EB-2015-0029
EB-2015-0049

Green Energy Coalition

Cross-examination Materials

For Union Panel 2

Overall, many stakeholders were of the view that annual DSM spending was likely to increase in order to achieve a greater level of natural gas savings, although there were some stakeholders who cautioned that increased spending must be supported by evidence that clearly displayed the incremental benefits the additional expenditures will produce.

4.2 Board Conclusions

The Board's objectives with respect to natural gas include the requirement to protect the interests of consumers with respect to prices, reliability and quality of gas service. The Board also has an objective to promote energy conservation and energy efficiency, but doing so having regard to the consumer's economic circumstances. In approving any budget amount, it is necessary for the Board to consider the rate impacts, or overall cost impacts, to customers, as all DSM costs are recovered through distribution rates. As noted earlier, since all customers share the total cost of DSM activities undertaken by the gas utilities, the Board must be mindful of the cost impacts to the non-participating customers. Many customers in all rate classes will likely not participate in a DSM program over the course of the new DSM framework. This is due to a number of reasons, including the inherent limits of DSM programs, primarily driven by the lack of opportunities a customer has to upgrade space or water heating systems. Although non-participating customers will enjoy some of the non-energy benefits that result from the program, including environmental benefits, the Board is centrally concerned with two factors that must be balanced: ensuring the gas utilities have sufficient funding available to pursue all cost-effective natural gas savings in their franchise areas and that the costs to undertake such efforts are reasonable for those customers who will not participate in a program.

Therefore, the Board has determined that for DSM activities between 2015 and 2020, the gas utilities' annual DSM budgets should be guided by the simple principle that DSM costs (inclusive of both DSM budget amounts and shareholder incentive amounts[15]) for a typical residential customer of each gas utility should be no greater than approximately $2.00/month. The current bill impact for a typical residential customer is just under $1.00/month. The budget guidance for the new multi-year DSM plans is in the order of double the cost impacts to residential customers from the 2012 to 2014 DSM period. Based on a $2.00/month cost impact to a typical residential customer and considering the general historic program mix and the relative size of each utility, the Board has estimated total annual DSM amounts of $85M for Enbridge and $70M for

[15] Shareholder Incentives are further discussed in Section 5 below.

V. Budget Sensitivity Analyses

Both Enbridge and Union present the results of sensitivity analyses that they conducted. However, both utilities' analyses are fraught with problems. To some extent that is understandable because the utilities had relatively little time to develop extensive new plans that were responsive to a number of different new directions given to them by the Board. Nevertheless, their sensitivity analyses provide very little, if any value, in understanding what the impacts of significant variations in DSM budgets might be.

1. Union's Sensitivity Analyses

Union examined three budget sensitivity scenarios – one in which it spends several million dollars less in 2020, another in which it spends approximately $5 million more (as well as all of its 15% DSMVA) and a third in which it spends about $10 million more (as well as all of its 15% DSMVA).[43] In the case of the two increased budget scenarios, the Company identified three existing programs on which it would increase spending, with resulting increases in participation and savings, and one new program it would launch for which it estimated only the cost (suggesting savings could not be estimated because the program was not sufficiently defined). There are a number of concerns with Union's analysis:

- The range of potential budget increases examined is far too limited. The largest budget increase considered - $10 million – represents only about a 17% increase in budget. Even if one includes the 15% DSMVA, the maximum increase considered is only 32%.
- The economic impacts – i.e. the TRC economic benefits of the increased spending, which should be one of the most important considerations when deciding whether the additional spending was warranted – were not reported to the Board.
- Union assumes that 20% of all increased spending would need to go towards administration and evaluation because that is the portion of its base budget that is allocated to those overhead items. This is a highly problematic assumption. The costs of evaluating a program will not change because higher rebates were offered and/or because participation increased. The only thing that might increase evaluation costs is the launch of a new program, and Union included only one very small new program in their analysis. Similarly, the costs of administering programs will not go up – at least not significantly, and certainly not linearly – because rebates are increased and/or participation increases. Thus, Union's sensitivity analysis significantly understates the additional savings that could be acquired by over-estimating how much of the increased spending would go towards items that do not produce savings.

[43] Exh A/T3/Appendix G. All of these amounts are expressed in 2015 dollars, unadjusted for inflation.

- The Company's estimates of the volume of additional participation and savings it could achieve from increase rebate levels for its home retrofit program are unsupportable. In its base budget, the Company has estimated that it would only have 5000 participating homes in 2020. In contrast, Enbridge exceeded that number with its home retrofit program in 2014 and is forecasting that it will have approximately 13,500 participants in 2020. Even after adjusting for the fact that Enbridge has roughly 50% more residential customers, Enbridge's forecast participation is nearly twice the participation rate Union has forecast for its own program with comparable incentive levels. Thus, Union should be able to achieve significant additional participation in this program without raising rebate levels.

2. Enbridge's Sensitivity Analyses

Enbridge also analyzed three budget sensitivity scenarios – one that represented 25% less spending than in its base plan, one that represented 25% greater spending than in its base plan and a third that represented 50% greater spending than in its base plan. Enbridge appeared to approach the sensitivity analysis in a more structured way than Union. In particular, it started by assessing each of its programs to determine which were "scalable" (i.e. could grow with additional funds) and which were not. Nine different program offerings were deemed to be scalable.[44]

The Company then developed estimates of how much of the increased budget would be allocated to different functions and programs. To Enbridge's credit (and in contrast with Union), only a small portion of the increased budget was assumed to be needed for additional overhead costs (e.g. evaluation and administration), so the 25% budget increase was assumed to be more like a 30% increase for programs. Note that because only a portion of programs are assumed to be scalable, the percent increase for the scalable programs is estimated to be even larger than that.

For the programs that generate trackable savings, Enbridge then developed and applied a formula that was supposed to correlate increased spending with increased savings. The formula was supposedly based on the relationship between changes in spending and changes in savings from Enbridge's recently completed potential study. Unfortunately, there are numerous and important problems with the approach that Enbridge took that render its sensitivity scenarios virtually useless:

- Additional budget is allocated to "scalable programs" in the same proportion as it was allocated to those programs in the Company's base budget. No effort was made

[44] Exh B/T1/S5.

2.0 Introduction

Union has prepared its DSM Plan (the "Plan") for the six year period of 2015 – 2020 in accordance with the Framework and Guidelines. The following summarizes the key elements of Exhibit A:

- Incorporates the Board's guiding principles and key priorities;
- Was informed by stakeholder consultation;
- Includes a roll-over of the 2014 Plan parameters to 2015 per the Board's direction;
- Budget spending rises from $34 million in 2015 to $59.5 million by 2020 (excluding inflation), including approximately $6 million for a new tracking and reporting system;
- Volumetric savings over the term of the plan are 8 billion lifetime cubic meters of natural gas[1];
- Achieves $1 billion in net total resource cost ("TRC") benefits[2];
- Union's shareholder incentive cap will be $11 million in 2015 and $10.45 million annually commencing in 2016;
- Union's shareholder incentive at 100% target will be included in rates beginning in 2016;
- Contains new program offerings for all customers beyond 2015 including; Residential, Low Income, Commercial, Industrial and Large Volume; and,
- Includes a commitment to coordinating with electricity Conservation Demand Management ("CDM") per the Board's direction.

[1] Savings assume Union achieves the cumulative 2015 m^3 target as estimated based on the pre-audit and pre-verification Resource Acquisition, Low Income and Large Volume Scorecards as outlined in Union's 2014 Draft Demand Side Management Annual Report.
[2] 2015 TRC results are based on the pre-audit, pre-verification results as outlined in Union's 2014 Draft Demand Side Management Annual Report.

Filed: 2015-06-23
EB-2015-0029
Exhibit B.T3.Union.ED.10
Attachment 1

Budget and Forecasted Net TRC Benefits ($000)										
Program	2016		2017		2018		2019		2020	
	Budget	Net TRC Benefits	Budget	Net TRC Benefits	Budget	Net TRC Benefits	Budget	Net TRC Benefits	Budget	Net TRC Benefits
Residential	$12,145	$22,433	$15,349	$28,655	$17,845	$34,264	$17,845	$34,320	$17,845	$34,320
Commercial/Industrial	$18,680	$218,838	$18,863	$221,605	$19,558	$224,584	$19,222	$224,584	$19,222	$224,584
Low Income	$11,349	$10,637	$12,284	$11,036	$13,514	$11,464	$14,088	$13,040	$14,948	$12,836
Performance Based Conservation	$548	$0	$843	$250	$1,088	$1,477	$833	$3,456	$1,053	$6,188
Large Volume	$809	$0	$758	$0	$783	$0	$807	$0	$831	$0
Market Transformation	$1,042	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	**$44,573**	**$251,908**	**$48,097**	**$261,546**	**$52,788**	**$271,789**	**$52,795**	**$275,400**	**$53,899**	**$277,928**

customers of reducing carbon emissions. The allowance mechanism would convert the cost of carbon emissions, which are currently an externality created by gas use in Ontario and borne by people and the environment globally, to an internalized charge on gas use in Ontario.

Q: Are you familiar with Ontario's climate change policies as they may affect avoided costs and cost-effectiveness screening?

A: I am aware that Ontario has had greenhouse gas (GHG) reduction targets in place for a number of years, including one for the year 2020, at the end of the period covered by the utilities' proposed DSM Plans. Progress reports indicate that the province is currently expected to fall short of the 2020 targets by 19 megatonnes (about 12% of the target) without further actions.[11]

The Province has also recently joined the Western Climate Initiative with Quebec, California, and other jurisdictions, and adopted a goal for 2030 of a 37% reduction in GHG emissions. That reduction would correspond to roughly a 2.5% annual reduction in emissions per year over the next 15 years. Achieving these goals and minimizing the burden on the Ontario economy will require maximizing the acquisition of cost-effective energy efficiency.

Ontario has also recently announced that it will introduce a carbon pricing policy in the form of a cap-and-trade program. The system is being designed in a process anticipated to continue into the autumn of this year.[12]

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[11]Feeling the Heat: Greenhouse Gas Progress Report 2015, Environmental Commissioner of Ontario, July 2015, at 13.

[12]news.ontario.ca/ene/en/2015/04/how-cap-and-trade-works.html

GEC Response to Energy Probe Interrogatory #3

Question:

Ref: L.GEC.1, Neme Report Pages 15 and 16

Preamble: Natural gas accounts for approximately 30% of all greenhouse gas emissions in the province, so some portion of the *additional future emission reductions will almost certainly have to come from the natural gas sector.*

a) Please indicate the sources/data for this statement. Indicate if the figure includes downstream (end use) and/or upstream NG production, transmission.
b) Clarify the statement that "*additional future emission reductions will almost certainly have to come from the natural gas sector.*
c) Specifically explain why NG will be targeted, relative to other higher Carbon Fuels.
d) Please provide your understanding of when and how Trade and Cap will be applied in Ontario to the downstream natural gas sector. Link your response to the assumptions used in the GHG estimates and calculations used by Mr. Chernick.

Response:

a) Ontario's GHG emissions were 171 megatonnes in 2013 (from FEELING THE HEAT: Greenhouse Gas Progress Report 2015, Environmental Commissioner of Ontario, July 2015). We asked Union (JT2.13) and Enbridge (JT1.18) for their total distribution throughput volumes excluding volumes for export from Ontario. The resulting total volume of 26,749,646,000 m^3 times 1.89 kg CO_2/m^3 of gas is 50.5 megatonnes or 29.6% of the province's emissions.

b) The provincial target for 2050 is an 80% reduction in GHG emissions from the 1990 level of 182 megatonnes or approximately 36 megatonnes/y. Even if all other sources of emissions were completely eliminated, reaching the 36 megatonne target would require a reduction of 28% from today's natural gas consumption which results in roughly 50 megatonnes of emissions.

c) It is likely that all sources of greenhouse gas emissions will have to make a contribution to meeting the targets. As Mr. Neme's evidence states governments will allocate reduction targets among the various opportunities for GHG reductions throughout the economy. Their decisions will likely be informed by the relative cost effectiveness of reduction opportunities, and I expect options that produce GHG reductions at no cost to the economy (such as gas DSM) will often be chosen over more expensive options. In any case, regardless of the allocation of reduction targets, allowance trading will encourage over-compliance from low-cost sources (e.g., gas DSM) to generate allowances for sale to high-cost sources.

Witness: Chris Neme, Paul Chernick

d) It is not yet clear exactly how or when the Ontario cap and trade system will be applied to the natural gas sector. In a way it does not matter, at least with respect to the value of carbon emission reductions from gas DSM, as long as the gas sector is "under" the provincial emissions cap. Consider, for example, a scenario in which the gas sector is under the cap but given a number of emission allowances equal to its forecast emissions under a "business as usual forecast with no new DSM programs" – or, put another way, all short-term emission reduction requirements were effectively allocated to other sectors. Under that scenario, even though the gas sector would not *need* to make reductions to stay within its emission allowance allocation, it *could* make reductions through more aggressive gas DSM efforts and sell the allowances that were freed up as a result to the other sectors that were effectively required to reduce their emissions. Put simply, the emission reductions from gas DSM would still have significant economic value to ratepayers.

The only way that carbon emission reductions from gas DSM would not have significant value is if emissions from the consumption of natural gas were not under the provincial cap. We think that is very unlikely. For example, the government has made clear that Ontario plans to "link" with the California and Quebec systems.[1] Cap and trade design consultations make clear that Ontario is proposing that natural gas distributors would be covered as they are in California and Quebec.

See also M.GEC.APPRO.4.

[1] "Ontario intends to link its cap and trade program with Quebec and California, two other member jurisdictions of Western Climate Initiative." See http://news.ontario.ca/ene/en/2015/08/ontario-names-board-members-to-western-climate-initiative.html August 5, 2015.

Witness: Chris Neme, Paul Chernick

Ontario

NEWS

Ministry of the Environment and Climate Change

Ontario Names Board Members to Western Climate Initiative

Province Moving Forward On Cap and Trade System

August 5, 2015 1:00 P.M.

Ontario is moving closer to becoming part of North America's largest carbon market by naming two members to the board of the Western Climate Initiative, Inc., a non-profit, corporation that helps provinces and states deliver cap and trade programs.

Two assistant deputy ministers from the Ministry of the Environment and Climate Change--Rob Fleming and Jim Whitestone--are the new members.

Naming these directors signals Ontario's intent to use the Western Climate Initiative's services and trading infrastructure, including its platform for auctioning emissions allowances and a system for tracking emissions allowances, for Ontario's cap and trade program.

A strong, effective cap and trade program will help ensure Ontario curbs greenhouse gas pollution while rewarding innovative companies, providing certainty for industries and creating more opportunities for investment in Ontario.

Fighting climate change while keeping industries competitive is part of the government's plan to build Ontario up. The four part plan includes investing in people's talents and skills, making the largest investment in public infrastructure in Ontario's history, creating a dynamic, innovative environment where business thrives and building a secure retirement savings plan.

QUICK FACTS

- Ontario intends to link its cap and trade program with Quebec and California, two other member jurisdictions of Western Climate Initiative.
- Cap and trade effectively reduces the amount of greenhouse gas pollution going into the atmosphere by setting a limit on emissions. The "cap" sets a maximum limit on the amount of greenhouse gas pollution that can be emitted by facilities included in the program. Over time, the cap is lowered, reducing greenhouse gas pollution.
- The "trade" creates a market for pollution credits where facilities that do not use all their credits can sell or trade with those that are over their limit.
- The Western Climate Initiative, Inc., was established in 2011 to provide administrative and technical support for member states and provinces setting up cap and trade programs.

- According to the Conference Board of Canada, each $100 million invested in Ontario's climate-related technologies is estimated to generate a gain of $137 million in GDP, $25 million in tax revenue and 1,400 new jobs.

LEARN MORE

- Western Climate Initiative, Inc.
- Climate Summit of the Americas Retrospective
- Climate Change Discussion Paper
- Ontario Climate Change Update 2014

Lucas Malinowski Minister's Office
lucas.malinowski@ontario.ca
(416) 212-7307
Kate Jordan Communications Branch
kate.jordan@ontario.ca
(416) 314-6666

Available Online
Disponible en Français

Greenhouse Gas Emissions Reductions Consultation on Cap and Trade

Ministry of the Environment and Climate Change

May 7, 2015

Confidential

Program Design

- Ontario will be designing a program that can link to the joint Quebec/California program
  - Linking will create access to a larger pool of low-cost abatement opportunities
  - Larger market is more stable, and Ontario can realize savings from sharing implementation costs with other jurisdictions.

Implications for Ontario

- Distribution of allowances to facilities is left to individual jurisdictions, but linking could require harmonization of some rules, including:
  - Price stability mechanisms (e.g., reserve prices for allowance auctions).
  - Trading rules to ensure transparency (e.g., reporting trades within a specified time).
  - Market rules (e.g., disclosure requirements on corporate affiliations, limits on number of allowances that a company can hold).
  - Limits on the use of offsets (e.g., 8% of compliance obligation).
  - Enforcement provisions (e.g., administrative penalties) to ensure compliance since non-compliance would weaken the program for all participating jurisdictions.

Cap and Trade

- Key Areas of Program Design
  - Scope: Sectors and Emissions
  - Cap Stringency, Decline and Timing
  - Offsets
  - Distribution of Allowances
  - Recognition of Early Action
  - Emissions Reporting and Verification
  - Linking

Scope: Sectors and Emissions

What sectors should be covered by the cap and trade program?

What types of emissions should be covered?

Sectors Covered

- An economy-wide approach ensures the maximum environmental benefit and supports market stability
- Quebec and California started with electricity and industry and expanded to cover heating and transportation fuels in 2015
- An Ontario program is proposed to cover:
  - Large emitters (>25,000 t): industry, institutions, waste management, utilities
  - Electricity generators and importers
  - Liquid petroleum fuel distributors and importers
  - Natural gas distributors

Combustion Emissions

- Emissions from burning fuel for heating or industrial furnaces

Process emissions

- Emissions from chemical or physical reactions as part of production
- California and Quebec cover both combustion and process emissions.
- Alberta covers only combustion emissions.

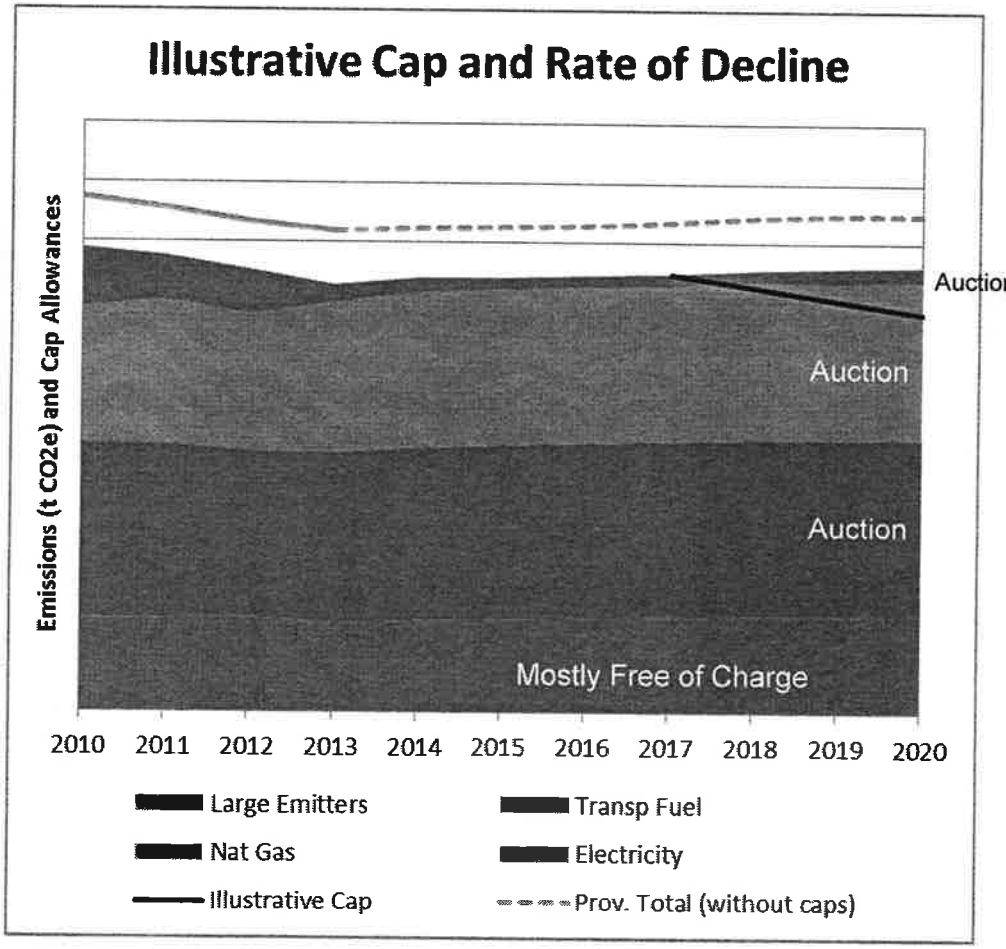
- An Ontario program is proposed to cover both types of emissions to create and maintain an incentive to reduce emissions from all sources

EB-2015-0029/0049 Exh M.GEC.IGUA.1 Attachment 1

Cap Stringency and Rate of Decline

What should be the rate of decline towards 2020?

- An economy-wide cap decline between 2-3% per year could put Ontario on track to meet its 2020 emissions target (exact figures to be confirmed)
- Caps in Quebec and California programs decline at more than 3% per year
- Other climate critical elements included in Ontario's Climate Change Strategy will also support achievement of provincial targets



Ontario

Offsets

What are the most important project types for Ontario?

- Offsets are projects undertaken by entities outside of the covered sectors that either reduce emissions or remove carbon from the atmosphere.
  - Examples in Ontario include manure management and destruction of ozone-depleting substances
- Offsets can be sold to covered facilities to use for compliance purposes, in place of allowances, providing another low cost compliance option.
- Quebec and California impose limits on the amount of offsets that can be used by entities for compliance, ensuring reductions occur within their borders

Distribution of Allowances

How can the allocation of allowances help address potential competitiveness concerns?

How should allowances be distributed to fuel suppliers (gas and liquid petroleum) and electricity generators?

How should new emitters be treated under the program?

- Allowances to be distributed free-of-charge and at auction
- Methods for allocating allowances will be the focus of sector-specific stakeholder consultations.
  - Allocation free of charge can help address competitiveness impacts on trade exposed emitters.
  - Auctions for sectors that are not trade exposed, including fuel distributors and electricity generators
  - A strategic reserve of allowances can also be made available for sale (at predetermined prices) to maintain price stability
  - Quebec and California both provide free allowances to large emitters through a combination of product benchmarks and energy usage methods.
- Allocations will also need to consider how growth can be accommodated, including new entrants.

Timing and Recognition of Early Action

Should Ontario have specific provisions for reward for early action?

- Quebec has rules for awarding early action allowances to facilities that improved their performance prior to the start of a program (California does not).
- Benchmarking can reward early reductions as part of the allocation process
  - Facilities that have taken early action will receive more allowances, relative to their emissions, than facilities that have not.

Emissions Reporting and Verification

- Changes to the emissions reporting regulation will be required to accommodate the creation of a cap and trade program
- Quebec and California reporting requirements have lower reporting thresholds and broader coverage:
  - 10,000 tonne threshold (25,000 tonnes for Ontario)
  - Includes additional sources - liquid petroleum and natural gas fuel suppliers, electricity importers, electricity transmissions, oil and gas pipeline (methane emissions), magnesium production
- Allocation of many allowances will be based on facilities' production
  - Third party verification for all *production* data, used to support allowance allocation
  - The scope of the current verification requirements need to encompass the verification of all production values since these are used as the basis for distribution of allowances free of charge

Proposed Key Timelines

Spring/Summer 2015:

- Consultations on program design, focussing on allowance allocations methods and common understanding of any competitiveness implications

Fall 2015:

- Regulatory proposal posted on the Environmental Registry for comments

Summer 2016:

- Final regulation posted on the Environmental Registry

Qualified Bid Summary Statistics

All Qualified Bid Summary Statistics are determined in USD including all bids submitted in USD and CAD. The CAD equivalent of the USD Qualified Bid Summary Statistics is based on the Auction Exchange Rate. USD statistics are converted into CAD in whole cents to be able to compare statistics on a common basis.

Qualified Bid Price Summary Statistics	Current Vintage		2018 Vintage	
	USD	CAD	USD	CAD
Auction Reserve Price	$12.10	$14.78	$12.10	$14.78
Settlement Price	$12.29	$15.01	$12.10	$14.78
Maximum Price	$45.21	$55.21	$18.59	$22.70
Minimum Price	$12.10	$14.78	$12.10	$14.78
Mean Price	$13.93	$17.01	$12.46	$15.22
Median Price	$12.50	$15.27	$14.52	$17.73
Median Allowance Price	$12.63	$15.42	$12.18	$14.87
Auction Exchange Rate (USD to CAD)				1.2212

Table 3: Efficiency Benefits that Put Downward Pressure on Rates

Benefit	NPV of Lifetime Benefits per Annual m^3 Saved[36]		Average Annual Value from Utilities'2016-2020 DSM Plans (millions $)[37]		Benefits as a % of Average Annual (2016-2020) DSM Plan Budget[38]	
	Enbridge	Union	Enbridge	Union	Enbridge	Union
1 Avoided carbon regulation costs[39]	$0.98	$0.98	$73.2	$73.9	101%	129%
2 Price suppression effects[40]	$0.08	$0.08	$6.2	$6.3	9%	11%
3 Reduce purchase of most expensive gas[41]	$0.10	$0.18	$7.2	$13.3	10%	23%
4 Avoided distribution system costs[42]	$0.38	$0.24	$28.1	$18.2	39%	32%
Total	**$1.54**	**$1.49**	**$114.7**	**$111.7**	**158%**	**195%**

[36] Assumes an average measure life of 16 years. All values in 2015 Canadian dollars (CDN).

[37] This is NPV of benefits per annual m3 saved multiplied by the average incremental annual m^3 savings forecast for the 2016-2020 period by Enbridge (74.4 million m^3) and Union (75.1 million m^3).

[38] Enbridge's average annual budget is $72.3 million; Union's is $57.4 million (both in 2015 dollars).

[39] Valued at Mr. Chernick's estimate of avoided costs of carbon emission regulations. As noted above, Mr. Chernick suggests such values would start at approximately $20 (2014 USD) per ton of CO_2 or $1.18 USD per MBtu of natural gas in the first year of a regulatory scheme. The values per m^3 of reduction are the same for both Enbridge and Union as the market clearing price unit of emissions is likely to be a provincial price.

[40] Mr. Chernick estimates that a 1 billion m^3 reduction in annual gas demand would produce a $0.00027 reduction in price per m^3. Over the 2016-2020 period, I assume that average annual gas sales in Ontario will be approximately 27 billion m^3. Thus, the price reduction benefit to Ontario gas users from a 1 billion m^3 reduction in gas demand would be worth approximately $7.2 million. That equates to a benefit of approximately $0.0072 for one year's worth of a single m^3 of demand reduction. That, in turn translates to a benefit of approximately $0.083 for 16 years (the average measure life) of one m^3 of demand reduction. The magnitude of this benefit is assumed to be the same (per m^3 of savings) for both utilities.

[41] For Enbridge, Mr. Chernick estimates that this benefit is equal to approximately $0.013 per m^3 of space heating gas saved per year and $0.011 per m^3 of combined space heating and water heating energy saved per year; there are essentially no such savings from baseload measures (industrial and water heating). For Union, I used the average of the differences Mr. Chernick reports for 2015 and 2016 (Chernick p. 28): $0.015 for baseload and $0.017 for space heating measures. Data on the mix of end use gas saved in the utilities' proposed plans were not included in their filing. Thus, I have assumed that the mix (in percentage terms) will be the same as in 2014 for Enbridge and the same as in 2014 for Union excluding the T2/Rate 100 savings. To the extent that the utilities will get more of their savings in future years from space heating these estimated benefits will be conservatively low."

[42] Enbridge used estimates of avoided distribution system costs developed for the Company by Navigant Consulting (Exh. C/T1/S4). The magnitude of those avoided costs varied by a factor of 4, depending on whether the savings were from space heating or from baseload measure end uses like water heating or industrial process efficiency improvements (See Navigant Table 7). Mr. Chernick has found that Enbridge's avoided distribution costs are actually three to five times higher than Navigant estimated for the Company. I have used the mid-point (factor of four) of that range. In this case, I estimated the lifetime NPV of an annual savings of an m^3 using a nominal discount rate (i.e. the 4% real discount rate adjusted for an assumed annual inflation rate of 1.68%) because Navigant estimates were expressed in constant nominal dollars. A weighted average value for the entire Enbridge portfolio was estimated based on the Company's 2014 distribution of savings by end use. Absent better information, the values for Union were assumed to be the same as for Enbridge per end use. However, because Union's savings are assumed to be more baseload heavy and less space heating focused, the weighted average value per m^3 is estimated to be lower for Union.

Commissioning programs – then it would seem more appropriate that they be put into a new "pilot program" portfolio for which it would not make sense to establish shareholder performance metrics.[80] I say that because when testing a concept one should not be driven by a performance metric that may not be important to figuring out how best to make the concept work. For example, it is probably less important to get larger numbers of participants in RIR, CEM and commercial new construction commissioning than to invest in deeper levels of exploration with a smaller number of customers regarding what works and what does not work well with a given program approach.

Beyond that high level concern, I have several concerns about the specifics of Enbridge's proposed metrics:

- If it is to be kept, the CEM target seems very low, especially in later years (growing to only 10 participants by 2020)
- The market share for commercial new construction projects starts off reasonably after the new code is introduced – 15 projects in 2017 out of roughly 170 annual projects,[81] or close to 10% - but hardly grows at all. In fact, three years later, in 2020, the target is only 21 projects. That is not a path to market transformation.
- The number of home ratings in 2016 (596) is lower than what was actually achieved in 2014 (662).[82] That clearly makes no sense. Moreover, it is only projected to roughly double by 2020. Again, that is not a path to market transformation.

2. Union

A. Resource Acquisition

Union's forecast resource acquisition spending per unit of savings over the 2016 to 2020 period is projected to be approximately 115% greater than what it experienced in 2014.

A significant portion of that increase is associated with its expansion of its home retrofit program (ramping up from 1000 participants in 2014 to 5000 per year by 2018) which produces savings at a higher cost than its historic C&I programs. However, that only explains about 35% of the difference in 2018. Another portion of the difference is the inclusion of the residential behavior program, which has a very high cost per unit of lifetime savings (on the order of six times the cost of the home retrofit program), at an annual budget of $3.3 million.[83] However, that only explains about another 20% of the difference.

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[80] Note that I am not suggesting that the total allowable performance incentive should change, only that there are categories of spending that may not warrant performance metrics. That spending can get allocated to the other scorecard categories for the purpose of allocated shareholder incentive dollars.

[81] JT1.12.

[82] JT1.36 Attachment 1.

[83] As suggested in the Enbridge discussion above, I am not suggesting that such behavior programs should not be included in the utility's portfolio. Such programs can and do play useful roles in DSM portfolios, both by enabling larger portions of customers to participate and reap benefits of DSM, by providing some marketing support or leads to other programs and by supporting the general objective of educating consumers about their energy use. However, they are generally not very effective – per dollar spent – generating (lifetime) savings.

The remaining difference appears to be a function of a couple of additional factors. First, Union is forecasting that savings from custom C&I measures will decline by about 10% relative to 2014 while the costs of acquiring them will increase by 25% per lifetime m^3 saved. There does not appear to be a reasonable rationale for that change. Second, the cost per unit of savings from prescriptive measures is projected to increase by about 30% relative to 2014 while the amount of savings from such measures is growing. I have not delved deeply enough into the details of how Union's prescriptive savings estimates were developed or how they compare to 2014 to ascertain whether that is a reasonable forecast.

B. Low Income

Union's proposed low income spending per unit of savings is projected to increase substantially – by an average of 60% – relative to 2014. One contributing factor is the Company's proposal to provide incentives for furnace efficiency upgrades at the time that a new unit is being purchased. Those savings are extremely expensive and not cost-effective. However, the inclusion of that measure accounts for less than 20% of the increased cost. It is not immediately apparent what the other reasons are as the mix of single family and multi-family savings is similar to what it has been in the past; also, though the portion of savings from private multi-family buildings is project to increase over time, even by 2020 it still only represents about 10% of total low income savings.

C. Market Transformation

Union has proposed only one market transformation program targeted to the residential new construction market. Moreover, it has proposed the program be terminated at the end of 2016.

The biggest concern this proposal raises is with Union's interest in and commitment to supporting longer-term market transformation. In the context of a near doubling of its annual budget, it is hard to fathom why the Company would completely give up on market transformation activities.

D. Performance-Based

Union has proposed two performance-based programs: RunSmart and Strategic Energy Management. It proposes an evolving set of performance metrics for those two programs starting with numbers of new participants and gradually evolving so more and more of the scorecard becomes a function of savings from, rather than participants in, the programs. Consistent with my comments on some of Enbridge's proposed MTEM programs which are similar to these, I question whether these programs should be in a separate scorecard rather than perhaps starting off as pilots for which no metrics are assigned (but for which budgets are set aside) and then migrating to the Resource Acquisition scorecard. Again, if the purpose of these programs is ultimately to generate savings – and that is the only purpose I can conceive for them – then they ultimately should be part of the scorecard that measures savings achieved.

operational efficiency improvements in commercial buildings to be no more than about 3%.[48] That is implausibly low.[49]

- Navigant's estimate of savings from do-it-yourself residential air sealing measures (e.g. caulking, weatherstripping, outlet gaskets, etc.) is implausibly high. The level of savings estimated is achievable, but only through more sophisticated blower-door guided air sealing by professionals. In other words, Navigant got the savings about right, but grossly under-estimated what it would cost to acquire.

- Even if one were to ignore all of the concerns about the use of the potential study, Enbridge made a basic mathematical error in developing the formula it used to apply the decline in savings yield per additional dollar spent derived from its potential study (what the Company calls its "decay factor"). The Company starts by noting that at the level of its base plan budget, the potential study suggests that for every 9% increase in budget there is approximately a 4% increase in savings.[50] It then makes the mistake of using those assumptions in a formula that not only adjusts savings from new spending but adjusts the base level of savings as well. The result is a formula that mistakenly suggests that it is impossible to achieve more than 17% more savings than Enbridge has forecast and that savings would actually start to decline once budgets were increased by about 70%. Those conclusions are inconsistent with the results of the flawed potential study that Enbridge's formula was designed to represent. More importantly, they are inconsistent with the experience of the leading jurisdictions discussed above.

3. Opportunities for Utilities to Acquire Substantial Additional Savings

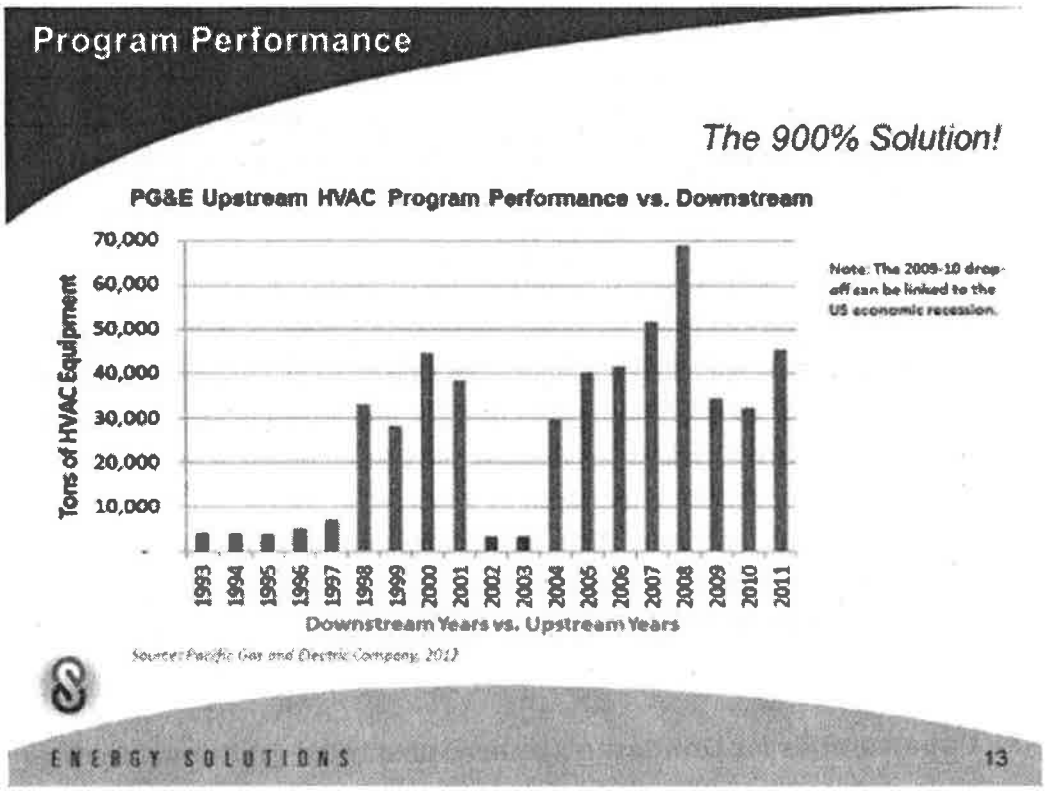
There are a number of ways in which the utilities could acquire significant additional cost-effective savings. These include:

- **Beginning to use "upstream incentive" program designs.** Upstream incentives – that is, incentives paid to manufacturers, distributors, contractors and/or other key players in the supply chain rather than to the end use customers – can have several advantages. Most importantly, they typically lead to much higher market penetration rates for efficient equipment. That can be seen in Figure 3, which shows that a commercial cooling equipment upstream incentive program (blue bars) run by Pacific Gas and Electric in California for over a decade achieved nine times the level of participation that its former "downstream" customer rebate program design

[48] Exh C/T1/S2 p. 18.
[49] See EB-2012-0451, Exhibit L.EGD.ED.1
[50] Enbridge response to GEC.42.

(red bars) achieved. Interestingly, when the program design was changed back to a customer rebate after four years of the upstream model, participation plummeted again. After two years of that much lower participation rate, the upstream incentive approach was re-initiated and participation skyrocketed again.

Figure 3: Upstream vs. Downstream Incentive Approaches[51]



Very similar results have been achieved in California for commercial gas boilers and other products.[52] Similarly, in September 2013 Efficiency Vermont launched an upstream incentive for high efficiency circulator pumps for boilers and saw the market share (from one of the leading HVAC wholesalers) for those products increase from 2% or less to about 50% in the span of just one year. It took about six months to get the program off the ground, but it continues to grow steadily.[53] These types of increases in market penetration happen for several reasons. First, it is generally easier to inform and work with a relatively small number of strategic market actors who influence (through their own stocking and sales practices) the purchases of thousands of end use customers. Second, because the cost of products is typically marked up at every step in the supply chain, a financial incentive paid to a distributor will cover a

[51] Hanna, James, et al., "The 900% Solution: Supercharging HVAC Efficiency Portfolios", Presentation at the 2012 ACEEE Summer Study (informal session), August 16, 2012.
[52] Personal communication between Jim Hanna (Energy Solutions) and Jim Grevatt (Energy Futures Group), who was collecting this information under my direction, July 2015.
[53] Personal communication with Jake Marin, Efficiency Vermont, July 2015.

higher fraction of the incremental cost of a product (making it easier to persuade the distributor to stock and promote it) than the same financial incentive paid to an end use customer. Third, upstream incentives are easy to set up in ways that eliminate the need for filling out of rebate forms and/or other paperwork that "downstream" players often hate. HVAC contractors are particularly notorious for their disdain for completing rebate forms, to the point, in my personal experience, where some will actually dissuade their customers from purchasing efficient equipment just so the contractor can avoid the paperwork. To be sure, launching an upstream program requires effort to build relationships with distributors and to reach agreement with them on how the program will work. However, once the relationships are established and the program systems are in place, the program can also reduce marketing and administrative costs. Moreover, once an upstream program for one type of equipment is in place, it is much easier to launch similar initiatives for other products sold by the same distributors (or other upstream market actors).

- **Launching an aggressive commercial new construction program**. Enbridge has a market transformation program targeted to this market. However, Union does not. Nor does Union have a resource acquisition program targeted to this market. That is a huge missed opportunity in a key "lost opportunity" market. It is worth noting that the gas utilities in Massachusetts, one of the leading gas DSM jurisdictions, got roughly one-third of their total C&I savings from commercial new construction projects in 2014.[54]
- **Increasing small commercial direct install program participation**. At this point, Union Gas has committed only to running a pilot program. Enbridge has committed to a full scale program and is forecasting that it will serve approximately 1700 small businesses per year. That represents approximately 1.2% of its eligible small business customers each year.[55] In contrast Commonwealth Edison's current small business direct install program in Illinois is expecting to serve 5% its eligible customers this year and forecast to serve over 6% next year,[56] suggesting much higher participation rates than those forecast by Enbridge are possible.
- **Increasing home retrofit program participation.** As noted above, even after normalizing for numbers of residential customers, Enbridge is proposing to ramp up to participation levels that are roughly double what Union is proposing. Moreover, Enbridge's proposed participation levels (between 0.6% and 0.7% of residential customers in 2020), though substantial, are still a factor of at least two or three below the annual participation levels achieved in Ontario at the end of the ecoEnergy program[57] or in other leading jurisdiction such as the United Kingdom.[58]

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[54] See "Gas Statewide Summary" at http://ma-eeac.org/results-reporting/.

[55] Enbridge has between 140,000 and 150,000 small business customers (2012-2014 Commercial Market Segmentation Power Point presentation presented to stakeholders March 2015).

[56] Commonwealth Edison has approximately 200,000 small business customers; 10,000 are forecast to participate in its program this year and 12,500 are forecast to participate next year (personal communications with Edward Musz, Commonwealth Edison, July 27, 2015).

[57] In the 2010-2011 program year, approximately 170,000 ecoEnergy jobs were completed in Ontario (program data from NRCAN). That represented approximately 4.4% of the eligible low rise housing stock in the province. However, probably only one-third to one-half of the jobs could be characterized as multi-measure whole house retrofits (interpretation of program data from Environmental Commissioner of Ontario, "Re-thinking Energy Conservation in Ontario – Results: Annual Energy Conservation Progress Report – 2009 (Volume 2)", November 2010.

- **Continuing Union's large industrial program for T2/R100 customers.** Experience from 2013 and 2014 suggests that would – by itself – roughly double Unions forecast savings for 2016 to 2020.
- **Increasing other large custom C&I participation and savings.** Both Union and Enbridge are proposing to offer financial incentives for custom C&I projects that are well below industry norms. Union's planned incentive offerings are $0.10 per annual m^3 saved for contract customers and $0.20 per annual m^3 saved for general service customers. Enbridge's incentives for industrial customers are also only $0.10 per annual m^3 saved. Enbridge has proposed a sliding scale of incentives for commercial customers, starting at $0.10 per annual m^3 saved for projects that produce savings up to 10% and increasing to as much as $0.30 per annual m^3 saved for customers saving more than 20%. A benchmarking study commissioned by Union suggests that both utilities' incentive levels are well below those of most other North American gas DSM programs:[59]

    - SoCalGas (California): $0.47 per m^3
    - PG&E (California): $0.47 per m^3
    - Nicor Gas (Illinois): $0.35 to $0.47 per m^3
    - Ameren (Illinois): $0.47 per m^3
    - Manitoba Hydro: $0.30 per m^3
    - Consumers Energy (Michigan): $0.36 per m^3
    - Xcel (Minnesota): $0.24 per m^3
    - Centerpoint (Minnesota): $0.34 per m^3

    That, in turn, suggests that both utilities are unlikely to be realizing the full savings potential from large customers. Moreover, both utilities' incentive structures are less than ideal in that they continue to base their incentive offerings on the magnitude of *annual* savings, rather than the *lifetime* savings upon which their performance metrics are based. On the other hand, Enbridge's proposal to increase the incentive for commercial customers as the savings increase is a welcome change that should encourage greater depth of savings from that customer segment.
- **More aggressively and systematically addressing opportunities to help customers improve on-going operational efficiency**. For example, the continuous energy management programs the utilities are proposing to deliver to a very small number of large customers could be significantly expanded over the six-year time horizon that the utilities' plans cover.

Based on the experience of leading jurisdictions discussed earlier, I estimate that Enbridge could increase its proposed level of savings by between 75% and 100% by aggressively tapping the opportunities identified above.[60] I also estimate that Union could increase its

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[58] Neme, Chris et al., "Residential Efficiency Retrofits: A Roadmap for the Future", published by the Regulatory Assistance Project, May 2011.

[59] Exhibit B.T2.Union.GEC.26, Attachment 7. Note that I have converted values expressed in U.S. Dollars to Canadian dollars for more accurate comparisons.

[60] As noted above, these jurisdictions have similar winter climates and long histories of DSM. Their customer mix is very similar to Enbridge. The Massachusetts, Minnesota, Rhode Island and Vermont gas utilities all sold between 37% (Vermont) and 50% (Massachusetts) of their gas to residential customers. Enbridge is in the

Table 2: Market Shares for Selected Union C&I Measures

Program & Measure	Potential annual market	2017 participants proposed	2017 participation rate
Commercial roof insulation when reroofing[21]	3,200	0	0%
Commercial condensing hot water tanks[22]	1,900	280	14.7%
Demand controlled kitchen ventilation[23]	1,229	50	4.1%
Commercial cooking equipment[24]	1,676	170	10.1%

[21] Re Insulation market size; EB-2011-0327, Exhibit A, Tab 1, Appendix K. ICF MARBEK NATURAL GAS ENERGY EFFICIENCY POTENTIAL STUDY, Commercial Sector Report Appendix F page 1, Union Gas July 2011. No insulation participants are reported in 2014 or specifically forecasted in Union's C/I program. Although some jobs may occur within the Custom projects, GEC's experience with review of custom projects through the Union Audit Committees suggests such cases are likely to be very rare.

[22] Re Commercial hot water tank market NRCan indicates 13,000 commercial tank type water heaters are sold annually in Canada. (http://www.nrcan.gc.ca/energy/regulations-codes-standards/bulletins/7191). With 38% of Canada's population in Ontario (http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo02a-eng.htm), and Union serving ~40% of Ontario's population the market is roughly 1,900 units per year. 2017 participants from B2.T2.Union.GEC.45a (vi).

[23] Market size for Demand Controlled Kitchen Ventilation starts with the Consortium for Energy Efficiency's estimate that 89,000-125,000 new kitchen ventilation systems are sold in the US each year. I use 100,000. (http://library.cee1.org/sites/default/files/library/6091/CEE_CommKit_ProgramDesignGuidanceCKV_5Oct2010.pdf.) Canada has 11% of the US population and Ontario is 38% of Canada, suggesting 4,180 may be sold in Ontario annually. NRCan shows 72.3% of Ontario households are gas heated (http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=on&rn=14&page=0). Union's share of these is assumed to be proportional to the Union/Enbridge residential customer count of 1.3 million / 1.9 million. 1.3/(1.3+1.9) = 40.6% * 72.3% * 4180 = 1229.
Union Gas 2017 participants from B2.T2.Union.GEC.45a (vi)

[24] Food service measures included are fryers, broilers, convection ovens and steam cookers. Potential markets from B.T13.Union.GEC.28 Attachment 5, page viii Table 0-2. 2017 participants from B2.T2.Union.GEC.45a (vi).