K 2.3

ONTARIO ENERGY BOARD

EB-2017-0224
EB-2017-0255
EB-2017-0275

IN THE MATTER OF the *Ontario Energy Board Act*, 1998, S. O. 1998, c. 15, Schedule B;

AND IN THE MATTER OF an applications for approval of the cost consequences of cap and trade compliance plans

GEC COMPENDIUM FOR CROSS-EXAMINATION

David Poch
Counsel for GEC

Impact of Reduced Savings Potential on Cost of Carbon

Filed: 2018-04-17
EB-2017-0224/0255/0275
Exhibit JT2.15
Page 3 of 4

Table 2: 2018-2020 Incremental Cost per Tonne Carbon Emission Reduction
(CPS Scenario Incremental Impacts, Excluding Large Volume Industrial Customers)

Utility/Sector		Annual Savings (million m3)	Budget (millions $)	Lifetime Carbon Avoided (tonnes)	Avoided Gas Costs (millions $)	Net Cost (millions $)	Net cost per Tonne Carbon
Constrained to Semi-Constrained							
	Res	15	$63	848,397	$63	$1	$1
	Com	20	$36	656,828	$52	($16)	($24)
	Ind	13	$19	440,483	$72	($52)	($119)
	Total	48	$119	1,945,708	$186	($67)	($34)
Semi-Constrained to Unconstrained							
	Res	135	$627	7,053,474	$649	($22)	($3)
	Com	65	$108	1,167,971	$134	($26)	($22)
	Ind	15	$275	436,651	$44	$231	$529
	Total	215	$1,011	8,658,096	$828	$183	$21

Adjusting Constrained to Semi-Constrained Industrial Savings Downward by 54%

	Annual Mm3	Budget $M	Carbon Tonnes	Avoided Gas $M	Net $M	Net/Tonne $
Ind	13	$19	440,483	$72	($52)	($119)
-54%	6	$9	202,622	$33	($24)	($118)

2018 – 2020 million m^3 Net Savings

Province-wide Excluding Large Volume Industrial Customers

(Excluding EGDI and Union Adjustments)

CPC Constrained 536 (JT 2.15)

MACC 292 (Ex. L, p. 15, Table 1)

LDC DSM Plans 438.7 (GEC/ED.STAFF.3)

Ontario

Ontario Energy Board

Report of the Board

Regulatory Framework for the Assessment of Costs of Natural Gas Utilities' Cap and Trade Activities

EB-2015-0363

September 26, 2016

3 Guiding Principles for Assessment of Costs

The OEB expects Utilities to develop Compliance Plans that outline how they will meet their obligations under Ontario's *Climate Change Act* and *Cap and Trade Regulation*. The OEB will review these Plans for prudence and reasonableness in meeting Cap and Trade obligations with a view to determining the appropriate costs to be recovered from natural gas customers in rates.

The OEB will not approve the Utilities' Compliance Plans. Utilities are responsible for deciding on the exact makeup of activities to be included in their Plans, how best to prioritize and pace investments in Cap and Trade compliance options and abatement activities, and how and when to participate in the market.

The Regulatory Framework describes how the OEB intends to assess the Utilities' Compliance Plans for cost-effectiveness and reasonableness and describes the information to be included in a Plan to assist the OEB in assessing and monitoring the Plans for prudence and protecting the interests of customers.

The OEB review of Utility Compliance Plans will be informed by a number of guiding principles intended to encourage optimal decision-making by Utilities and appropriate rate protection for customers. This principle-based approach will provide the Utilities the flexibility to develop compliance strategies that are responsive to changing market and volume conditions and that best suit their operations and customer base.

3.1 The Guiding Principles

The OEB's assessment of the reasonableness of Compliance Plan costs for recovery in rates will be guided by the following principles:

- **Cost-effectiveness**: cap and trade activities are optimized for economic efficiency and risk management

- **Rate Predictability**: customers have just and reasonable, and predictable rates resulting from the impact of the Utilities' cap and trade activities

- **Cost Recovery**: prudently incurred costs related to cap and trade activities are recovered from customers as a cost pass-through

5.3 Approach to Assessment of Cost Implications of the Utilities' Compliance Plans

Consistent with the Regulatory Framework's six guiding principles discussed in Section 3, in determining whether the cost consequences of the Utilities' Compliance Plans are cost-effective, optimized and reasonable, the OEB will consider the following:

1. whether a Utility has engaged in strategic decision-making and risk mitigation, resulting in a Compliance Plan that is as cost-effective as possible in reducing its facility-related and customer-related GHG emissions, and whether the Utility has considered a diversity (portfolio) of compliance options;

2. whether a Utility has selected GHG abatement activities and investments that, to the extent possible, align with other broad investment requirements and priorities of the Utility in order to extract the maximum value from the activity or investment; and,

3. whether the Compliance Plans are sufficiently flexible to adapt to variability in volume, changes in market prices, market dynamics and other sources of risk thereby providing for greater rate predictability as well as mitigating the risk to customers of changes in the Cap and Trade market.

5.3.1 **Assessment of Cost-Effectiveness and Optimization**

Inherent in the OEB's review of cost-effectiveness and reasonableness is an assessment of whether Compliance Plans reflect optimized decision-making. This includes:

- A consideration of a diversity of compliance options;
- Risk mitigation;
- Whether a Utility has approached its compliance strategy in an integrated manner that extracts maximum value from commitments that integrate multiple benefits; and,
- Whether a Utility has demonstrated flexibility to adapt to changes.

The OEB believes that assessing the Utilities' plans through this lens will lead to cost-effectiveness and greater rate predictability, and will reduce the costs and risk to customers.

To carry out this assessment, the OEB will expect robust and thorough information from the Utilities. The OEB will want to see information from the Utilities that demonstrates they have undertaken a detailed analysis which supports their choice of compliance options, including use of the OEB MACC to pace and prioritize their investments.

Most stakeholders that commented on the issue of Compliance Plan assessment were generally supportive of the OEB's approach. Some environmental groups felt that the cost-effectiveness test should be based on total societal costs and benefits (TRC [Total Resource Cost] or SCT [Societal Cost Test]), and that the OEB should require Utilities to undertake abatement where it is less costly than the procurement of allowances.

Given the newness of the Cap and Trade program the OEB considers it premature to apply the TRC or SCT to the Utilities' Compliance Plans at this time. The OEB will consider the use of additional tests such as the TRC or SCT after gaining experience with the assessment of Compliance Plans.

The OEB's approach to assessing the cost-effectiveness and reasonableness of Compliance Plans is discussed below.

5.3.1.1 Compliance option analysis and optimization of decision-making

The OEB's assessment will require a general understanding of the Utilities' approach to compliance. The OEB expects a Utility to provide an overview of its strategy, including an outline of the activities that it proposes to take to meet its compliance obligations (such as procurement of allowances and offset credits, GHG abatement programs for natural gas customers, and GHG abatement and mitigation activities for the Utility's own facilities and operations, and the rationale behind their selection of compliance actions and activities.

As part of its assessment of cost-effectiveness and reasonableness, the OEB will assess whether the Utilities effectively used the OEB MACC, their forecasts, and any other inputs to prioritize and select the compliance instruments and activities they have decided to include in their Compliance Portfolio.

The OEB will use the information provided by the Utilities to assess whether Compliance Plans reflect optimized and strategic decision-making, including consideration of a diversity of compliance instruments. The OEB will also use the

Plan proceeding should have reconsidered DSM budgets, cost effectiveness, targets and scorecards. Enbridge submitted that it would have been premature to propose incremental DSM as part of its Compliance Plan until the Government of Ontario's intentions under its *Climate Change Action Plan* are fully known.

Union responded to Environmental Defence's proposal and stated that there is no evidentiary basis for Union's cap and trade compliance costs to be disallowed. Union re-iterated that it was not feasible to include incremental abatement as part of its 2017 Compliance Plan, but that it is continuing to investigate opportunities for possible inclusion in future Compliance Plans.

5.7.3 OEB Findings

The OEB finds that each of the Gas Utilities' approaches to longer term investments, new business activities and abatement strategies as outlined in their respective 2017 Compliance Plans are reasonable and appropriate, given the lack of time between the announcement of the program and submission of the Compliance Plans, and the nascence of the cap and trade program.

The OEB is responsible for reviewing the Compliance Plans, that outline how the Gas Utilities will meet their GHG compliance obligations, for prudence and reasonableness to determine the appropriate costs to be recovered from natural gas customers in rates. The OEB does not dictate what elements should be contained in the Compliance Plans. The OEB agrees with the Gas Utilities' argument, supported by some parties, that the lack of Compliance Plan preparation time and the lack of the MACC and LTCPF during that development timeframe made it difficult to include these elements in their 2017 Compliance Plans. The OEB will not, therefore, disallow any of the Gas Utilities' cost requests on the basis that they did not include substantive abatement activities in their 2017 Compliance Plans.

Gas Utilities are encouraged to give further consideration to these options for inclusion in future Compliance Plans with the benefit of time, availability of the MACC and LTCPF, as well as new information and regulations/policies regarding other options such as offsets.

5.8 Monitoring and Reporting

Issue 2 - Monitoring and Reporting – Are the proposed monitoring and reporting processes reasonable and appropriate?

Table 3: 2018 TRC-Plus and PAC Analysis and Ratios

	2018 Total Resource Acquisition & Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Multi-Year TRC & PACT Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Resource Acquisition & Low Income	**48,555**	**$251,201,450**	**$66,489,040**	**$36,353,379**	**$8,414,927**	**$10,334,976**	**$85,238,943**	**$165,962,507**	**2.95**	**$55,103,282**	**$196,098,168**	**4.56**
Resource Acquisition	45,988	$231,543,744	$57,102,463	$28,142,333	$6,385,477	$7,985,813	$71,473,753	$160,069,991	3.24	$42,513,623	$189,030,121	5.45
Low Income	2,567	$19,657,706	$9,386,577	$8,211,046	$2,029,450	$2,349,163	$13,765,190	$5,892,516	1.43	$12,589,659	$7,068,047	1.56

	2018 Resource Acquisition						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Resource Acquisition TRC Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Large Customers												
Large Custom	739	$120,544,190	$34,066,705	$5,262,555	$1,287,579	$0	$35,354,284	$85,189,905	3.41	$6,550,134	$113,994,056	18.40
Large Prescriptive	4,234	$14,154,141	$634,864	$728,630	$574,046	$0	$1,208,910	$12,945,231	11.71	$1,302,676	$12,851,465	10.87
Small Customers												
Small Custom	106	$6,872,172	$4,904,950	$425,317	$386,111	$0	$5,291,060	$1,581,112	1.30	$811,427	$6,060,745	8.47
Small Prescriptive	1,867	$14,832,141	$280,012	$737,035	$193,194	$0	$473,206	$14,358,935	31.34	$930,229	$13,901,912	15.94
Small DI	1,600	$12,713,263	$240,010	$3,502,583	$1,255,761	$0	$1,495,771	$11,217,492	8.50	$4,758,344	$7,954,920	2.67
Residential Adaptive Thermostats	27,000	$16,094,082	$1,836,000	$2,025,000	$150,000	$0	$1,986,000	$14,108,082	8.10	$2,175,000	$13,919,082	7.40
Residential CER	10,441	$42,290,068	$15,139,921	$15,461,213	$2,538,787	$0	$17,678,708	$24,611,360	2.39	$18,000,000	$24,290,068	2.35
RA Overall TRC	**45,988**	**$231,543,744**	**$57,102,463**	**$28,142,333**	**$6,385,477**	**$7,985,813**	**$71,473,753**	**$160,069,991**	**3.24**	**$42,513,623**	**$189,030,121**	**5.45**

	2018 Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Low Income TRC Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Multi-Family Homes - Part 3	257	$12,945,630	$5,282,740	$2,821,839	$991,457	$0	$6,274,197	$6,671,434	2.06	$3,813,296	$9,132,334	3.39
Single Family Homes - Part 9	2,310	$6,712,076	$4,103,837	$5,389,207	$1,037,993	$0	$5,141,830	$1,570,246	1.31	$6,427,200	$284,876	1.04
LI Overall TRC	**2,567**	**$19,657,706**	**$9,386,577**	**$8,211,046**	**$2,029,450**	**$2,349,163**	**$13,765,190**	**$5,892,516**	**1.43**	**$12,589,659**	**$7,068,047**	**1.56**

Figure 1: Comparison of Renewable Gas Proposal Cost-Effectiveness Test Results

Utility Cost Test

Benefits		Costs		Net Benefits	Benefit-Cost Ratio
Avoided Cost of Traditional Gas	$3.69	Utility payment for RNG	$4.54		
Avoided Cost of CO2 Allowances	$0.85	Provincial Subsidy for RNG	n.a.		
Total	$4.54	Total	$4.54	$0.00	1.00

TRC or Societal Test

Benefits		Costs		Net Benefits	Benefit-Cost Ratio
Avoided Cost of Traditional Gas	$3.69	Utility payment for RNG	$4.54		
Avoided Cost of CO2 Allowances	$0.85	Provincial Subsidy for RNG	$11.46		
Total	$4.54	Total	$16.00	($11.46)	0.28

Utility Cost vs. Carbon Benefits Only

(i.e. approach utilities used to evaluate incremental efficiency)

Benefits		Costs		Net Benefits	Benefit-Cost Ratio
Avoided Cost of Traditional Gas	n.a.	Utility payment for RNG	$4.54		
Avoided Cost of CO2 Allowances	$0.85	Provincial Subsidy for RNG	n.a.		
Total	$0.85	Total	$4.54	($3.69)	0.19

Q: Have you assessed the cost-effectiveness of incremental efficiency from the UCT cost-effectiveness perspective?

A: I have performed a high-level assessment of the cost-effectiveness of incremental efficiency from the UCT cost-effectiveness perspective. I essentially used the same data that Union used in computing the cost per tonne of carbon emission reduction.[35] That is, I focused on the incremental utility costs and incremental savings of going from the CPS' constrained scenario to its semi-constrained scenario. However, I did two things in my analysis that Union and Enbridge

[35] Exh. 3, Tab 4, Sch. 1.

Undertaking No. JT2.15:

To Rerun the Table at Exhibit GEC.ED.Staff.3 using that savings that are included with the Conservation Potential Report, and at the three various scenarios – constrained, semi-constrained and unconstrained – for the period 2018 to 2020.

GEC Response:

The requested information is provided in Tables 1 and 2 below. Note that, as in GEC's response to Staff.3, all of the results are expressed in terms of utility costs (i.e. under the UCT) and exclude large volume industrial customers.

Table 1 shows the estimated net cost per tonne of carbon emission reduction, by sector, for each of the three Conservation Potential Study (CPS) scenarios in their totality – i.e. the *total* net cost for each scenario divided by the *total* carbon emission reduction for each scenario. The sources of the information used in the analysis are provided below the table. Depending on the life of the savings, anything with a carbon emission reduction cost on the order or $25 to $30 would be cost-effective under the UCT. As the table shows, the value of just the avoided gas costs is hundreds of millions of dollars greater than the utility DSM program costs for each sector in each scenario. As a result, the net utility cost per tonne of carbon emission reduction is ***negative*** for each sector for each scenario.

Table 2 shows the *incremental* net utility costs per *incremental* tonne of carbon emission reduction for each of the following two "steps" of increased savings above the CPS constrained scenario:

(1) between the constrained and semi-constrained scenarios; and
(2) between the semi-constrained and unconstrained scenarios.

This second tables provides insight into how far up the "supply curve" of savings one can go and still achieve additional increments of carbon emission reduction cost-effectively. As the table shows, for both the residential and commercial sectors, both the increment from constrained to semi-constrained and the increment from semi-constrained to unconstrained are very cost effective.[1] In other words, of the three levels of efficiency analyzed under the CPS, the unconstrained scenario provides the greatest incremental benefit per incremental dollar spent on DSM. For the industrial sector, the increment between the constrained and semi-constrained scenarios is cost-effective, with net cost savings and negative costs per tonne of carbon emission reduction. However, the increment between the semi-constrained and the unconstrained scenarios is not cost-effective.

[1] All have costs per tonne of carbon emission reduction well below the cost-effectiveness breakeven point of about $25-$30 per tonne, with almost all of them providing carbon emission reductions at negative net cost.

Table 1: 2018-2020 Total Cost per Tonne of Carbon Emission Reduction
(CPS Scenarios Analyzed Separately, excluding Large Volume Industrial Customers)

Utility/Sector		Annual Savings (million m3)	Budget (millions $)	Lifetime Carbon Avoided (tonnes)	Avoided Gas Costs (millions $)	Net Cost (millions $)	Net cost per Tonne Carbon
Constrained							
	Res	201	$175	3,227,376	$355	($181)	($56)
	Com	126	$110	3,266,518	$326	($216)	($66)
	Ind	209	$59	6,460,908	$604	($545)	($84)
	Total	536	$344	12,954,802	$1,286	($942)	($73)
Semi-Constrained							
	Res	216	$238	4,075,773	$418	($180)	($44)
	Com	146	$146	3,923,346	$377	($231)	($59)
	Ind	222	$79	6,901,391	$676	($597)	($87)
	Total	584	$463	14,900,510	$1,471	($1,009)	($68)
Unconstrained							
	Res	351	$865	11,129,247	$1,067	($202)	($18)
	Com	211	$254	5,091,317	$512	($258)	($51)
	Ind	237	$354	7,338,042	$720	($366)	($50)
	Total	799	$1,473	23,558,606	$2,299	($826)	($35)

Notes

1 Annual m3 from Tables ES7 (Res), ES11 (Com) and ES 15 (Ind), with industrial numbers adjusted down to exclude large volume customers based on percent of total 2020 industrial savings from such large customers (based on CPS tables ES16 and ES17), as year-by-year annual savings values are only available for the sector as a whole.

2 Lifetime savings based on 2020 ratios of lifetime to annual savings from Tables ES8 (Res excl Low Inc), ES12 (Com excl Low Inc) and ES16 (Ind excl large volume). This extrapolation is necessary since year by year lifetime savings values by sector are not available. Note that this approach may understate lifetime savings because some of the measures installed in 2015 through 2019 will no longer be producing savings in 2020.

3 Sector budgets based on ratios of total budgets through 2020 to total annual savings through 2020 (multiplied by 2018-2020 annual savings) from Tables ES8 (Res excl Low Inc), ES9 (Res low income), ES12 (Com excl Low Inc), ES13 (Com Low Income) and ES16 (Ind excl large volume). This extrapolation is necessary since year by year budgets by sector are not available.

4 Avoided carbon emissions calculated as 1875 tonnes/million m3 savings

5 Value of avoided gas costs calculated using avoided costs in CPS Exh. 11, assuming 50% weather sensitive savings and 50% baseload, as well as a real discount rate of 4%.

6 Net cost is the difference between avoided gas costs (i.e. savings) and program costs.

7 Cost per tonne of carbon emission reduction is net cost divided by lifetime tonnes of carbon emission reduction.

Table 2: 2018-2020 Incremental Cost per Tonne Carbon Emission Reduction
(CPS Scenario Incremental Impacts, Excluding Large Volume Industrial Customers)

Utility/Sector		Annual Savings (million m3)	Budget (millions $)	Lifetime Carbon Avoided (tonnes)	Avoided Gas Costs (millions $)	Net Cost (millions $)	Net cost per Tonne Carbon
Constrained to Semi-Constrained							
	Res	15	$63	848,397	$63	$1	$1
	Com	20	$36	656,828	$52	($16)	($24)
	Ind	13	$19	440,483	$72	($52)	($119)
	Total	48	$119	1,945,708	$186	($67)	($34)
Semi-Constrained to Unconstrained							
	Res	135	$627	7,053,474	$649	($22)	($3)
	Com	65	$108	1,167,971	$134	($26)	($22)
	Ind	15	$275	436,651	$44	$231	$529
	Total	215	$1,011	8,658,096	$828	$183	$21

It should be emphasized that the incremental UCT cost-effectiveness of additional DSM spending and savings by the utilities – relative to their 2018-2020 plans – is likely to be considerably better than the increment shown in Table 2 for the increment between the CPS constrained and CPS semi-constrained scenarios. There are a couple of reasons for this. First, the utilities planned spending for 2018-2020 (i.e. about $381 million, as shown in GEC's response to Staff.3) is actually a little more than 10% higher than implied by the CPS report for the constrained scenario (i.e. $344 million as shown in the first table below). Second, and more importantly, the CPS constrained scenario savings (536 million annual m^3, as shown in the first part of the first table below) is 22% higher than utilities' forecast savings (i.e. 438 million m^3 between the two utilities as shown in GEC's response to Staff.3). Thus, while the difference between the CPS constrained and semi-constrained scenarios is only 9% more annual savings[2] for 35% more budget (still a very cost-effective increment), the difference between the utilities' current plans and the semi-constrained scenario is 33% more annual savings for just 21% more budget. The principal reason for this difference appears to be that each of the CPS scenarios were optimized – i.e. designed to maximize savings for a given budget level – whereas the level of savings achieved was only one of several considerations in the design of the utilities' efficiency program portfolios. To be clear, I am not suggesting that the utilities could achieve 33% more savings with 21% more budget – or at least not with dramatic changes to their DSM plans (likely including elimination of market transformation activities).

[2] Note that the 9% increase in annual savings is associated with a 15% increase in lifetime savings and lifetime carbon emission reductions. In essence, the additional measures added to the constrained scenario to produce the semi-constrained scenario are much longer-lived (an average life of more than 21 years) than the measures in the constrained scenario (an average life of a little under 13 years). The difference is most pronounced for the residential sector (incremental savings between constrained and semi-constrained scenarios of about 30 years compared to average of about 9 years for the constrained scenario).

However, the utilities should be able to achieve significantly more additional savings per dollar than implied by the difference in the CPS constrained and semi-constrained scenarios.

consideration the results of the previous year's auctions. It will be possible to extrapolate the five-year cost of carbon from the 10-year forecast

Stakeholders that commented on this issue agreed that the OEB should be responsible for providing the long-term carbon price forecast.

5.2.4 **Marginal Abatement Cost Curve (MACC)**

The OEB has determined that it will develop a province-wide, generic MACC for the Utilities to use as an input into the development of their Compliance Plans and as a key input to the OEB's assessment of the cost consequences of the Plans.

The MACC will provide the Utilities and the OEB with the range of all possible compliance options along a spectrum of costs. It is an essential input that the OEB expects all Utilities to use in developing their Compliance Plans. A single, generic province-wide MACC (OEB MACC), used by all Utilities, will ensure a standard description of compliance costs for the purpose of the OEB's assessment of the Compliance Plans.

The OEB MACC and the Utilities' description of their compliance strategy and activities will allow the OEB to assess the Compliance Plans for evidence of the Utilities' cost-effective optimization of compliance instruments.

The timeframe for the OEB MACC will be 10 years, to align with the long-term carbon price forecast. The OEB will develop a MACC for mid-2017 and will update the MACC at the beginning of each subsequent three-year Compliance Plan term.

Stakeholders were supportive of the idea of developing a single MACC to be used by all Utilities. Stakeholder preference was for the OEB to develop the MACC. The Utilities suggested that the MACC supporting their Compliance Plans should be developed by each Utility to reflect its specific considerations.

The OEB understands that a Utility may choose to develop its own, company-specific MACC to inform the development of its Compliance Plan however, the OEB will rely on the OEB MACC as its principal tool for assessing Utilities' selection of compliance options and resulting costs consequences.

Marginal Abatement Cost Curve (MACC) Report: In addition to the CPS, Union utilized the MACC report released by the OEB to determine if, from the utility's perspective, there is any incremental cost-effective m^3/GHG abatement above and beyond the targets identified in the 2015-2020 DSM Plan. Since the MACC does not separate the total customer emission abatement potential from existing DSM activities underway as per the OEB's Decision and Order in EB-2015-0029/0049, this analysis focused on comparing the total abatement identified within each MACC to the abatement opportunity being targeted within Union's DSM Plan. This approach allows Union to understand how much incremental abatement opportunity exists at a macro level, for example which market Commercial/Industrial ("CI")or Residential does potential incremental abatement exist. To complete this evaluation, the following steps were taken:

1. The abatement potential identified within each MACC was separated into Union and EGD opportunity. This was completed using the percentage breakdown identified in the CPS based on savings identified in the constrained scenario in Union's franchise for 2018-2020. Union assumed that 38%, 42% and 66% of the MACC opportunity is in Union's franchise for the residential, commercial and industrial sector, respectively.
2. Because the opportunity identified in the MACC is in gross savings, Union discounted the MACC abatement opportunity by an assumed free-rider rate for each market. MACC abatement opportunities are adjusted using an assumed free-rider rate for each sector based on existing offerings as filed in Union's 2015-2020 DSM Plan, EB-2015-0029. Union assumed a 5% free rider rate for the residential sector based on the Home Reno Rebate offering, 10% for the commercial sector based on the Prescriptive offering and 54% for the industrial sector based on the Custom offering.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit 3, Tab 4, Appendix A, p. 4

Preamble: Union Gas indicates that it adjusted the savings potentials found in the CPS and the OEB MACC because it claims that they were gross, i.e., did not exclude efficiency upgrades that would occur in the absence of DSM programming.

The OEB's Natural Gas Conservation Potential Study explicitly gives special consideration to natural conservation, and notes that it gave special consideration to:

- Naturally-occurring improvements in equipment efficiency
- Expected penetration of more efficient equipment into the building stock
- Known, upcoming changes in building and equipment energy performance codes and standards

Questions:

a) Please indicate why Union Gas believes that the opportunities identified in the OEB MACC are gross savings.
b) Please confirm that Union Gas understands that the OEB MACC analysis is based on the data and analysis from the OEB CPS, which indicates that the reference case explicitly included natural conservation.
c) Please explain how the adjustment factors Union Gas used to reduce the OEB MACC potential are reasonable, given that the reference case included natural conservation.

Response:

a) – c)

Union understands that the opportunities identified in the MACC and CPS take into account some natural conservation; however, Union does not believe that this natural conservation takes into account all applicable factors. For example, as noted in the CPS "the reference case does not account for initiatives related to the Climate Change Action Plan, which was under development at the time the analysis was completed. It is anticipated that some of these initiatives would reduce gas consumption in the reference case forecast, which would reduce the achievable potential savings found in this study."[1] To account for all applicable factors including the significant amount of CCAP funding that is expected to continue Union applied a discount to each MACC within its incremental energy efficiency abatement opportunity analyses.

[1] ICF Natural Gas Conservation Potential Study, Updated July 7, 2016, p. ii.

Illustrative Examples of Results

If LDC Free Ridership Indicates the What Government Programs Will Achieve

A	B	C	D	E	F	G
Potential Savings (MACC)	LDC Gross Savings	LDC F.R. rate	LDC Net Savings	Remaining Potential	Gov't Net Reducing MACC (A X C)	LDC Adjusted MACC (A-F)
100	40	50%	20	80	50	50
100	40	10%	36	64	10	90

Examples of Union's DSM C&I Measure Rebates vs. incremental Costs

- **Energy Star cooking equipment (convection ovens, steam cookers, broilers):**
  Rebate: Nil[1]

- **Air curtains (space heating measure):**
  Rebate: $300 per 7' x 3' single door, $400 for 7' x 6' single door, and $500 for 8' x 6' single door[2]

  TRM[3] incremental costs: $1429, $2000, and $2143, respectively.

- **Infrared heaters (space heating equipment):**
  Rebates: $300 per single stage unit and $400 per two-stage unit, plus $100 to HVAC contractors and $50 to distributors[4]

  TRM incremental cost is $11.22 per kBtu of capacity for new buildings and $30.28 per kBtu of capacity for existing buildings. (For a 200,000 BTU heater, $2244 per unit in new buildings and $6056 per unit in existing buildings.)

- **Condensing storage water heater**:
  Rebates: $450 per unit, plus another $100 to HVAC contractors and $50 to distributors[5]

  TRM incremental cost is $2591 for units less than 250 kBtuh capacity and $4464 for larger units.

---

[1] https://www.uniongas.com/business/save-money-and-energy/equipment-incentive-program/foodservice-programs
[2] https://www.uniongas.com/business/save-money-and-energy/equipment-incentive-program/space-heating-programs/air-curtains
[3] EB-2016-0246, Exhibit B, Tab 1, Tab 2
[4] https://www.uniongas.com/business/save-money-and-energy/equipment-incentive-program/space-heating-programs/infrared-heaters
[5] https://www.uniongas.com/business/save-money-and-energy/equipment-incentive-program/water-heating-programs/condensing-gas-water-heaters

- Adoption rates for BAU case incentive levels
- End use classification (e.g., industrial HVAC, commercial space heating, etc.)
- Utility program and incentive costs
- Treatment of conservation measure interactions
- All economic and market assumptions (including 4% discount rate)

The same caveats and limitations apply to this study as are documented in the 2016 CPS report, including that the model does not consider factors such as infrastructure requirements or lead time to implement abatement programs.

Cost Metric

The cost metric used in this study was developed to quantify the cost effectiveness of natural gas customer conservation abatement options under different carbon pricing assumptions from a utility perspective. The cost metric includes:

Benefits (avoided costs):

- Natural gas avoided costs, comprising commodity costs, upstream capacity costs and downstream distribution system costs[1]
- Avoided cost of carbon, based on the three LTCPF scenarios (see Section 1.4.2)

Costs:

- Utility incentive costs
- Utility program delivery costs

The data and assumptions for all cost and avoided cost components listed above remain unchanged from the 2016 CPS[2], with the exception of the carbon price which is based on the LTCPF Report. The three MACC study scenarios – based on the minimum, maximum and mid-range carbon price forecast – were developed by varying the LTCPF used in the cost metric.

Capped and Uncapped Participants

Estimates of natural gas consumption volumes representing ‘capped’ participants under Ontario’s cap and trade program were developed through consultation with the utilities, and their associated natural gas volumes were removed from the modelling exercise[3]. Facilities directly covered under the program are excluded from the utilities’ compliance obligations, so the associated abatement potential was excluded from the MACCs.

Heat Pumps

Heat pumps were assessed through an analysis separate from the CPS model exercise (refer to Appendix A).

[1] For a detailed description of avoided costs, see chapter 3 of the 2016 CPS Report.
[2] While cost data and assumptions from the CPS were used for this analysis, the definition of the cost metric in this study is *not* the same as the cost metric in the CPS. The main driver behind the differences in what costs and benefits are included is that the CPS was based on a societal cost perspective, whereas this study’s objective is to evaluate costs from a utility perspective.
[3] Refer to Section 6.2 for recommendation to develop market penetration rates that might be more reflective of non-LFEs in future studies.

Energy Conservation
Proven Leadership, Expertise & Speed

Conservation remains the lowest cost solution to reducing emissions and saving customers money. Ontario should use 'GreenON' to enhance the utilities' conservation initiatives.

$ **Residential Customers save $2.67 for each dollar spent on natural gas conservation**
(Environmental Commissioner of Ontario, 2016)

Average Residential Customer Usage Reduced 21% (1995-2015)

Moving forward:

- Reach of the gas utilities: 3.5M customers (78% of homes); New GIF program reaches all Ontarians
- Enbridge's proposals to partner with GreenON beyond the existing Green Investment Fund Partnership would allow further cost-effective opportunities to further reduce emissions by leveraging Enbridge's business model, relationships, expertise and speed
- Enbridge's conservation teams at Enbridge Gas and Union Gas can ensure alignment with government, participation from market players and we can be in the market quickly.

UNDERTAKING JT2.1

UNDERTAKING

TR 2, p.5

To add a row to the table attached to ED24 estimating the value of the avoided natural gas costs.

RESPONSE

Please see the attached excel worksheet.

In preparing this undertaking response, the Company corrected an error made in the original response to Environmental Defence Interrogatory #24 filed at I.1.EGDI.ED.24, whereby the carbon price for years 2029 to 2033 had incorrectly included inflation. The table attached now includes the carbon price for years 2029 to 2033 in Real dollars.

Value of Lifetime[1] GHG Emissions Reductions from 2018 DSM Residential Program

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Forecast Annual Gas Savings m3[2]	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	16,756,884	268,110,144
Forecast Annual GHG Reductions (t C02e)[3]	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	31,419	502,707
Forecast Carbon Price ($/t C02e)[4,5]	$17.00	$18.00	$18.00	$19.00	$20.00	$21.00	$31.00	$36.00	$43.00	$50.00	$57.00	$60.88	$65.02	$69.44	$74.16	$79.20	n/a
Value of GHG Reduction	$534,126	$565,545	$565,545	$596,964	$628,383	$659,802	$973,994	$1,131,090	$1,351,024	$1,570,958	$1,790,892	$1,912,673	$2,042,734	$2,181,640	$2,329,992	$2,488,431	$21,323,792
Cost of Gas ($/m3)[6,7]	$0.1766	$0.2112	$0.1993	$0.2038	$0.2085	$0.2133	$0.2182	$0.2232	$0.2283	$0.2335	$0.2388	$0.2443	$0.2499	$0.2556	$0.2614	$0.2674	n/a
Avoided Cost of Gas	$2,958,938	$3,538,779	$3,339,368	$3,415,781	$3,493,944	$3,573,894	$3,655,675	$3,739,326	$3,824,892	$3,912,416	$4,001,943	$4,093,518	$4,187,189	$4,283,003	$4,381,010	$4,481,259	$60,880,935

Value of Lifetime[1] GHG Emissions Reductions from 2018 DSM Commercial and Industrial Program

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Forecast Annual Gas Savings m3[2]	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	59,891,949	958,271,184
Forecast Annual GHG Reductions (t C02e)[3]	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	112,297	1,796,758
Forecast Carbon Price ($/t C02e)[4,5]	$17.00	$18.00	$18.00	$19.00	$20.00	$21.00	$31.00	$36.00	$43.00	$50.00	$57.00	$60.88	$65.02	$69.44	$74.16	$79.20	n/a
Value of GHG Reduction	$1,909,056	$2,021,353	$2,021,353	$2,133,651	$2,245,948	$2,358,245	$3,481,220	$4,042,707	$4,828,788	$5,614,870	$6,400,952	$6,836,217	$7,301,080	$7,797,553	$8,327,787	$8,894,076	$76,214,855
Cost of Gas ($/m3)[6,7]	$0.1766	$0.2112	$0.1993	$0.2038	$0.2085	$0.2133	$0.2182	$0.2232	$0.2283	$0.2335	$0.2388	$0.2443	$0.2499	$0.2556	$0.2614	$0.2674	n/a
Avoided Cost of Gas	$ 10,575,746	$ 12,648,197	$ 11,935,467	$ 12,208,582	$ 12,487,948	$ 12,773,706	$ 13,066,002	$ 13,364,988	$ 13,670,815	$ 13,983,640	$ 14,303,623	$ 14,630,929	$ 14,965,724	$ 15,308,180	$ 15,658,473	$ 16,016,781	$ 217,598,801

Value of Lifetime[1] GHG Emissions Reductions from 2018 Total DSM Program

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Forecast Annual Gas Savings m3[2]	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	76,648,833	1,226,381,328
Forecast Annual GHG Reductions (t C02e)[3]	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	143,717	2,299,465
Forecast Carbon Price ($/t C02e)[4,5]	$17.00	$18.00	$18.00	$19.00	$20.00	$21.00	$31.00	$36.00	$43.00	$50.00	$57.00	$60.88	$65.02	$69.44	$74.16	$79.20	n/a
Value of GHG Reduction	$2,443,182	$2,586,898	$2,586,898	$2,730,615	$2,874,331	$3,018,048	$4,455,213	$5,173,796	$6,179,812	$7,185,828	$8,191,844	$8,748,889	$9,343,814	$9,979,193	$10,657,778	$11,382,507	$97,538,648
Cost of Gas ($/m3)[6,7]	$0.1766	$0.2112	$0.1993	$0.2038	$0.2085	$0.2133	$0.2182	$0.2232	$0.2283	$0.2335	$0.2388	$0.2443	$0.2499	$0.2556	$0.2614	$0.2674	n/a
Total Program Costs[8]	$ 56,267,166	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$56,528,979
Avoided Cost of Gas	$13,534,684	$16,186,976	$15,274,834	$15,624,364	$15,981,891	$16,347,600	$16,721,677	$17,104,314	$17,495,707	$17,896,056	$18,305,566	$18,724,447	$19,152,913	$19,591,183	$20,039,483	$20,498,040	$278,479,736

1. For simplicty assumes a 15 year measure life for all measures, although some components may have a longer measure life.
2. Forecast residential gas savings (including Low Income Part 9)less gas savings from proposed O-Power Program, commercial and industrial gas savings (including Low Income Part 3) as filed in the Multi-Year DSM Plan (EB-2015-0049) escalated by 2% productivity factor.
3. Assumes a conversion rate of 1.875kg of C02e per cubic meter of gas.
4. Assumes the Mid-Range LTCPF 2018 - 2028 Carbon Price (Real 2017 CAD) per the "Long Term Carbon Price Forecast Report" (ICF, 2017).
5. Assumes Mid-Range LTCPF 2029-2033 Carbon Price (Real 2017 CAD) esclated using the Minimum LTCPF methodology per the 'Long Term Carbon Price Forecast Report'(ICF, 2017).
6. The unit cost of gas relies on unaudited 2017 inputs converted to real dollars using the inflation value from the LTCPF.
7. For simplicity the cost of gas is a reasonable average based on a combination of DSM measures.
8. Administration costs attributed to programs that claim gas savings have been included.

Value of Lifetime[1] GHG Emissions Reductions from Capped[2] 2018 DSM Commercial and Industrial Program

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Forecast Annual Gas Savings m3[3]	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	10,780,551	172,488,816
Forecast Annual GHG Reductions (t C02e)[4]	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	20,214	323,417
Forecast Carbon Price ($/t C02e)[5,6]	$17.00	$18.00	$18.00	$19.00	$20.00	$21.00	$31.00	$36.00	$43.00	$50.00	$57.00	$59.85	$62.84	$65.98	$69.28	$72.75	n/a
Value of GHG Reduction	$343,630	$363,844	$363,844	$384,057	$404,271	$424,484	$626,620	$727,687	$869,182	$1,010,677	$1,152,171	$1,209,780	$1,270,269	$1,333,782	$1,400,472	$1,470,495	$13,355,264
Cost of Gas ($/m3)[7,8]	$0.1766	$0.2112	$0.1993	$0.2038	$0.2085	$0.2133	$0.2182	$0.2232	$0.2283	$0.2335	$0.2388	$0.2443	$0.2499	$0.2556	$0.2614	$0.2674	n/a
Avoided Cost of Gas	$ 1,903,634	$ 2,276,676	$ 2,148,384	$ 2,197,545	$ 2,247,831	$ 2,299,267	$ 2,351,880	$ 2,405,698	$ 2,460,747	$ 2,517,055	$ 2,574,652	$ 2,633,567	$ 2,693,830	$ 2,755,472	$ 2,818,525	$ 2,883,021	$ 39,167,785

1. For simplicty assumes a 15 year measure life for all measures, although some components may have a longer measure life.
2. Capped participants represent approx. 18% of Commercial and Industrial customers per EB-2017 B-2-1, Table 1, p.6 and DSM volumes are proportional to total volumes.
3. Forecast commercial and industrial gas savings (including Low Income Part 3) as filed in the Multi-Year DSM Plan (EB-2015-0049) escalated by 2% productivity factor.
4. Assumes a conversion rate of 1.875kg of C02e per cubic meter of gas.
5. Assumes the Mid-Range LTCPF 2018 - 2028 Carbon Price (Real 2017 CAD) per the "Long Term Carbon Price Forecast Report" (ICF, 2017).
6. Assumes Mid-Range LTCPF 2029-2033 Carbon Price (Real 2017 CAD) esclated using the Minimum LTCPF methodology per the 'Long Term Carbon Price Forecast Report'(ICF, 2017).
7. The unit cost of gas relies on unaudited 2017 inputs converted to real dollars using the inflation value from the LTCPF.
8. For simplicity the cost of gas is a reasonable average based on a combination of DSM measures.

Value of Lifetime[1] GHG Emissions Reductions from Uncapped[2] 2018 DSM Commercial and Industrial Program

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Forecast Annual Gas Savings m3[3]	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	49,111,398	785,782,368
Forecast Annual GHG Reductions (t C02e)[4]	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	92,084	1,473,342
Forecast Carbon Price ($/t C02e)[5,6]	$17.00	$18.00	$18.00	$19.00	$20.00	$21.00	$31.00	$36.00	$43.00	$50.00	$57.00	$59.85	$62.84	$65.98	$69.28	$72.75	n/a
Value of GHG Reduction	$1,565,426	$1,657,510	$1,657,510	$1,749,594	$1,841,677	$1,933,761	$2,854,600	$3,315,019	$3,959,606	$4,604,194	$5,248,781	$5,511,220	$5,786,781	$6,076,120	$6,379,926	$6,698,922	$60,840,645
Cost of Gas ($/m3)[7,8]	$0.1766	$0.2112	$0.1993	$0.2038	$0.2085	$0.2133	$0.2182	$0.2232	$0.2283	$0.2335	$0.2388	$0.2443	$0.2499	$0.2556	$0.2614	$0.2674	n/a
Avoided Cost of Gas	$ 8,672,112	$ 10,371,522	$ 9,787,083	$ 10,011,037	$ 10,240,117	$ 10,474,439	$ 10,714,122	$ 10,959,290	$ 11,210,068	$ 11,466,585	$ 11,728,971	$ 11,997,362	$ 12,271,894	$ 12,552,708	$ 12,839,948	$ 13,133,760	$ 178,431,016

1. For simplicty assumes a 15 year measure life for all measures, although some components may have a longer measure life.
3. Uncapped participants represent approx. 82% of Commercial and Industrial customers per EB-2017 B-2-1, Table 1, p.6 and DSM volumes are proportional to total volumes.
2. Forecast commercial and industrial gas savings (including Low Income Part 3) as filed in the Multi-Year DSM Plan (EB-2015-0049) escalated by 2% productivity factor.
4. Assumes a conversion rate of 1.875kg of C02e per cubic meter of gas.
5. Assumes the Mid-Range LTCPF 2018 - 2028 Carbon Price (Real 2017 CAD) per the "Long Term Carbon Price Forecast Report" (ICF, 2017).
6. Assumes Mid-Range LTCPF 2029-2033 Carbon Price (Real 2017 CAD) esclated using the Minimum LTCPF methodology per the 'Long Term Carbon Price Forecast Report'(ICF, 2017).
7. The unit cost of gas relies on unaudited 2017 inputs converted to real dollars using the inflation value from the LTCPF.
8. For simplicity the cost of gas is a reasonable average based on a combination of DSM measures.

semi-constrained scenarios – i.e. 16 million m^3 of additional annual savings.[37] As my analysis above shows, that level of increase in energy savings would produce cost savings to customers on the order of $36 million to the two utilities' customers (combined). About half of those net benefits (i.e. cost savings) coming from avoided gas and related gas infrastructure investment cost and the other half from avoided purchases of carbon emission allowances. In ballpark terms, I think that about half of those extra savings (8 million m^3) – and therefore about half of the cost savings ($9 million) – could have been realized by each utility.[38] Again, I believe that those are conservatively low estimates of additional savings potential and economic net benefits.

2. Risk

Q: Are there risk implications of the Companies' failure to include increases in efficiency program savings?

A: Yes. Efficiency investments are generally considered less risky than supply investments and expenditures for several reasons, including reduced risk of exposure to future fuel price volatility and the cost of compliance with future environmental regulations. The latter risk is made clear in OEB's long-term carbon price forecast (LTCPF). For example, the mid-range LTCPF estimate was $57/tonne in 2028, with the minimum LTCPF in the same year being $27 and the maximum being $108. In other words, the downside risk to consumers of higher prices than the best estimate (i.e. an increase of $51/tonne) is greater than the upside potential of lower prices (i.e. a decrease of $30/tonne). Thus, every tonne of carbon emission reduction that is foregone because of decisions to not increase efficiency investment in cost-effective efficiency exposes

[37] Note that this is only the average annual difference for non-large volume customers.
[38] Using Union's assumptions regarding the share of CPS savings from each sector, excluding large volume customers, that would attributable to each utility – i.e. 38% residential, 42% commercial and 66% industrial being Union's and the balance being Enbridge's (Union response to Staff.31) – the magnitude of the increased savings potential between the CPS constrained and semi-constrained potentials is roughly the same for each utility.

of avoided gas costs ($285 million) plus avoided carbon emission allowance purchases ($85 million) is greater than the incremental program costs. This leads to a net program cost per tonne of avoided carbon emissions of $27 – again well below the $119/tonne estimated by Union.

Moreover, I believe that these results are conservative.

Table 1: UCT Cost-Effectiveness of Incremental CPS Efficiency

	Incremental Impact between Constrained & Unconstrained	Incremental Impact between Constrained & Semi-Constrained
Savings		
Annual m3 Savings (millions)	86	16
lifetime m3 Savings (millions)	1,653	328
Average measure life (years)	19.3	21.2
Annual CO2 emissions (tonnes)	160,938	29,063
Costs		
Program cost (millions $)	$369	$37
Benefits		
Avoided gas cost	$285	$56
Value of avoided carbon emissions	$85	$17
Total gas utility benefit	$370	$73
Net Benefits		
Total benefit minus prog cost	$1	$36
Benefit-Cost Ratio		
Total benefits divided by prog cost	1.00	1.98
Net Cost per Tonne of CO2 avoided		
(Program cost - Avoided gas Cost) / Tonnes	$27	-$31

Q: Why do you believe that these results are conservative?

A: There are several major reasons. First, and probably most importantly, this analysis implicitly assumes that the CPS constrained scenario is a proxy for the utilities currently planned level of savings because it assumed essentially the same budget levels as currently planned.

UNDERTAKING JT2.4

UNDERTAKING

TR 2, p.10

To update on a best-efforts basis the net benefits according to the program administrator cost test and the TRC for 2018 DSM programs, to add the long-term carbon price forecast

RESPONSE

Enbridge does not update forecasts for TRC on an annual basis.

In order to be responsive to this undertaking, Enbridge has referenced "Table 3: 2018 TRC-Plus and PAC Analysis and Ratios" from EB-2015-0049[1] and tables utilized in the response to Environmental Defence Interrogatory #24 found at Exhibit I.1.EGDI.ED.24 for the EB-2017-0224 proceeding.

Because the TRC Plus test included a component to account for benefits such as environmental, economic and social, two scenarios are presented below, one where the LTCPF is added to the TRC Plus test and a second scenario where the LTCPF is added to the TRC test but the "Plus" (i.e., the 15% adder) is removed. Enbridge does not have insight into what portion of the 15% adder the Board intended to account for carbon, and so is using these two scenarios for illustrative purposes.

TRC Plus Net Benefits	TRC Plus + GHG Related Benefits*	TRC (no plus) + GHG Related Benefits*
$165,962,507	$222,960,321	$193,799,630

PACT Net Benefits	PACT + GHG Related Benefits*
$196,098,168	$262,040,550

*GHG Avoided costs were derived through a conversion of the $/tCO$_2$e values provided in Exhibit I.1.EGDI.ED.24.

[1] EB-2015-0049, Exhibit B, Tab 2, Schedule 3, page 5 of 8.

Caveats

1. The forecast for this TRC calculation was developed in 2015 for the 2018 time period. Actual program spend, actual program results and the current cost of gas have all changed significantly, which will result in a material change (likely a decrease) in this forecast.

2. Converting the cost per tonne of carbon to a cost per m^3 does not account for facility-related Cap and Trade costs.

3. Many of these values can be significantly impacted by a future NTG assessment.

Decarbonizing Ontario’s Natural Gas Supply

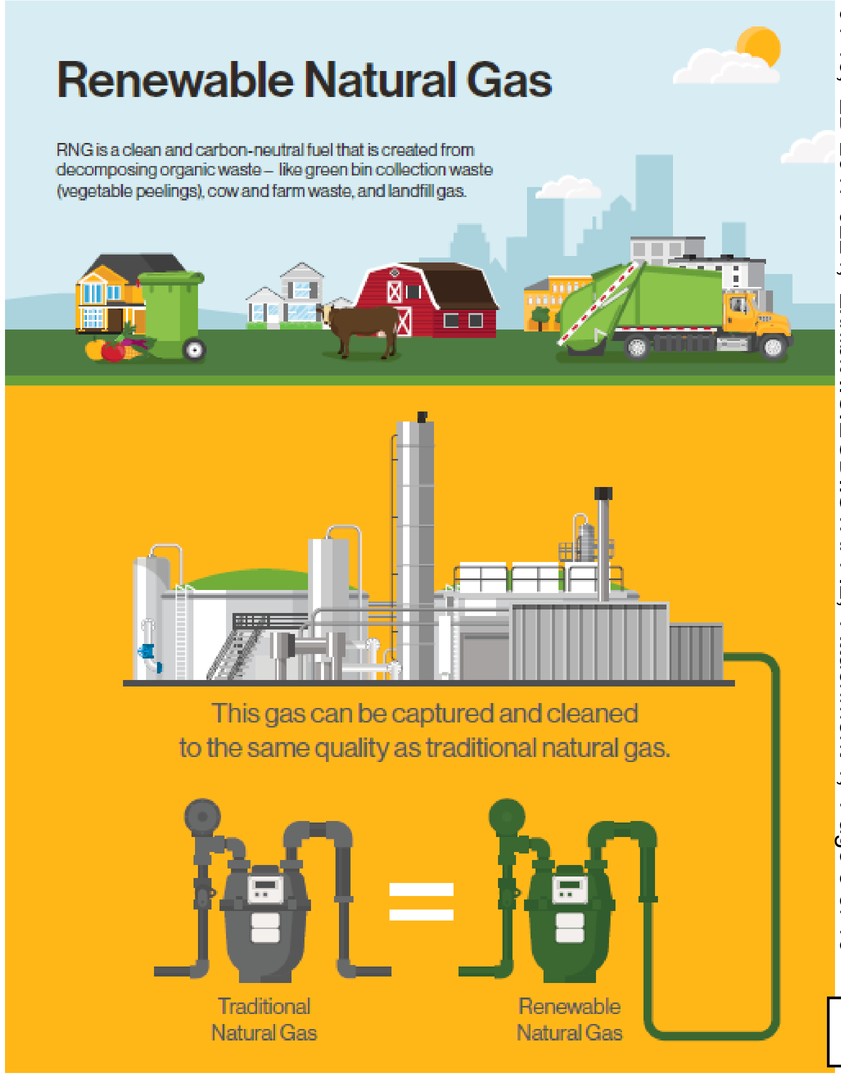
Renewable Natural Gas

- Renewable Natural Gas (RNG) is created by upgrading biogas that can be found on farms, landfills and food processing facilities to a quality that meets pipeline injection specifications. RNG can be transported throughout the natural gas distribution system.

- RNG is non-emitting, and would allow the province to reduce building emissions significantly, without having to build new transmission or distribution, at a fraction of the cost of electrification.

- RNG could provide 8 MT CO2e emission reductions by 2030

Energy Costs:	
Traditional Natural Gas	2 cents / kWh
RNG (Low-Cost)	4 cents / kWh
RNG (High-Cost)	8 cents / kWh
Electricity (Mid-Peak)	13 cents / kWh
Electricity (On-Peak)	19 cents / kWh



EXISTING CUSTOMER ABATEMENT PROGRAMS

73. The following sections outline existing customer abatement programs that will continue to be implemented in 2018, and do not require approval in this proceeding.

Demand Side Management ("DSM")

74. DSM is a very important means by which Enbridge will continue to assist the Government in meeting emissions reductions targets. The Company continues to offer a broad range of DSM programs through its 2015-2020 Multi-Year DSM Plan. For clarity, the volumetric impacts attributable to OEB approved DSM activity for 2018 are reflected in the volumetric forecasts upon which the Company's Cap and Trade compliance obligation planning is based.

75. An analysis of the MACC study results as compared to the Company's DSM plans shown in Table 3 below indicates that Enbridge's current DSM Plan delivers results for ratepayers that are well in excess of what the MACC study would otherwise indicate is cost-effective under a Mid-Range LTCPF scenario. At present, Enbridge does not have sufficient insight into the underlying analysis of the MACC study to fully understand what is driving the clear differences between the MACC study results, the Conservation Potential Study results and the Utilities' DSM Plans. At a minimum this analysis serves as a reminder that in designing and deploying DSM to date, Enbridge has been aggressive in its pursuit to reduce volumes and emissions through the most cost-effective opportunities available.

GEC INTERROGATORY #20

INTERROGATORY

At Exhibit C, Tab 5Schedule 2, p. 25 the company says: "75. An analysis of the MACC study results as compared to the Company's DSM plans shown in Table 3 below indicates that Enbridge's current DSM Plan delivers results for ratepayers that are well in excess of what the MACC study would otherwise indicate is cost-effective under a Mid-Range LTCPF scenario. At present, Enbridge does not have sufficient insight into the underlying analysis of the MACC study to fully understand what is driving the clear differences between the MACC study results, the Conservation Potential Study results and the Utilities' DSM Plans."

a. Why did Enbridge not investigate the reasons for this result? Has the company done so since filing its application (perhaps in preparing its mid-term review filing)? If so, please provide your current understanding. If not, why not?
b. Is it the company's understanding that the MACC includes or excludes the avoided costs of DSM (apart from the avoided C&T compliance costs)?
c. Does the company agree that DSM can be cost effective even though the utility costs of the DSM are higher than the avoided cost of allowances or credits

RESPONSE

a) Enbridge did investigate to some extent but has been unable to resolve all the differences at this time. Enbridge will continue to work towards ensuring appropriate cost-effectiveness review for carbon compliance abatement, and DSM.

b) It is the Company's understanding, as is confirmed in the MACC study itself, that the MACC includes the avoided cost of natural gas for the lifetime of the measure(s) as well as the avoided Cap and Trade compliance costs.

c) Please see response to Board Staff Interrogatory #24 filed at I.1.EGDI.STAFF.24, and response to GEC Interrogatory 24, filed at I.1.EGDI.GEC.24.

Witnesses: D. Johnson
F. Oliver-Glasford

GEC INTERROGATORY #29

INTERROGATORY

At Exhibit C, Tab 5, Schedule 2, at Page 25 Enbridge states: "At present, Enbridge does not have sufficient insight into the underlying analysis of the MACC study to fully understand what is driving the clear differences between the MACC study results, the Conservation Potential Study results and the Utilities' DSM Plans."

At Page 28 Enbridge states: "In summary, the Company believes that DSM should be considered a vital part of its overall long-term Compliance Plan. This is especially so where the results from incremental conservation and energy efficiency are known to be more cost effective over the long term than the purchase of compliance instruments. Enbridge reviewed the MACC relative to current DSM targets and found that all cost effective savings are already captured."

a. Please reconcile these two statements. Specifically, how did the company conclude (based on the MACC) that all cost effective savings are already captured when it does not fully understand what is driving differing results in the analyses?
b. Since filing the current C&T application, has Enbridge investigated and obtained a full understanding of the MACC study as part of its preparation for the Mid-Term Review? If so, please update the above referenced statements and provide details.
c. If the answer to part b. of this question is 'no', how does Enbridge expect that the Mid-Term Review process will adequately address this issue?

RESPONSE

a) Please refer to the response to Board Staff Interrogatory #24a, filed at Exhibit I.1.EGDI.STAFF.24.

b) No further detail beyond what is provided by the final MACC has been obtained for either the Mid-Term Review or the Compliance Plan proceeding.

c) Enbridge believes that the MACC will not provide the details necessary for either the Compliance Plan or the Mid-Term Review given it does not capture the significant spending from the GreenON Fund around energy conservation into its analysis.

Witnesses: D. Johnson
F. Oliver-Glasford