (envelope, HVAC systems, DHW, appliances and lighting, custom electric measures).
Incentive and co-pay levels	WAP negotiates a landlord co-pay. Where landlords pay heating bills, WAP starts with a stated goal of a 25% co-pay but typically receives a contribution of less than 10%. Landlords are given credit for recent efficiency work, commitments to installing health and safety measures. Where tenants pay bills, WAP requires very low or no co-pays, but may negotiate a landlord commitment to health and safety measures.
Building audits	NEAT software (national WAP program software).
Protecting tenants post-program	Landlords participating in WAP must sign an agreement not to raise rents, and accept a 3 year lien on the building, requiring partial repayment if the building is sold within 3 years (75% repayment if sold in year 1, 50% if sold in year 2, 25% if sold in year 3).
Impacts of landlord requirements	The WAP program manager feels that co-pays, liens and rent agreements do discourage many landlords, but the program continues to have broad rental property participation. The Efficiency Vermont program manager feels that co-pays are not a deterrent if properly negotiated and appropriate to the individual case.

Results:

Metric	Results
Total participants/year	<i>Information not available.</i>
% of tenants among participants	~50% (WAP) Unknown for EVT
Tenant average savings as % of non-tenant average savings	<i>Information not available.</i>

SASKATCHEWAN: SASKATCHEWAN HOME ENERGY IMPROVEMENT PROGRAM (SASKATCHEWAN HOUSING CORPORATION)

Summary: SHEIP provides incentives for low-income homeowners and landlords for insulation, air sealing and heating system efficiency upgrades. Participants must first pass through the Saskatchewan Energuide for Houses (SEGH) program before receiving SHEIP incentives.

Issue	Treatment
Eligibility: building size	Up to 3.5 stories and 600 m2. Note than no multifamily buildings have participated to date.
Eligibility: bill payment	Homeowners or tenants must meet income levels. Occupant bill-payment is not required.
% of tenants required for multifamily measures	Non-applicable. Incentives are on a per-unit basis.
Treatment of electricity-bill paying tenants	Non-applicable - no distinctions made based on income.
Proof of income	Landlords collect a Tenant Income Declaration/Consent form from eligible tenants and submit forms to program. No additional proof is required.
Measures	Rental properties are eligible for the same three measures as owner-occupied homes: furnace upgrades, insulation, and air sealing.
Incentive and co-pay levels	Incentives are calculated based on submitted invoices for eligible measures. Participants receive the full cost of measures, up to maximum incentives (minus SEGH incentive levels). Maximum incentives (South/North): <ul style="list-style-type: none"> • Homeowners: \$4 000/\$4 700 • Landlords: #3 500/\$4 200/unit
Building audits	Building audits are performed by the SEGH program using HOT2000.
Protecting tenants post-program	Landlords sign an agreement that rents will not be raised as a result of work completed under the program. There is no monitoring or enforcement.
Impacts of landlord requirements	No issues to date – the program has not had any difficulty recruiting landlord participants.

Program Results:

Metric	Results
Total participants/year	5514 since program inception (3 years)
% of tenants among participants	29%
Tenant average savings as % of non-tenant average savings	<i>Information not available.</i>

NEW BRUNSWICK: ENERGY EFFICIENCY RETROFIT PROGRAM FOR LOW INCOME HOUSEHOLDS (DEPARTMENT OF SOCIAL DEVELOPMENT)

Summary: The EER program, started in 2006, is co-delivered with the federal-provincial repair program* - most participants also receive substantial FPRP funds for non-efficiency retrofits. Landlords participate rather than tenants. Participants receive a free ecoENERGY audit and a proposed package of measures provided by program staff. Incentives are based on measure costs and are capped per home, with additional low-interest financing available. The participant must find their own contractors who provide sealed bids to the program, who chooses the contractor. The program does little marketing and has a waiting list. Although it has focused to date on developing its offerings for single family homes, it has substantial rental property participation due to co-delivery with the longstanding FPRP program.

Note that the program receives ecoENERGY incentives directly and integrates these funds into the general budget.

Issue	Treatment
Eligibility: building size	All
Eligibility: bill payment	No tenant bill-payment required.
% of tenants required for multifamily measures	There are no requirements - funding is per eligible unit.
Treatment of electricity-bill paying tenants	Bill payment is not a condition.
Proof of income	Landlords must provide income declaration forms signed by tenants for each eligible unit. Program managers have had no reports of tenant reluctance to providing income information via landlord.
Measures	Homeowners and landlords are eligible for the same measures: heating systems, insulation, air sealing, window replacement and ventilation systems.
Incentive and co-pay levels	Maximum incentives: Homeowners: \$4 500 Landlords: \$1 500/unit Participants are also eligible for low-interest loans. No co-pay is required of landlords, and landlords generally do not spend additional funds on efficiency retrofits. The FPRP program does require a 25% co-pay from landlords.
Building audits	Audits for buildings less than 3.5 stories, 600 m2 are conducted with HOT2000 software. Large buildings are visually inspected but no energy modelling is done currently.
Protecting tenants post-program	Landlords sign a declaration stating that a) rents will not be increased as a result of retrofits b) where energy costs are included in the rent, savings will be reflected in lower rents. The DSD currently has little resources for

* Also known as the Residential Rehabilitation Assistance Program (RRAP).

Issue	Treatment
	monitoring and enforcement of this declaration. Landlords participating in the FPRP program must sign a ten-year "mortgage" for the funds disbursed, which essentially acts like a lien. 10% of the program incentive is forgiven per year. Landlords must pay the balance if they sell the building or violate conditions of the program, including provisions re rent increases.
Impacts of landlord requirements	Program requirements do not appear to discourage landlord participation.

Results:

Metric	Results
Total participants/year	~1750/year.
% of tenants among participants	~50%
Tenant average savings as % of non-tenant average savings	Unavailable.

Appendix 3: Market Barriers

The table below provides definitions of the most common and significant market barriers faced by energy efficiency programs.

COMMON 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 behaviour.
Hassle or Transaction Costs	The indirect costs of acquiring energy efficiency, including the time, materials, and labour 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 behaviour 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 behaviour 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.	