

**EB-2021-0002**  
**Enbridge Gas 2022-2027 DSM Plan**

**Interrogatories of Environmental Defence**

**Issue 1 – Response to OEB directions**

1. Does Enbridge Gas’s 2023-2027 DSM Framework and DSM Plan adequately respond to previous OEB direction and guidance on future DSM activities (e.g., DSM Mid-Term Review Report, 2021 DSM Decision, OEB’s post-2021 DSM guidance letter)?

**Interrogatory # 1-ED-1**

Reference: The OEB’s post-2021 DSM guidance letter

Preamble: The OEB’s guidance letter includes the following:

“Enbridge Gas’s DSM plan application should be informed by ... the 2019 Achievable Potential Study ...” (p. 2).

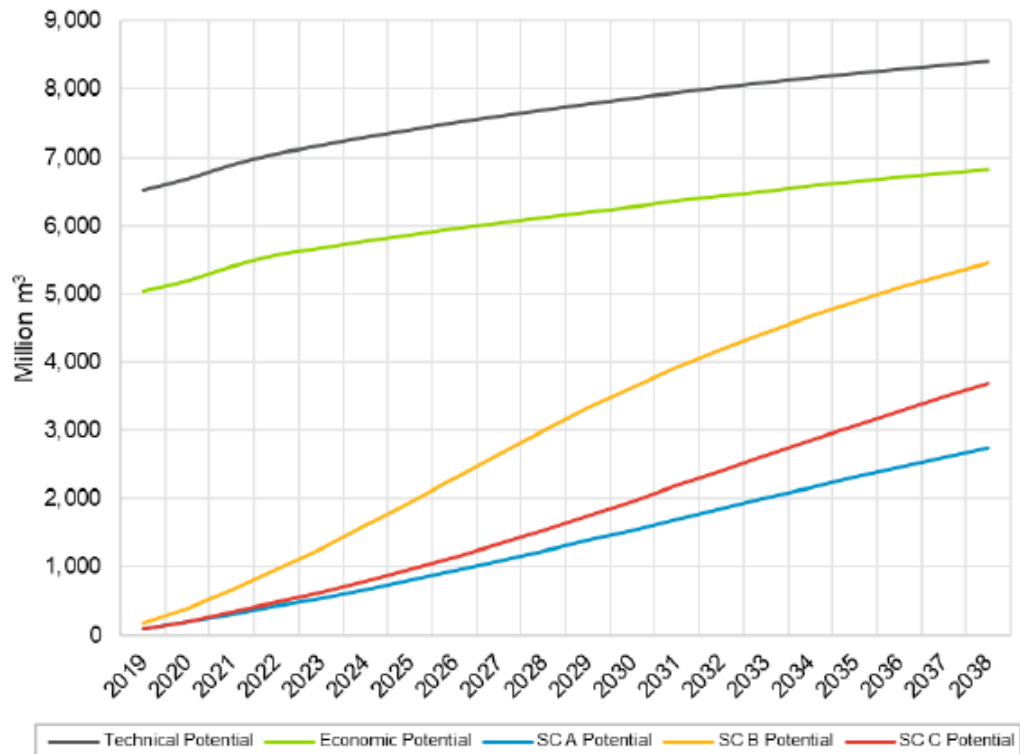
“The OEB completed an updated Achievable Potential Study in October 2019. The study was integrated with the IESO with the objective of identifying and quantifying energy savings (electricity and natural gas), greenhouse gas emissions reductions and associated costs from demand side resources for the period from 2019 to 2038. While not determinative, the OEB expects that the findings from the study will be used to inform future natural gas DSM plans.” (p. 4-5)

Note that this question is also related to other issues, such as the appropriateness of the gas savings levels and budgets proposed by Enbridge.

Questions:

- (a) Please add a line to the following figure from page vii of the 2019 Achievable Potential Study to approximately represent the gas savings according to Enbridge’s DSM plans. Where available, please use audited results. For other years, please use forecast results based on the DSM plans (at 100% target levels). For years beyond 2027, please continue the line at the same slope as for the years 2023-2027. Please make and state any assumptions and caveats as necessary.

Figure ES-4. Natural Gas Potential



Source: Navigant analysis

- (b) Please add rows to the following figure from page vii of the 2019 Achievable Potential Study to approximately represent the gas savings according to Enbridge's DSM plans. Where available, please use audited results. For other years, please use forecast results based on the DSM plans (at 100% target levels). For years beyond 2027, please continue the line at the same slope as for the years 2023-2027. Please make and state any assumptions and caveats as necessary.

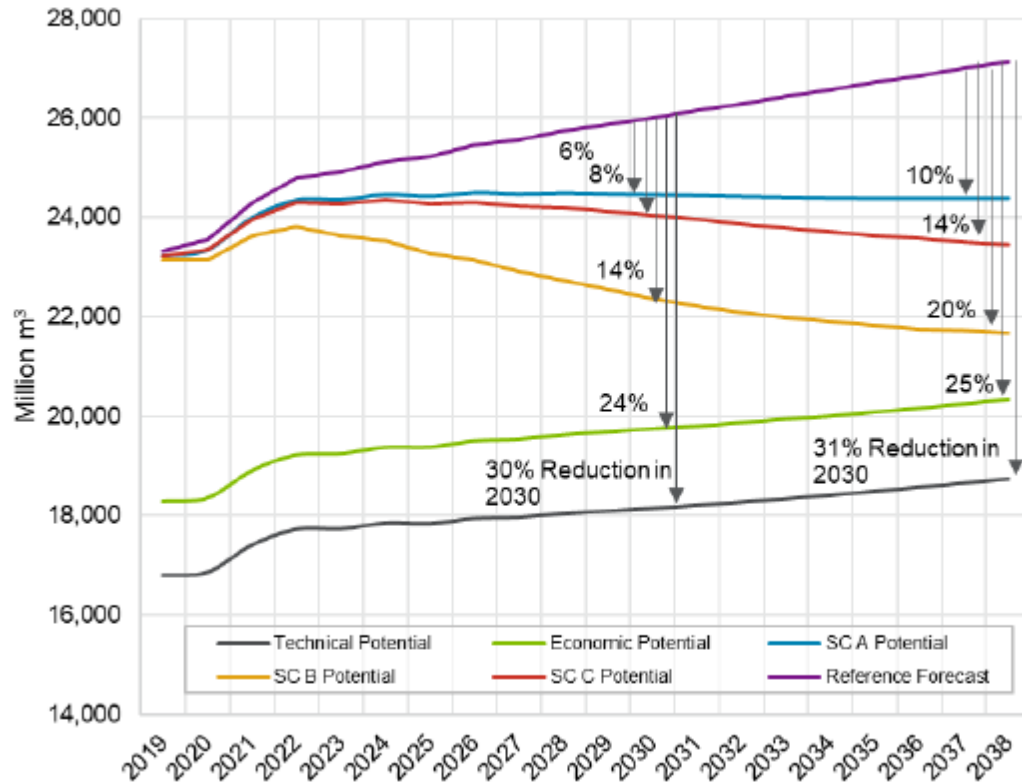
**Table ES-3. Key Natural Gas Potential Summary Statistics – Three Indicative Years**

Year	Potential Type	Natural Gas Potential (Million m3)	GHG Emissions Reduction (KT CO2e)	Program Admin Cost in Given Year (\$ Million)	Average Incentive LUEC (\$/lifetime m3)	TRC-Plus <sup>4</sup> Ratio	PAC Ratio <sup>5</sup>
2023	Max Achievable (Sc B)	1,266	2,474	\$548	\$0.082	3.3	2.1
2030	Max Achievable (Sc B)	3,634	7,106	\$749	\$0.104	3.2	2.3
2038	Max Achievable (Sc B)	5,458	10,672	\$665	\$0.131	2.9	2.3
2023	Semi Constrained (Sc C)	623	1,217	\$175	\$0.054	3.3	2.4
2030	Semi Constrained (SC C)	1,969	3,849	\$309	\$0.063	3.5	2.8
2038	Semi Constrained (Sc C)	3,687	7,209	\$363	\$0.074	3.4	3.2
2023	Constrained (Sc A)	542	1,060	\$79	\$0.031	3.7	3.8
2030	Constrained (Sc A)	1,542	3,014	\$79	\$0.024	4.0	4.7
2038	Constrained (Sc A)	2,740	5,357	\$79	\$0.021	4.0	7.2

- (c) Please add a line to the following figure from page ix of the 2019 Achievable Potential Study to approximately represent the reference case minus the gas savings according to Enbridge's DSM plans. Where available, please use audited results. For other years, please use forecast results based on the DSM plans (at 100% target levels). For years beyond 2027, please continue the line at the same slope as for the years 2023-2027. Please make and state any assumptions and caveats as necessary.

Please also add another line to the following figure to show the actual gas consumption figures for the years with available data and for other years showing Enbridge's estimate for gas consumption in Ontario were there to be no DSM (i.e. akin to an updated reference case).

Figure ES-6. Natural Gas Potential – Compared with Reference Forecast



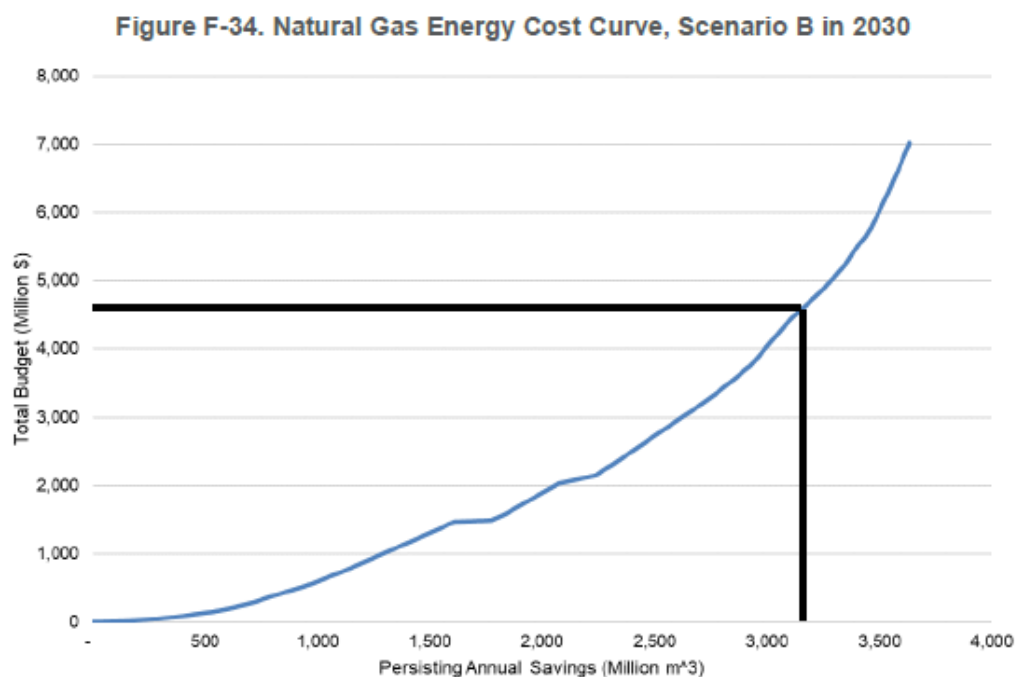
- (d) Navigant made the following recommendation at page xxi of the 2019 Achievable Potential Study: “The four most important of Navigant’s recommendations for improving future studies are provided below. ... Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs. It is unclear to what degree the natural gas avoided costs currently account for the costs associated with natural gas infrastructure expansion, specifically the costs of installing pipelines (and associated equipment) to connect new developments to the natural gas distribution network.”

Please describe in detail to what degree the natural gas avoided costs currently account for the costs associated with natural gas infrastructure expansion, specifically the costs of installing pipelines (and associated equipment) to connect new developments to the natural gas distribution network.

- (e) Please provide a table indicating the avoided costs associated with natural gas infrastructure expansion, specifically the costs of installing pipelines (and associated equipment) to connect new developments to the natural gas distribution network (\$/m3).
- (f) Has Enbridge fulfilled the following recommendation at page 186 of the 2019 Achievable Potential Study? If not, why not, does it intend to do so, and when does it intend to do so?

- **Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs.** It is unclear to what degree the natural gas avoided costs account for the costs associated with natural gas infrastructure expansion. For example, when considering fuel switching for new construction, it seems likely that the existing avoided costs would understate the benefit of not having to install pipelines and access points to a new housing development. If it can be demonstrated that the existing avoided costs do not account for these costs, or do not account for them specifically in the case of new construction, the OEB should consider developing (or engaging others to develop) another set of avoided costs that does. These could then be used for future fuel switching studies where there is an expectation of meaningful growth residential and commercial building stock.

(g) Please confirm that the black line added to the following figure on page F-24 of the 2019 Achievable Potential Study approximately represents the persisting annual savings and budget level that would correspond with Ontario’s Environment Plan ([link](#)). If Enbridge does not know or believes this is false, please check with the authors of the report and the Board Staff involved in the commissioning of the report.



## Interrogatory # 1-ED-2

Reference: EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87

Preamble: In the previous DSM plan decision, the OEB directed Enbridge to present an analysis of net rate impacts. The direction reads as follows:

“The cost impact of DSM programs for a customer was discussed during the proceeding. Some parties suggested that this cost impact be shown as a net rate impact, and both the

benefits and the costs of the DSM programs be included in the same calculation. The OEB suggests the gas utilities consider a net rate impact approach further. Some areas to consider include: the sample (e.g., years, participants, customers, etc.) required to reasonably consider the benefits and costs to customers, price forecasts used, demand reduction impact on price, among others. This analysis should be presented to the OEB as part of the gas utilities' next multi-year DSM plans.”<sup>1</sup>

Questions:

- (a) Please provide a copy of the analysis that the OEB said should be presented as part of the gas utilities' next multi-year DSM plans in the above passage.
- (b) Please provide the avoided cost figures used by Enbridge for avoided in-franchise distribution and transmission costs (i.e. excluding upstream savings in shipping tariffs). Please provide the complete figures with a full breakdown by year, etc. It is not clear to us, but Enbridge may refer to these as avoided natural gas downstream infrastructure costs (per Exhibit C, Tab1, Schedule 1, Page 48).
- (c) Please describe what DRIPE is.
- (d) Please provide Enbridge's best estimate of the price suppression effect of conservation savings in the Ontario market.
- (e) Please provide any studies that Enbridge has identified regarding the quantification of DRIPE / price suppression.
- (f) Please provide the marginal capital cost arising from an additional m3 of design day demand in Enbridge's system. Please provide an average figure over the entire system. If it significantly varies from place to place, please provide location-specific figures.

### **Interrogatory # 1-ED-3**

Reference: EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87

Preamble: In the previous DSM plan decision, the OEB directed Enbridge to present an analysis of net rate impacts. The direction reads as follows:

“Avoided distribution costs were examined extensively during this proceeding. Several parties provided recommendations on areas of improvements in calculating the avoided costs that result from DSM programs. Considerable time was spent reviewing and updating a summary table proposed by one of the expert witnesses. The OEB expects the utilities to provide a transparent calculation of the avoided costs and a list of the input assumptions that go into this calculation. Given the different geography, system and customers between Union and Enbridge, it is expected that the avoided cost calculation will be specific to each utility; however, the methodology, approach and presentation should be the same for both gas utilities.”<sup>2</sup>

Questions:

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<sup>1</sup> EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87.

<sup>2</sup> EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87.

- (a) Please comment on each of the conclusions made in the expert evidence by Paul Chernick filed in EB-2015-0029/0049. Please also comment on the specific net rate impact figures generated by Mr. Chernick.
- (b) Where Enbridge disagrees with net rate impact figures calculated by Paul Chernick, please provide Enbridge's best estimate along with all of the underlying calculations and assumptions.

#### **Interrogatory # 1-ED-4**

Reference: EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87

Preamble: In the previous DSM plan decision, the OEB directed Enbridge to develop new joint and enhanced joint programs with the IESO:

“The opportunity for collaborative work among the gas and electric utilities, along with the IESO, is expected to result in a number of new joint programs. The OEB expects enhanced joint energy conservation programs will reduce customer confusion and improve the efficiency of program delivery. The OEB expects this to be an area that the gas utilities explore and pursue aggressively over the course of this DSM term, with design details of the joint programs initially provided as part of the mid-term review.”<sup>3</sup>

Questions:

- (a) Please list the joint IESO/Enbridge programs in the 2015-2020 plan and list the joint IESO/Enbridge programs in the 2023-2027 plan. Please include a table for each plan showing the budgets for each program. Please also include a table showing the correspondence between the old and new programs (e.g. where one program has continued with adjustments under a new name, etc.).
- (b) Please specifically list how coordination with the IESO has been incrementally enhanced since the 2015-2020 plan.

#### **Interrogatory # 1-ED-5**

Reference: EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87

Preamble: In the previous DSM plan decision, the OEB directed Enbridge to provide transparent calculations of avoided distribution costs:

“Avoided distribution costs were examined extensively during this proceeding. Several parties provided recommendations on areas of improvements in calculating the avoided costs that result from DSM programs. Considerable time was spent reviewing and updating a summary table proposed by one of the expert witnesses. The OEB expects the utilities to provide a transparent calculation of the avoided costs and a list of the input assumptions that go into this calculation. Given the different geography, system and customers between Union and Enbridge, it is expected that the avoided cost calculation

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<sup>3</sup> EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87.

will be specific to each utility; however, the methodology, approach and presentation should be the same for both gas utilities.”<sup>4</sup>

Questions:

- (a) Please provide a transparent calculation of the avoided distribution costs and a list of the input assumptions that go into this calculation.
- (b) Please compare Enbridge’s best estimates of avoided distribution costs with the summary table described in the above passage.
- (c) Please file copies of all the updates of the summary table referred to above to ensure that they can be referenced in this proceeding in an organized way.

### **Interrogatory # 1-ED-6**

Reference: EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87

Preamble: In the previous DSM plan decision, the OEB directed Enbridge to provide sensitivity information on the impacts of increased budgets:

“The OEB did not find the sensitivity information submitted by the gas utilities to be helpful in determining the impacts of increased budgets on target metrics such as gas savings and participation levels. The sensitivity analysis was too vague to provide the OEB with any assistance in its review of proposed DSM budget levels and options to redirect components of the DSM plans. The OEB expects the gas utilities to provide more details of any future sensitivity analysis related to DSM budgets levels at the program level.”<sup>5</sup>

Question:

- (a) Please provide the kind of sensitivity analysis requested by the OEB.

### **Interrogatory # 1-ED-7**

Reference: EB-2017-0127/128, *Report of the Ontario Energy Board Mid-Term Review of the Demand Side Management (DSM) Framework for Natural Gas Distributors*, November 29, 2018, p. 27

Preamble: In the most recent DSM mid-term review decision, the OEB encouraged Enbridge to explore the concept of amortizing DSM costs:

“The OEB agrees that amortizing DSM costs over the lifetime of the energy efficiency programs should be explored during the post-2020 DSM framework development.”<sup>6</sup>

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<sup>4</sup> EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87.

<sup>5</sup> EB-2015-0029/0049, Decision and Order, January 20, 2016, p. 87.

<sup>6</sup> EB-2017-0127/128, *Report of the Ontario Energy Board Mid-Term Review of the Demand Side Management (DSM) Framework for Natural Gas Distributors*, November 29, 2018, p. 27



Questions:

- (a) Please describe all the work that Enbridge has completed to explore amortizing DSM costs.
- (b) Please provide a copy of all memos or studies that Enbridge has prepared in exploring the idea of amortizing DSM costs.

## Issue 2: Consistency with Government Policy

### Interrogatory # 2-ED-8

Reference: EB-2021-0002, Exhibit D, Tab 1, Schedule 3, Page 4

Preamble: Note, these questions are also relevant to other issues, such as the appropriateness of the proposed budget levels.

Questions:

- (a) Please complete the following table. Please make and state assumptions as needed. For example, for the purposes of the target adjustment mechanism we suggest the assumption that Enbridge meets its 100% targets in 2023 to 2027.

DSM Savings Historic and Targeted					
	2018	2019	...	2026	2027
First Year Savings (per plan / target), m3 <sup>7</sup>					
First Year Savings (audited results), m3 <sup>8</sup>					
Lifetime Savings (per plan / target), m3 <sup>9</sup>					
Lifetime Savings (audited					

<sup>7</sup> The first year savings arising from the DSM programs in each year as derived from that year's plan and target.

<sup>8</sup> The first year savings arising from the DSM programs in each year per audited results.

<sup>9</sup> The lifetime savings arising from the DSM programs in each year as derived from that year's plan and target. For 2023 to 2027, please provide the best estimate of the lifetime savings despite the fact that the targets are based on first year savings.

results), m3 <sup>10</sup>					
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(b) Please complete the following table. Please make and state assumptions as needed.

DSM Savings Persisting in 2030					
	2018	2019	...	2026	2027
DSM Savings Persisting in 2030 (m3) <sup>11</sup> – According to Plan/Budget					
DSM Savings Persisting in 2030 (m3) <sup>12</sup> – Based on Audited Results					

### Interrogatory # 2-ED-9

Reference: EB-2021-0002, Exhibit D, Tab 1, Schedule 3, Page 4

Preamble: Note, these questions are also relevant to other issues, such as the appropriateness of the proposed budget levels.

Questions:

- (a) The Auditor General states, with respect to the Environment Plan, that “18% (3.2 Mt) of emissions reductions will come from natural gas conservation programs.”<sup>13</sup> Is this statement correct? If not, why not?
- (b) The Auditor General provided the following chart from Ministry of the Environment data.<sup>14</sup> Please confirm that this shows a linear increase in CO2e emissions reductions from natural gas consumption until 2030. If not, please explain.

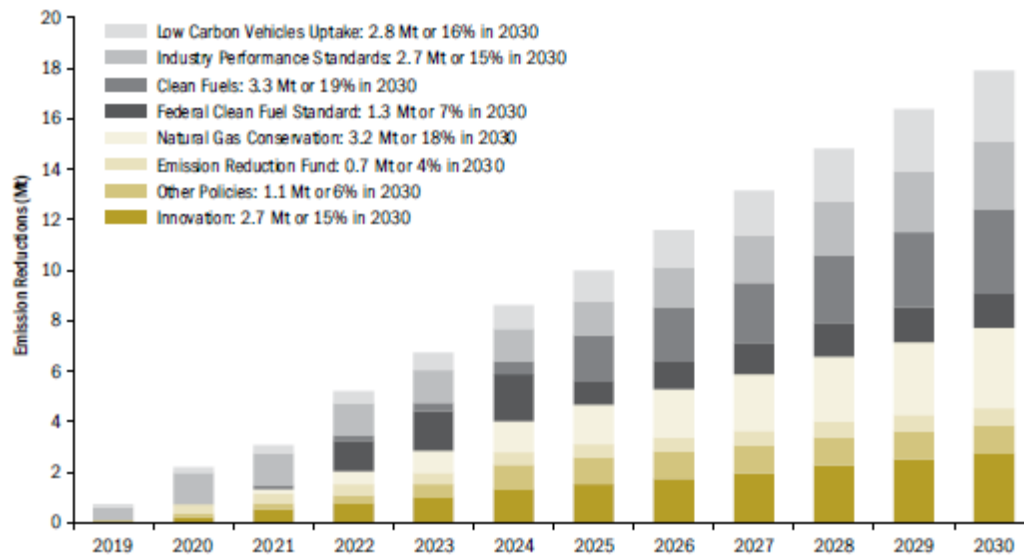
<sup>10</sup> The lifetime savings arising from the DSM programs in each year as derived from that year’s plan and target. For 2023 to 2027, please provide the best estimate of the lifetime savings despite the fact that the targets are based on first year savings.

<sup>11</sup> DSM savings from the programs in the relevant year that are assumed to persist in 2030 based on the measure life.

<sup>12</sup> DSM savings from the programs in the relevant year that are assumed to persist in 2030 based on the measure life.

<sup>13</sup> Auditor General of Ontario, 2019 Annual Report Volume 2, Chapter 3, p. 150.

<sup>14</sup> *Ibid.* p. 142.



- (c) Please confirm that the chart referred to in (b) above shows carbon emission reductions starting from natural gas conservation commencing in 2021 (this is clearer in the original version at this [link](#)). If this differs from Enbridge’s understanding, please explain.
- (d) Please confirm that the 3.2 Mt reduction in carbon emissions from natural gas conservation is incremental to a status quo scenario including a continuation of the savings levels from the then-existing programs in the 2015-2020 DMS plans. If not, please explain Enbridge’s understanding.
- (e) The Auditor General stated “In 2016, every dollar spent on natural gas conservation programs resulted in energy bill savings of about \$2.40. Internally, the Ministry estimated the additional required funding for this scenario from 2021 to 2030 would be \$6.6 billion.”<sup>15</sup> Please confirm that the 3.2 Mt reduction in carbon emissions from natural gas conservation is incremental to a status quo scenario including a continuation of the 2020 savings levels. If not, please explain Enbridge’s understanding.

## Interrogatory # 2-ED-10

Reference: EB-2021-0002, Exhibit D, Tab 1, Schedule 3, Page 4

Preamble: Note, these questions are also relevant to other issues, such as the appropriateness of the proposed budget levels.

Questions:

- (a) Please complete the following table. For the GHG reductions called for in the Environment Plan ([link](#)), please make or state assumptions as necessary. We suggest the assumption of a linear increase in persisting GHG savings starting in 2021 resulting in a 3.2 Mt reduction persisting in 2030.

<sup>15</sup> *Ibid.* p. 151.

<b>GHG Reductions: Environment Plan vs. DSM Plans (t CO2e – Persisting Annual)<sup>16</sup></b>					
		2020	2021	...	2030
GHG Savings from Natural Gas Conservation Consistent with Environment Plan (Incremental) <sup>17</sup>	Annual Increase				
	Persisting Since 2020				
GHG Savings from Natural Gas Conservation Assuming 2020 Status Quo Gas Savings Continue to 2030	Annual Increase				
	Persisting Since 2020				
GHG Savings from Natural Gas Conservation DSM Plans <sup>18</sup>	Annual Increase				
	Persisting Since 2020				
GHG Savings from Natural Gas Conservation Incremental to 2020 Status Quo per DSM Plans	Annual Increase				
	Persisting Since 2020				

(b) Please complete the following table. For the GHG reductions called for in the Environment Plan ([link](#)), please make or state assumptions as necessary. We suggest the assumption of a linear increase in persisting GHG savings starting in 2021 resulting in a 3.2 Mt reduction persisting in 2030. (Note – this is the same as above but with a 2021 start date).

<b>GHG Reductions: Environment Plan vs. DSM Plans (t CO2e – Persisting Annual)<sup>19</sup></b>					
		2021	2022	...	2030
GHG Savings from Natural Gas Conservation Consistent with Environment Plan (Incremental) <sup>20</sup>	Annual Increase				
	Persisting Since 2021				
GHG Savings from Natural Gas Conservation	Annual Increase				

<sup>16</sup> For all figures, please provide the tonnes of CO2e that will persist in 2030.

<sup>17</sup> For the GHG reductions called for in the Environment Plan, please make or state assumptions as necessary. We suggest the assumption of a linear increase in persisting GHG savings starting in 2021 resulting in a 3.2 Mt reduction persisting in 2030.

<sup>18</sup> Assuming targets are met at 100%. For 2028 to 2030, assume the same growth in savings from 2023-2027 continues.

<sup>19</sup> For all figures, please provide the tonnes of CO2e that will persist in 2030.

<sup>20</sup> For the GHG reductions called for in the Environment Plan, please make or state assumptions as necessary. We suggest the assumption of a linear increase in persisting GHG savings starting in 2021 resulting in a 3.2 Mt reduction persisting in 2030.

Assuming 2020 Status Quo Gas Savings Continue to 2030	Persisting Since 2021				
GHG Savings from Natural Gas Conservation DSM Plans <sup>21</sup>	Annual Increase				
	Persisting Since 2021				
GHG Savings from Natural Gas Conservation Incremental to 2020 Status Quo per DSM Plans	Annual Increase				
	Persisting Since 2021				

(c) Please complete a version of the above tables expressed in cubic metres instead of CO2e.

### Interrogatory # 2-ED-11

Reference: EB-2021-0002, Exhibit D, Tab 1, Schedule 3, Page 4

Preamble: Note, these questions are also relevant to other issues, such as the appropriateness of the proposed budget levels.

Question:

- (a) Please prepare a table comparing the proposed gas savings in the current DSM plans with the amounts referenced in the Environment Plan ([link](#)). Where necessary, please make and state assumptions. If Enbridge believes a response to the previous interrogatory provides the best comparison it need not reproduce that response again here.

### Issue 5: DSM policy framework

5. Is Enbridge Gas's proposed DSM policy framework, including guiding principles and guidance related to budgets, targets, programs, evaluation, and accounting treatment appropriate?

### Interrogatory # 5-ED-12

Reference: Exhibit C, Tab 1, Schedule 1, Page 9

Preamble: Page 17 of OEB, *Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020)*, December 22, 2014 states as follows:

“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

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<sup>21</sup> Assuming targets are met at 100%. For 2028 to 2030, assume the same growth in savings from 2023-2027 continues.

estimated total annual DSM amounts of \$85M for Enbridge and \$70M for Union (these amounts are inclusive of the maximum annual shareholder incentive).”

Please note that this interrogatory is also relevant to other issues, such as the reasonableness of the rate impacts (Issue 6) and whether DSM programs (and the shareholder incentive levels) should be increased.

Questions:

- (a) The 2015-2020 DSM Framework estimated the DSM budgets with reference to \$2/month per residential customer bill, with the budgets for other sectors scaled correspondingly (see page 17 of the 2015-2020 DSM Framework for details). What would the DSM budget level be in 2023 if it was set based on \$2/month for residential customers and a corresponding adjustment for other sectors according to the historic program mix?
- (b) Please confirm that the 2015-2020 DSM Framework, which first contained the \$2/month yardstick, was published in 2014. If not, please explain.
- (c) Please confirm that \$2 in 2014 is worth \$2.27 in 2021 per the Bank of Canada Inflation Calculator.
- (d) What would the DSM budget level be in 2023 if it was set based on \$2.27/month for residential customers and a corresponding adjustment for other sectors according to the historic program mix?
- (e) Please describe how Enbridge calculated the bill impact figures that it included in the notice of hearing for this matter. Please provide those underlying figures.
- (f) Please complete the following table. If the entire table cannot be completed, please complete as much as possible and provide alternative information for the portions that cannot be completed. Please make and state assumptions and caveats as needed.

Average Monthly Residential Gas Bill			
	2015	...	2027
Variable rate (\$/m3)			
Variable costs (\$)			
Fixed costs			
Total bill			
# of customers			
Total residential gas costs			

- (g) Please complete the following table. (The purpose, in part, is to allow us to assess the DSM budgets and reasonableness of the rate/bill impacts against total costs borne by Enbridge customers, including commodity, distribution, and carbon costs).

Annual Gas Costs			
	2015	...	Latest year of data

Total Ontario gas consumption (m3) <sup>22</sup>			
Total Ontario Gas Customers			
Total Ontario gas consumption for which Enbridge has commodity price data <sup>23</sup>			
Average annual commodity price (for gas that Enbridge has data for) – \$/m3			
Annual commodity costs (for gas that Enbridge has data for) – \$			
Annual commodity costs (estimate other customers) <sup>24</sup>			
Annual distribution costs <sup>25</sup>			
Annual carbon costs <sup>26</sup>			
Annual gas related costs - other <sup>27</sup>			
Annual gas costs - total			

(h) Please complete above table for 2023-2027 as best as possible.

(i) Please complete the following table based on the most current information available. Please state the source of figures. You may wish to focus on prices for gas procured by Enbridge for its customers.

<b>Gas Prices (Commodity and Carbon) – Historic and Future</b>
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<sup>22</sup> Enbridge may wish to use the figure from the Natural Gas Yearbook figures.

<sup>23</sup> Presumably this would be everything but direct purchasers.

<sup>24</sup> Please provide a best estimate of the cost incurred by other customers where Enbridge does not have specific data on the price. If no estimate is possible, please assume that the price is the same as it is for gas procured by Enbridge for its customers.

<sup>25</sup> i.e. All costs charged by Enbridge to customers through rates in Ontario.

<sup>26</sup> Please exclude carbon costs from the commodity prices above to avoid double counting. For customers responsible for their own carbon costs, please either estimate their cost or exclude them from this row and indicate so in the response.

<sup>27</sup> If the above items are missing anything, please include them here.

	2015 (historic)	...	20nn (forecast future year as far as the current forecast goes)
Average annual gas commodity price (\$/m3), excl. carbon			
Annual carbon price \$/m3			

- (j) Please ask Enbridge's gas supply planning group to provide their latest gas price forecasts. Please also ask that group to provide a copy of the most current third party gas price forecasts in their possession. Please file all of those. If any of those forecasts are in units other than \$/m3, please also provide a table converting them to \$/m3.
- (k) Does Enbridge have any reason to expect that average annual gas commodity price paid by distribution customers who purchase from entities other than Enbridge would be higher or lower than the average annual gas commodity price for gas procured by Enbridge for its customers? Would the price paid by direct purchase customers potentially be higher because they do not have the same degree of buying power as Enbridge?

### Interrogatory # 5-ED-13

Reference: Exhibit C, Tab 1, Schedule 1, Page 14; Exhibit D, Tab 1, Schedule 2

Preamble: The Energy Future Group presentation for the Mid-Term Review included these slides:

### **Problem: No incentive to maximize net benefits**

- Current model: utilities profit from meeting targets, but have:
  - No profit incentive to design optimal plans that maximize net benefits
  - No profit incentive to design the most cost-effective plans possible
  - Perverse incentives to propose modest savings targets
- Utilities are incentivized to *execute* DSM plans well, but not to *design and develop* optimal DSM plans



## Solution: Incentivize maximization of net benefits & optimization

- Option 1: allow \$10M incentive cap to rise if UCT net benefits rise
  - E.g., for every X% increase in net benefits over the previous year the incentive cap rises by Y%
    - E.g. hold the current ratio of net benefits to the \$10M incentive pot constant
  - Incentives would still be earned for meeting targets, but the maximum incentives (~\$10M) could increase if more net benefits are achieved via better conservation plans over time
- Option 2: pay all or a portion of incentives as a growing percent of net benefits
  - Illustrative example:
    - 0% for the first \$100 million,
    - X% for the second \$100 million,
    - Y% for the third \$100 million, etc.
- Could be implemented now, but if it isn't, it should be flagged as a priority issue for the next DSM Framework

Note that this interrogatory is also relevant to issue 8, the appropriateness of the proposed shareholder incentives.

### Questions:

- (a) Please comment on whether Enbridge would oppose option 1 and/or 2 as detailed above in relation to future DSM plans involving a potential significant increase in savings and investment levels.
- (b) If, for example, the OEB orders a 300% increase in DSM savings levels and budgets, would Enbridge believe that the incentive envelop should increase? If yes, please comment on the appropriateness of options 1 and 2 above as a means to incentivize the creation of a plan that maximizes net benefits.
- (c) Why is Enbridge moving to incentives being primarily based on first-year savings instead of lifetime savings? Please respond to the concern that this would not sufficiently incentivize Enbridge to implement longer-lived measures.

### Interrogatory # 5-ED-14

Reference: Exhibit C, Tab 1, Schedule 1, Page 38

### Questions:

- (a) Does Enbridge believe it would be appropriate to calculate the UCT/PAC as a secondary measure to use as a consideration in the prioritization of measures or offerings?
- (b) Does Enbridge believe it would be appropriate to use the UCT/PAC as the main cost-effectiveness measure?
- (c) Does Enbridge believe it would be appropriate to have the option of using the UCT/PAC as a cost-effectiveness test for certain measures where there are gaps in the application of the TRC (e.g. where there are high non-energy-benefits that are difficult to quantify and variable)?

### **Interrogatory # 5-ED-15**

Reference: Exhibit C, Tab 1, Schedule 1, Page 39

Preamble:

Enbridge states the following in relation to the TRC: “Under this test, benefits are driven by avoided resource costs, which are based on the marginal costs avoided by not producing and delivering the next unit of natural gas to the customer. Those marginal costs avoided include the natural gas commodity costs (both system and customer) and transmission and distribution system costs (e.g., pipes, storage, etc.).”

Question:

- (a) Please provide a table showing Enbridge’s avoided cost figures for “transmission and distribution system costs (e.g., pipes, storage, etc.)” as described in the above passage.

### **Interrogatory # 5-ED-16**

Reference: Exhibit C, Tab 1, Schedule 1, Page 48

Preamble: Enbridge states:

“Assumptions relating to the benefit of not having to supply an extra unit of natural gas or other resource (e.g., electricity, heating fuel oil, propane, or water) through the delivery of DSM programs are referred to as avoided costs. Avoided costs are required to quantify the benefits for the TRC-plus test.

Avoided costs are long-term estimates forecasted over the lifetime of DSM measures and include:

- Avoided natural gas commodity costs
- Avoided natural gas upstream transportation and third-party services costs
- Avoided natural gas seasonal storage requirement costs.
- Avoided unaccounted for natural gas fuel losses
- Avoided natural gas downstream infrastructure costs<sup>28</sup>
- Avoided costs, other resources (electricity, heating fuel oil, propane, and/or water)
- Avoided carbon costs”

Note that this question is also relevant to a number of other issues, including issue 13 (appropriateness of avoided cost input assumptions) and 10 (optimal suite of program offerings). Please feel free to move it to a different section of the interrogatory responses. This information is also important to promote consistency between intervenor evidence and Enbridge’s evidence.

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<sup>28</sup> [Footnote 61] “For DSM this reflects passive avoided distribution costs driven by broad-based DSM programs, rather than active/geo-targeted avoided distribution costs unique to a specific initiative.”

Questions:

- (a) Please provide a live excel spreadsheet (or spreadsheets) containing a full breakout of all of the prices and inputs for the avoided cost calculations underlying Enbridge's application (e.g. \$/m3, \$/kWh, etc.).
- (b) For each of the avoided cost categories listed above, please indicate the approximate date that the forecast of future costs was made.
- (c) Please provide a table (ideally as an excel spreadsheet) showing the forecast carbon price for avoided carbon costs for each year both as \$/tonne CO2e and as \$/m3 of gas.
- (d) Please describe the rationale for Enbridge's forecast avoided carbon price in 2031 and beyond.
- (e) Please provide a table (ideally as an excel spreadsheet) showing the forecast electricity prices for avoided electricity costs.
- (f) Please describe the basis used by Enbridge to forecast electricity prices for the purposes of avoided electricity costs.
- (g) Please describe the degree to which and why avoided gas costs in the TRC calculations differ from the rates appearing on customer bills. Please compare the avoided gas costs with the rates from a typical bill.
- (h) Please describe the degree to which and why avoided electricity costs in the TRC calculations differ from the rates appearing on customer bills. Please compare the avoided gas costs with the rates from a typical bill.
- (i) With respect to electricity price forecasts and avoided costs: (i) Does Enbridge differentiate between peak and off-peak times? (ii) Does Enbridge differentiate between energy (\$/kWh) and capacity costs (\$/kW)? For each, please explain the rationale.
- (j) If a measure would decrease gas consumption but cause somewhat of an increase in electricity consumption (e.g. a custom commercial or industrial project), how would Enbridge calculate the cost impact of the increased electricity consumption (e.g. for cost-effectiveness calculations or otherwise)? Would Enbridge use the same electricity price forecasts for this purpose as it uses to measure the value of electricity consumption reductions (e.g. from more electrically efficient gas furnace blowers)?

**Interrogatory # 5-ED-17**

Reference: Exhibit C, Tab 1, Schedule 1, Page 48

Questions:

- (a) Please provide a table showing for 2023 to 3035: (i) the avoided gas cost figures underlying Enbridge's application and (ii) Enbridge's best forecast of future gas prices. Please express both in \$/m3.
- (b) Please provide gas conversions rates for:
  - a. BTU to m3
  - b. GJ to m3
  - c. \$/GJ to \$/m3
  - d. \$/BTU to m3

- e. tonnes CO<sub>2</sub>e per m<sup>3</sup>
- f. kWh per m<sup>3</sup>

### **Interrogatory # 5-ED-18**

Reference: Exhibit C, Tab 1, Schedule 1, Page 48

Preamble: Enbridge states:

“In some cases, avoided cost estimates are required to extend beyond their forecasted periods. If necessary, a four-quarter moving inflation rate based on the Gross Domestic Product Implicit Price Index for Final Domestic Demand will be used, based on the most recently available information at the time avoided costs are updated.”

Question:

- (a) Please provide a table with the above-noted figures underlying Enbridge’s application. Please indicate when these were calculated (i.e. when the avoided costs were updated).

### **Interrogatory # 5-ED-19**

Reference: Exhibit C, Tab 1, Schedule 1, Page 49

Preamble: Enbridge states:

“For the purpose of the cost-effectiveness test (i.e. TRC-Plus), the total avoided costs resulting over the life of the DSM measures need to be discounted to a present value. Consistent with the 2015-2020 DSM Framework, the discount rate used to determine the net present value of avoided costs over the lifetime of DSM measures is 4% (real).”

Tim Woolf, Synapse Energy, *Benefit-Cost Analysis for Distributed Energy Resources*, Prepared for the Advanced Energy Economy Institute, September 22, 2014, p. 61 ([link](#)):

“We recommend that the DER BCA framework use a societal discount rate. The societal discount rate is best able to reflect the value of short- versus long-term costs and benefits to all utility customers, as well as to society in general. The societal discount rate is best able to reflect the time preference associated with the state’s energy policy goals, many of which are related to societal impacts. In addition, the societal discount rate is consistent with the use of the Societal Cost Test, which we recommend using in the DER BCA framework (see Chapter 2).

We also recommend that the societal discount rate chosen for the DER BCA framework be somewhere in the range of zero to three percent real. This range is frequently used for societal discount rates, and is also very close to the current values of risk-free discount rates.”

Questions:

- (a) Please confirm that the OEB has the jurisdiction to set the discount rate that is used in the post-2021 DSM framework.
- (b) Would Enbridge oppose using a societal discount rate in the range of zero to three percent as recommended by Synapse Energy (either for this DSM plan or on a going forward basis)?
- (c) Please discuss each of the rationales for using a societal discount rate in the Synapse Energy report ([link](#)) and whether they would apply in the context of DSM in Ontario.
- (d) Please provide a live excel spreadsheet underlying the cost-effectiveness calculations for one of Enbridge's programs to more clearly illustrate how Enbridge applies the 4% discount rate in its TRC NPV calculations. Please simply pick one of the existing underlying spreadsheets and file it. If that is not possible, please prepare an example.
- (e) Does Enbridge apply an inflation adjustment in addition to the discount rate (seeing as the 4% is a real figure)? Please explain. If yes, what rate is used and how is it applied?

## Issue 6: Budgets

Does Enbridge Gas's proposed budget, including program costs and portfolio costs result in reasonable rate impacts while addressing the OEB's stated DSM objectives in its letter issued on December 1, 2020, including having regard to consumers' economic circumstances?

### Interrogatory # 6-ED-20

Reference: Exhibit D, Tab 1, Schedule 1, Page 11

Preamble:

Questions:

- (a) To help us understand whether (and by how much) budgeted portfolio and admin costs are increasing or decreasing, please complete the following table with combined data for both Enbridge and Union. Please include the costs for the thermostat program approved for Union in the mid-term review and specify where they have been included.

Comparison of Budgeted Program, Portfolio, and Overhead Costs			
	2015	...	2027
Program costs (incentives, promotion, & delivery)			
Program overhead			
Portfolio costs (non-admin)			
Portfolio costs (admin)			

Total overhead costs (program and portfolio)			
Total portfolio costs and overhead costs			
Total costs			

- (b) Please complete the following table. Please include the \$1.5 million Union Gas adaptive thermostat program approved in the mid-term review starting in 2019 to ensure consistency with 2023, which includes that program. Please confirm that this \$1.5 million is part of the DSM budget per the latest OEB verification report: OEB, *2019 Natural Gas Demand-Side Management Annual Verification Report*, December 3, 2020, p. 208 ([link](#)). For the real 2019 dollars, please use inflation figures per the Bank of Canada ([link](#)).

DSM Investments - 2019-2023 Budgets					
	2019	2020	2021	2022	2023
<b>Total programs (real \$2019)</b>					
<b>Total programs (nominal)</b>					
<b>Resource acquisition</b> (all but market transformation)					
<b>Market transformation</b>					
<b>Total overhead</b>					
<b>Program overhead</b>					
<b>Portfolio overhead</b>					
<b>Total budget</b>					
<b>Overhead as % of Total</b>					

- (c) Please complete this table:

Proposed Program Budget Increases From 2023 to 2027		
	Nominal	Inflation Adjusted (@ 2% Annual)
<b>Resource Acquisition</b> (incl. all but market transformation)		
<b>Market Transformation</b>		

- (d) Please complete this table:

Proposed Budgets - 2023-2027
------------------------------

	2023	2024	2025	2026	2027	% Change Nominal	% Change Inflation Adjusted <sup>29</sup>
<b>Resource Acquisition</b> (incl. all but market transformation)							
<b>Percent Increase</b>							
<b>Market Transformation</b>							
<b>Percent Increase</b>							
<b>Total Program</b>							
<b>Portfolio Overhead</b>							
<b>Total</b>							

## Issue 10: Optimal Portfolio and Programs

10. Has Enbridge Gas proposed an optimal suite of program offerings that will maximize natural gas savings and provide the best value for rate payer funding?

- a. Are Enbridge Gas's proposed program offers for residential customers appropriate?
- b. Are Enbridge Gas's proposed program offerings for low-income customers appropriate?
- c. Are Enbridge Gas's proposed program offerings for commercial customers appropriate?
- d. Are Enbridge Gas's proposed program offerings for industrial customers appropriate?
- e. Are Enbridge Gas's proposed program offerings for large volume customers appropriate?
- f. Are Enbridge Gas's proposed energy performance program offerings appropriate?
- g. Are Enbridge Gas's proposed beyond building cost program offerings appropriate?
- h. Should there be any other program offerings included in addition to or to replace those proposed by Enbridge Gas?
- i. Are Enbridge Gas's proposed program offerings appropriate for customers in Indigenous communities?
- j. Is Enbridge Gas's proposed low carbon transition program appropriate?

### Interrogatory # 10-ED-21

Reference: Exhibit D, Tab 1, Schedule 4

Preamble: Enbridge includes the following table:

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<sup>29</sup> Assumed 2% annual inflation.

Table 1: 2023 TRC-Plus and Net Benefits

/u

2023 TRC-Plus Forecast	TRC-Plus Benefits <sup>1</sup>	TRC Costs	Net Benefits <sup>2</sup>	TRC-Plus Ratio
<b>Residential Program</b>	<b>\$125,706,884</b>	<b>\$66,254,346</b>	<b>\$59,452,537</b>	<b>1.90</b>
<i>Residential Whole Home</i>	\$73,977,785	\$46,006,919	\$27,970,866	1.61
<i>Residential Single Measure</i>	\$8,961,854	\$7,529,043	\$1,432,811	1.19
<i>Residential Smart Home</i>	\$42,767,245	\$11,229,960	\$31,537,285	3.81
<i>Program Level Admin</i>		\$1,488,425	-\$1,488,425	
<b>Commercial Program</b>	<b>\$133,540,929</b>	<b>\$30,573,084</b>	<b>\$102,967,845</b>	<b>4.37</b>
<i>Commercial Custom</i>	\$103,530,272	\$12,205,023	\$91,325,250	8.48
<i>Prescriptive Downstream</i>	\$8,696,432	\$3,602,595	\$5,093,837	2.41
<i>Direct Install</i>	\$14,451,859	\$5,764,458	\$8,687,401	2.51
<i>Prescriptive Midstream</i>	\$6,862,366	\$5,691,921	\$1,170,445	1.21
<i>Program Level Admin</i>		\$3,309,088	-\$3,309,088	
<b>Industrial Program</b>	<b>\$210,099,973</b>	<b>\$15,949,294</b>	<b>\$194,150,679</b>	<b>13.17</b>
<i>Industrial Custom</i>	\$210,099,973	\$12,171,680	\$197,928,293	17.26
<i>Program Level Admin</i>		\$3,777,614	-\$3,777,614	
<b>Low Income Program</b>	<b>\$52,688,511</b>	<b>\$20,090,692</b>	<b>\$32,597,819</b>	<b>2.62</b>
<i>Home Winterproofing</i>	\$22,736,285	\$14,088,455	\$8,647,829	1.61
<i>Affordable Housing Multi-Residential</i>	\$29,952,226	\$4,554,095	\$25,398,132	6.58
<i>Program Level Admin</i>		\$1,448,142	-\$1,448,142	
<b>Large Volume Program</b>	<b>\$12,904,860</b>	<b>\$4,625,266</b>	<b>\$8,279,594</b>	<b>2.79</b>
<i>Direct Access</i>	\$12,904,860	\$4,408,642	\$8,496,218	2.93
<i>Program Level Admin</i>		\$216,624	-\$216,624	
<b>Energy Performance Program</b>	<b>\$0</b>	<b>\$584,156</b>	<b>-\$584,156</b>	<b>0.00</b>
<i>Whole Building Pay 4 Performance (P4P)<sup>3</sup></i>	\$0	\$530,000	-\$530,000	0.00
<i>Program Level Admin</i>		\$54,156	-\$54,156	
<b>Building Beyond Code Program</b>		<b>\$5,618,903</b>		
<b>Low Carbon Transition Program</b>		<b>\$625,291</b>		
<b>Program Subtotal</b>	<b>\$534,941,157</b>	<b>\$144,321,033</b>	<b>\$390,620,124</b>	<b>3.71</b>
<b>Portfolio Costs</b>		<b>\$18,360,000</b>		
<b>Portfolio Total</b>	<b>\$534,941,157</b>	<b>\$162,681,033</b>	<b>\$372,260,124</b>	<b>3.29</b>

1. Forecast 2023 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available information at the time of plan submission).

2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.

3. Based on the program design, energy savings are not forecasted until Year 2 (2024).

Questions:

- Please create a copy of the above table for each year over 2024-2027.
- Please reproduce this table for 2023 using the PAC/UCT test.
- In the previous DSM plan pre-filed evidence Enbridge included PAC/UCT test results. Why has it not done so here?

### Interrogatory # 10-ED-22

Reference: Exhibit E, Tab 1, Schedule 2, Page 12

Preamble: Enbridge's evidence includes this table:



Table 1: Whole Home Measure Incentives

<u>Measure</u>	<u>Criteria</u>	<u>Incentive</u>
Attic Insulation	Increase insulation from R35 or less to at least R60	\$650
	Increase cathedral/flat roof insulation by at least R14	\$650
Air Sealing	Achieve 10% or more above base target	\$150
	Achieving base target	\$100
Basement Insulation Must upgrade a minimum of 20 per cent of the total wall area	Add at least R23 insulation to 100% of basement	\$1,250
	Add at least R12 insulation to 100% of basement	\$750
	Add at least R23 insulation to 100% of crawl space wall	\$1,000
	Add at least R12 insulation to 100% of crawl space wall	\$500
	Add at least R23 insulation to 100% of floor above crawl space	\$1,000
Exterior Wall Insulation Must upgrade a minimum of 20 per cent of the total wall area	Add at least R20 to 100% of building	\$3,000
	Add at least R9 insulation to 100% of building to achieve a minimum of R12	\$1,750
	Add at least R3.8 to 100% of building to achieve a minimum of R12	\$1,000
Furnace/Boiler	For replacing a less than 96% AFUE natural gas furnace with a 96% AFUE or higher condensing natural gas furnace; OR, For replacing a less than 90% AFUE natural gas boiler with a 90% AFUE or higher condensing natural gas boiler.	\$250 for furnace or \$1,000 for boiler

Questions:

- What is the expected life of a residential furnace for the purposes of estimating the cost-effectiveness of measures involving a furnace? If different, what is the expected life of a residential boiler for the purposes of estimating the cost-effectiveness of measures involving a furnace?
- Please provide a spreadsheet calculating the TRC cost-effectiveness of incentivizing a 96% AFUE furnace (incremental to the 95% AFUE standard). Please include all underlying assumptions and calculations. Please calculate the TRC ratio and TRC net costs/benefits.
- Please calculate the PAC/UCT for the \$250 rebate discussed above.
- How many customers received the \$250 rebate in 2018, 2019, and 2020?
- How many customers are forecast to receive the \$250 rebate in 2023-2027

- (f) Please provide the assumed annual gas consumption (m3) for an average customer with a 95% AFUE furnace versus an average customer with a furnace that received the \$250 rebate discussed above.
- (g) When calculating the cost-effectiveness of measures involving gas furnaces and boilers, does Enbridge use the manufacturer specifications for the AFUE? If no, please explain?
- (h) Has Enbridge researched whether the manufacturer AFUE specifications accurately reflect the AFUE results in real-world applications? If yes, please provide a copy or link to all studies that have been consulted.
- (i) Please provide a spreadsheet calculating the TRC cost-effectiveness of incentivizing a 90%+ AFUE boiler (incremental to the 90% AFUE standard). Please include all underlying assumptions and calculations. Please calculate the TRC ratio and TRC net costs/benefits.
- (j) Please calculate the PAC/UCT for the \$1,000 boiler rebate discussed above.
- (k) How many customers received the \$1,000 boiler rebate in 2018, 2019, and 2020?
- (l) How many customers are forecast to receive the \$1,000 boiler rebate in 2023-2027?
- (m) Please provide the assumed annual gas consumption (m3) for an average customer with a 90% AFUE boiler versus an average customer with a boiler that received the \$1,000 boiler rebate discussed above.
- (n) Does a customer receive the \$150 bonus incentive for three measures even if one of those measures is a gas furnace or boiler?
- (o) Please provide the data that Enbridge has on the efficiency level of the gas furnaces and gas boilers of its customers. For example, please provide (a) an approximate average efficiency of customer gas furnaces, (b) the number of customers with gas furnaces, (c) the number of customers with furnaces within 5% efficiency ranges (e.g. 80-85, 85-90, 90-95 etc). Please also provide this information for boilers. Please provide a breakdown by customer type as possible (single family, etc.).

### Interrogatory # 10-ED-23

Reference: Exhibit E, Tab 1, Schedule 2, Page 12

Preamble: Enbridge's evidence includes this table:

Water Heater	Replace existing natural gas water heater with 0.80 EF or higher tanked ENERGY STAR® qualified natural gas water heater. Or Replace existing natural gas water heater with 0.87 UEF or higher tankless ENERGY STAR qualified natural gas water heater.	\$400
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Questions:

- (a) Please calculate the TRC ratio and net benefits for this measure. Please provide all assumptions and calculations.
- (b) What is the average lifetime of a natural gas water heater (tank and tankless) for the purposes of estimating measure cost-effectiveness?

- (c) For a typical home, what is the annual m3 consumption for a gas water heater that meets minimum standards versus one that meets the above criteria (please provide the answer for tank and tankless)?
- (d) Please provide the data that Enbridge has on the efficiency level of the gas water heaters of its customers. For example, please provide (a) an approximate average efficiency of customer gas water heaters, (b) the number of customers with gas water heaters, (c) the number of customers with gas water heaters within 5% efficiency ranges (e.g. 80-85, 85-90, 90-95 etc). Please provide a breakdown by customer type as possible (single family, etc.).

### Interrogatory # 10-ED-24

Reference: Exhibit E, Tab 2, Schedule 2

Preamble: This question is relevant to a number of other issues aside from the programming for new construction.

Questions:

- (a) Please complete this table as much as is possible. Please make and state assumptions and caveats as necessary. Best estimates are sufficient.

<b>Enbridge Customers – Characteristics by Sector</b>			
	2015	...	2030
Total Enbridge Customers			
Residential			
Commercial			
Industrial			
Average Gas Consumption (m3/yr/customer)			
Residential			
Commercial			
Industrial			
Total Enbridge Customers with Air Conditioning			
Residential			
Commercial			
Industrial			
Total Enbridge Customers with Air Conditioning (central, ducted)			
Residential			

Commercial			
Industrial			
Total Enbridge Customers with Gas Water Heater			
Residential			
Commercial			
Industrial			
Total Enbridge Annual Water Heating Load			
Residential			
Commercial			
Industrial			
Total Enbridge Customers with Other Gas Equipment (e.g. stove)			
Residential			
Commercial			
Industrial			

### Interrogatory # 10-ED-25

Reference: Exhibit E, Tab 2, Schedule 2

Questions:

- (a) In the residential savings by design program, would Enbridge help a customer calculate the costs of adopting electric heating (ccASHP, etc.) instead of gas heating?
- (b) In the residential savings by design program, are electric cold climate air source heat pumps and heat pump water heaters eligible equipment for incentives for potential gas customers deciding *not* to connect to the gas system?
- (c) In EB-2019-0188, Exhibit I.ED.9(d), Enbridge indicated that the annual cost of heating with a heat pump would be lower than the cost of natural gas heating if the surcharge was considered. Please provide the underlying calculations. Please file a live version of the “Residential Natural Gas Conversion Savings Estimate” excel document (I.ED.7 in EB-2019-0188) with the variables that produced the result in I.ED.9(d).
- (d) Please comment on the applicability of this to other areas where a surcharge would be charged.
- (e) Please update the analysis (i.e. input updated variables into the savings estimate tool) based on the latest carbon pricing information from the federal government (i.e. increases to \$170/t CO<sub>2</sub>e in 2030). Please indicate the difference in cost between heat pumps and gas heating. Please file a live copy of the savings tool with these updated variables inputted into it.

## Interrogatory # 10-ED-26

Reference: Exhibit E, Tab 2, Schedule 2

Preamble: Navigant made the following recommendation at page xxi of the 2019 Achievable Potential Study:

“The four most important of Navigant’s recommendations for improving future studies are provided below. ... Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs. It is unclear to what degree the natural gas avoided costs currently account for the costs associated with natural gas infrastructure expansion, specifically the costs of installing pipelines (and associated equipment) to connect new developments to the natural gas distribution network.”

Page 186 of the 2019 Achievable Potential Study states:

**“Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs.** It is unclear to what degree the natural gas avoided costs account for the costs associated with natural gas infrastructure expansion. For example, when considering fuel switching for new construction, it seems likely that the existing avoided costs would understate the benefit of not having to install pipelines and access points to a new housing development.”

The OEB’s guidance letter includes the following:

“Enbridge Gas’s DSM plan application should be informed by ... the 2019 Achievable Potential Study ...” (p. 2).

“The OEB completed an updated Achievable Potential Study in October 2019. The study was integrated with the IESO with the objective of identifying and quantifying energy savings (electricity and natural gas), greenhouse gas emissions reductions and associated costs from demand side resources for the period from 2019 to 2038. While not determinative, the OEB expects that the findings from the study will be used to inform future natural gas DSM plans.” (p. 4-5)

Note that this question is also related to other issues, such as the appropriateness of the gas savings levels and budgets proposed by Enbridge.

Questions:

- (a) Please complete the following table. Please include a project based on the year of completion or any other consistent method, explaining which is used. Please make and state any assumptions and caveats with respect to estimates for future expansion costs. This question relates to new residential developments, not the government-funded community expansion program or the costs thereof.

<b>Capital Costs to Connect New Residential Developments</b>				
	2015	2016	...	2030
Number of projects				
Number of residential customers <sup>30</sup>				
Total capital cost				
Portion funded via rates (\$)				
Portion funded by the new customers (\$) <sup>31</sup>				

- (b) Please complete the following table. Please include a project based on the year of completion or any other consistent method, explaining which is used. Please make and state any assumptions and caveats with respect to estimates for future expansion costs. This question relates to new residential developments, not the government-funded community expansion program or the costs thereof.

<b>Capital Costs to Connect New Commercial / Industrial Customers</b>				
	2015	2016	...	2030
Number of projects				
Number of customers <sup>32</sup>				
Total capital cost				
Portion funded via rates (\$)				
Portion funded by new customers (\$) <sup>33</sup>				

- (c) Please describe in detail how contributions in aid of construction (CIAC) typically work for residential developments. For example, approximately what percent of the CIAC is paid up front, if any? For portions of the CIAC paid over time, how are they recouped? What entity negotiates and agrees to the CIAC terms (e.g. the developer)? Who paid for the majority of the CIAC (e.g., the future homeowners via rate riders)?
- (d) Are all customer connection costs for new residential developments considered to be a CIAC? If not, please explain and compare the magnitude of these other costs to the magnitude of the CIACs.
- (e) Please provide the average capital cost for connecting a new residential development expressed as an average per customer to be connected. Please also provide high and low range (e.g. top and bottom quartile for capital cost per customer). Please provide a

<sup>30</sup> The number of customers to be connected for the projects in that year once the development is completed.

<sup>31</sup> This would include, for example, a CIAC, including both up-front contributions and rate riders.

<sup>32</sup> The number of customers to be connected could potentially be larger than the number of projects in the case, for example, of a business park that will have multiple commercial customers.

<sup>33</sup> This would include, for example, a CIAC, including both up-front contributions and rate riders.

breakdown for the capital cost funded in general rates versus those costs funded by the new customers (e.g. through the CIAC).

### **Interrogatory # 10-ED-27**

Reference: Exhibit E, Tab 2, Schedule 2

Preamble:

Page 186 of the 2019 Achievable Potential Study states:

**“Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs.** It is unclear to what degree the natural gas avoided costs account for the costs associated with natural gas infrastructure expansion. For example, when considering fuel switching for new construction, it seems likely that the existing avoided costs would understate the benefit of not having to install pipelines and access points to a new housing development.”

Questions:

- (a) Is Enbridge open to the concept of it providing geothermal pipe installations for new construction in cases where the customers would otherwise connect to the gas system (either via a subsidiary or as a rate-regulated activity)?
- (b) Please confirm that avoiding the design day demand from new customer connections could passively avoid future needs for upstream infrastructure expansions (i.e. avoid infrastructure needs despite not being part of a specific IRPA for a specific area)?
- (c) Please assess the TRC cost effectiveness of installing ground source heat pumps and air-source heat pump water heaters (e.g. [link](#)) in a new residential development instead of the standard gas equipment used. Please (i) include the impact on gas and electricity consumption and costs, (ii) account for the avoided cost of pipeline connections, (iii) assume a horizontal loop is possible, (iv) account for the differential equipment costs (including no need for a separate AC unit), and (v) assume the heat pumps are energy star rated. Please include all assumptions and calculations.

### **Interrogatory # 10-ED-28**

Reference: Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Questions:

- (a) Is Enbridge open to the concept of it providing geothermal pipe installations for existing customers at the end of their existing furnace's life (either via a subsidiary or as a rate-regulated activity)? Has Enbridge explored this as a potential DSM measure? If not, why not?

- (b) Enbridge previously proposed a geothermal program, which it withdrew due to the end of provincial subsidies for geothermal equipment. Does Enbridge agree that, since that time, the cost-effectiveness of geothermal has improved due to (a) increases in the carbon price and (b) the geothermal subsidies recently rolled out by the federal government?
- (c) Please confirm that geothermal is an allowable business activity for Enbridge. Please provide a copy of the relevant portions of the relevant documents delineating this.
- (d) Please assess the TRC of installing a ground source heat pump in a typical home. Please (i) include the impact on gas and electricity consumption and costs, (ii) assume the heat pump replaces a furnace and air conditioner which are at the end of life, (iii) assume a horizontal loop is possible, and (iv) assume the ground source heat pump is Energy Star rated. Please include all assumptions and calculations.
- (e) Please assess the TRC of installing a ground source heat pump and an in-house air-source heat pump water heater (e.g. [link](#)) in a typical home. Please (i) include the impact on gas and electricity consumption and costs, (ii) assume the ground source heat pump replaces a furnace and air conditioner which are at the end of life, (iii) assume a horizontal loop is possible, and (iv) the heat pumps are Energy Star rated. Please include all assumptions and calculations.

### Interrogatory # 10-ED-29

Reference: Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Questions:

- (a) Please complete the following table:

Typical Customer – Average Annual Gas Consumption (m3)				
	Total	Space Heating	Water Heating	Other (e.g. stove)
Union Rate Zone - Typical Single-Family Residential Customer				
Enbridge Rate Zone – Typical Single-Family Residential Customer				
Enbridge - Typical Single-Family Residential Customer				

- (b) Please complete the following table:

Residential Customer Characteristics – Water Heating					
	Customers with gas	Average annual water	Average annual water	Average water heating	Average design day load (m3)



	water heaters	heating load (m3)	heating load (BTU)	efficiency (AFUE)	from water heating
Enbridge - Typical Single-Family Residential Customer					
Enbridge – Average MURB					
Enbridge – Average Commercial Customer					

(c) Please complete the following table:

<b>Electricity Use – Typical Customer After Conversion to Heat Pumps</b>									
	Average Annual Gas Consumption (m3)			Average Annual Electricity Consumption (ccASHP & HPWP, HSPF Region 5=10 <sup>34</sup> ) (kWh)			Average Annual Electricity Consumption (GSHP & HPWP, sCOP=5) (kWh)		
	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Enbridge - Typical Single-Family Residential Customer									

### Interrogatory # 10-ED-30

Reference: Exhibit E, Tab 2, Schedule 2, Page 8

Questions:

- Please provide a complete list of the financial incentives and eligibility criteria for the financial incentives for: (i) Residential Savings by Design; (ii) Affordable Housing Savings by Design; and (iii) Commercial Air Tightness Testing.
- Please confirm that customers must commit to plan to use natural gas to be eligible for support from Enbridge in the (i) Commercial Savings by Design, (ii) Affordable Housing

<sup>34</sup> Equivalent to ~sCOP=2.9 (2.96516)

Savings by Design; and (iii) Commercial Air Tightness Testing. Please explain the rationale for this.

### **Interrogatory # 10-ED-31**

Reference: Exhibit E, Tab 2, Schedule 2, Attachment 1, Page 37

Preamble: See SeeLine Group made the following recommendation to Enbridge:

“As noted in Section 5, SLG encourages EGI to consider conducting technology potential research on the following ECMs for potential DSM resource acquisition technologies for the commercial new construction market:

- Solar perforated air collectors,
- Drain water heat recovery,
- ASHP-VRF, and,
- WSHP-VRF”

Questions:

- (a) Please describe how Enbridge had followed through with the last two bullets of that recommendation (re air source and water source heat pumps).

### **Interrogatory # 10-ED-32**

Reference: Exhibit E, Tab 2, Schedule 2, Attachment 2

Preamble: The report from Building Knowledge Canada notes as follows:

“Air-to-water heat pump technology has advanced substantially in the last 10 years. With CO2 based ASHW systems, operating COPs of 3.5 to 4+ are possible. These systems can also operate very effectively in Net Zero Ready / Tier 5 type homes as combo/combined space and water heating appliances”

“Lower loads enable more efficient use of air source heat pump technologies, if even for part load conditions.”

Question:

- (a) Please describe how these conclusions were factored into Enbridge’s DSM plan.

### **Interrogatory # 10-ED-33**

Reference: Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Preamble: These questions on heat pumps relate to a variety of evidence and issues area and are collected here for organizational purposes.

Questions:

- (a) Please confirm that most Ontarians live in “region 5” for the purpose of Heating Seasonal Performance Factor (HSPF) figures. Please confirm that Region 5 HSPF is most reflective of heat pump performance in the Ottawa region.<sup>35</sup> If not, please explain and provide what Enbridge believes is the accurate alternative information.
- (b) Please confirm that the following map reflects NRCan’s projection of region 5 for HSPF calculations in Canada. If not, please explain and provide what Enbridge believes is the accurate alternative information.



- (c) Please confirm that the climate where a majority of Ontarian’s live is similar (or warmer than) the climate where the majority of Vermonter’s live. If not, please explain.
- (d) Please confirm that the following report found that the real world performance of 77 cold climate heat pumps in Vermont was, on average, 88% of the manufacturer’s nameplate HSPF rating for region 4: The Cadmus Group, *Evaluation of Cold Climate Heat Pumps in Vermont*, November 3, 2017 ([link](#)) – “The average AHRI nameplate efficiency of the cCHPs was 11.9 HSPF. Through this metering study, we found an average HSPF for the cCHPs of 10.7 kBtu/kWh, 10 approximately 88% of the nameplate value.”)<sup>36</sup> If Enbridge disagrees with this understanding of the paper or disputes the findings, please explain.

<sup>35</sup> E.g. per NRCan - <https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about/energy-star-announcements/publications/heating-and-cooling-heat-pump/6817>

<sup>36</sup> Note: the nameplate HSPF values are found in appendix A on page 42.

- (e) Please confirm that the NRCan energy efficiency ratings for air source heat pumps (split systems) includes (a) over 25 models with an HSPF region 5 rating of 13 or higher and (b) a very large number of models with an HSPF region 5 rating of 10 or higher.<sup>37</sup> If we have misunderstood these ratings, please explain why.
- (f) Please confirm that HSPF can be converted to a seasonal co-efficient of performance (sCOP) by multiplying by 0.293. If not, please explain and provide the appropriate conversion.
- (g) Please confirm that HSPF ratings for region 4 can be approximately converted to HSPF ratings for region 5 by multiplying by 1.15.<sup>38</sup> If not, please explain and provide the appropriate conversion.
- (h) Does Enbridge believe it is appropriate to use NRCan's Energy Efficiency Ratings, and specifically the HSPF region 5 ratings, to assess the cost-effectiveness of measures involving air source heat pumps? If not, why not?
- (i) Are the numbers that Enbridge uses to assess the cost-effectiveness of measures involving gas furnaces consistent with NRCan's Energy Efficiency Ratings? If not, why not?
- (j) When Enbridge is designing a program for energy efficient equipment, how does it decide on the efficiency threshold for incentive eligibility? Does Enbridge believe that an efficiency eligibility threshold of 10 (HSPF region 5) would be reasonable for a program incentivizing air source heat pumps? What does Enbridge believe would be the range of reasonable efficiency eligibility thresholds (in terms of HSPF region 5) for a program incentivising air source heat pumps?
- (k) Please confirm that properly-sized cold climate electric heat pumps can provide 100% of the heating in Ontario's climate region. If Enbridge disagrees, please explain why, explain which portions of Ontario are appropriate for cold climate electric heat pumps, and the approximate percent of Enbridge customers living in those portions of Ontario.
- (l) Please describe how electric heat pump water heaters with demand response functionality can assist electric utilities in controlling heating loads.

### **Interrogatory # 10-ED-34**

Reference: Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Questions:

- (a) What is the winter peak electricity demand from (i) a gas furnace, (ii) a hybrid system, (iii) an air source heat pump (HSPF, region 5, of 10), (iii) an air source heat pump (HSPF region 5 of 10), (iv) a ground source heat pump (sCOP of 5), and (v) resistance heating? Please make and state assumptions as necessary. Please estimate based on an average customer home.
- (b) What is the summer peak electricity demand from (i) a traditional central air conditioner (Energy Star rated), (ii) an air source heat pump (Energy Star rated), and (iii) a ground source heat pump (Energy Star rated)? Please make and state assumptions and caveats as necessary. Please estimate based on an average customer home.

<sup>37</sup> NRCan, Energy Efficiency Ratings Heat pumps, air source, split system ([link](#)); sortable excel spreadsheet ([link](#)).

<sup>38</sup> NRCan, Energy Efficiency Ratings Heat pumps, air source, split system ([link](#)); sortable excel spreadsheet ([link](#)).

- (c) What is Ontario's peak electricity load from air conditioning in the summer (MW)?  
Please make and state assumptions and caveats as necessary.
- (d) What is Ontario's peak electricity load from home heating in the winter (MW)? Please make and state assumptions and caveats as necessary.
- (e) What is the average annual cooling load (BTU) for an average Enbridge customer with central air conditioning (or for Ontario as a whole)?
- (f) Please complete this table of cooling efficiencies:

<b>Cooling Efficiencies of Various Equipment Types</b>			
		SEER	EER
Central air conditioners	Average of current stock (best estimate, Enbridge customers or Ontario average)		
	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps in hybrid systems (if different)	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – closed loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – open loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Cold climate heat pumps – variable speed	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		

### **Interrogatory # 10-ED-35**

Reference: Exhibit E, Tab 3, Schedule 1, Page 2

Questions:

- (a) Please list the incentives and incentive eligibility criteria for all incentives to be provided in the low carbon transition program.
- (b) Please provide a breakdown of the proposed low carbon transition program budget for each year by the various offerings (i.e. the portion of the budget allocated to each offering).
- (c) For each low carbon transition program offering, please provide a breakdown of the budget as between incentive and non-incentive costs.
- (d) Beyond 2024, approximately how much of the market transformation funding will be allocated to the low carbon transition program? We understand that this decision has not been made yet. We are looking for a very rough approximate estimate.

### **Interrogatory # 10-ED-36**

Reference: Exhibit E, Tab 3, Schedule 1, Page 2

Preamble: Enbridge states:

“The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems ...”

Questions:

- (a) If a home has an existing gas furnace and a central air conditioner at the end of its life, what is the incremental cost of installing a hybrid heating system? Please provide a full breakdown of all assumptions, calculations, and figures, including (a) the cost of replacing the AC with a traditional AC unit (equipment and installation), (ii) the cost of replacing the AC with an efficient air source heat pump capable of hybrid heating and smart fuel switching controls (equipment and installation). Please make sure to break out all the costs and incremental costs separately. Please make and state assumptions as necessary.
- (b) If a home owner is replacing their central air conditioner, is upgrading to hybrid heating cost-effective? Please estimate the TRC ratio and net benefits of this on a best efforts basis.
- (c) Please describe the smart fuel switching controls necessary for hybrid heating, provide some examples of real world equipment (e.g. manufacturer details), and what they cost.
- (d) Will Enbridge be recommending that the heat pump installed for hybrid heating be more powerful than the traditional air conditioning system that would be installed instead? If yes, please provide an example for a traditional home.
- (e) In light of the fact that all air conditioning units are heat pumps, what specifications for the heat pump would Enbridge require for a hybrid heating incentive?
- (f) How many customers does Enbridge expect to provide an incentive to for a hybrid heating system in each year from 2023 to 2027?
- (g) Will Enbridge use a heat pump efficiency threshold for eligibility for incentives for hybrid heating? If yes, what will that be? If not, please explain why and provide an efficiency threshold (or range of thresholds) that Enbridge believes would be reasonable

for hybrid heating incentive. Please provide the answers as seasonal COP values applicable to Ontario and as HSPF values (specifying the region).

### **Interrogatory # 10-ED-37**

Reference: Exhibit E, Tab 3, Schedule 1, Page 2

Preamble: Enbridge states:

“The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems ...”

Questions:

- (a) Will customers offered an incentive to upgrade to hybrid heating be given estimates of the impacts on the customer’s yearly operating costs before and after the switch? If yes, please provide a live copy of the tool (or draft tool if it is not finalized) used to develop those estimates (presumably an excel spreadsheet). Please provide all underlying calculations and assumptions.
- (b) If Enbridge has not already created a tool to estimate operating cost impacts on customers for hybrid heating, will it be creating a tool similar to its “Residential Natural Gas Conversion Savings Estimate” tool? An example can be found at this [link](#).<sup>39</sup>
- (c) Please provide the latest master version of the “Residential Natural Gas Conversion Savings Estimate” tool in electronic format (xlsx). We have a copy for one community (see [link](#)) but it only has the data for one community.
- (d) Please provide the three most recent versions of the “Residential Natural Gas Conversion Savings Estimate” tool in electronic format (xlsx) as used to calculate fuel switching costs in specific communities. We have a copy (see [link](#)) but it is outdated and will have been used since that time.
- (e) If a home owner is replacing their central air conditioner, is upgrading to hybrid heating cost-effective from the customer’s own perspective? Please include all calculations and assumptions.
- (f) How long does Enbridge assume that the air source heat pump portion of a hybrid heating system will last for the purpose of cost-effectiveness evaluations? What would the assumed measure-life be for a measure involving an air source heat pump? Please provide any references to studies or data on the longevity of air source heat pumps.
- (g) Please complete the following table for an average customer. Knowing that fuel prices vary by location, please provide an Ontario-wide average. Please include all gas and electricity charges that would appear on energy bills (categorized as variable, carbon, and fixed). If estimates of some future prices are not available, please leave those cells blank. Please base the figures on an average customer. For electricity prices, please use a weighted average of the TOU pricing. (Note: The community expansion group will likely have these figures as they are often using tools to assess the cost-effectiveness of fuel switching for customers):

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<sup>39</sup> <https://www.rds.oeb.ca/CMWebDrawer/Record/673175/File/document>

Customer Fuel Prices				
		2020	...	2035
Gas	Variable costs \$/m3 (excl. carbon)			
	Carbon price (\$/			
	Fixed charges (\$)			
Electricity	Variable costs \$/kWh			
	Fixed charges (\$)			

- (h) Please complete the above table for three representative locations in Ontario (e.g., THESL/Enbridge, HONI/Union, HONI/Enbridge).
- (i) Seeing as the heat pump portion of a hybrid heating system will not operate below a certain temperature, please provide an average annual COP value that accounts for that fact (which would presumably be higher than a COP value for that region).

### Interrogatory # 10-ED-38

Reference: Exhibit E, Tab 3, Schedule 1, Page 2

Preamble: Enbridge states:

“The objective of the Residential Heat Pump offering is to accelerate the adoption of ... natural gas heat pumps...”

Questions:

- (a) Enbridge states: “Although available in other parts of the world, these systems are not currently available in North America for a typical residential application.” Please list three other places where residential gas heat pumps are available and provide a price in those countries for a residential unit converted to \$CAD.
- (b) Enbridge states: “Residential gas heat pumps are currently not available in North America. They are expected to enter the Ontario market in 2024 at which point they will be incorporated into this offering.” What does Enbridge expect gas heat pumps to cost in Ontario for the equipment when they are introduced? Please provide a best estimate and the range of reasonably possible outcomes.
- (c) What makes (and models, if known) of residential gas heat pumps are expected to enter the Ontario market in 2024?
- (d) What is a representative seasonal COP for a residential gas heat pump? Does Enbridge expect this to apply to those entering the Ontario market in 2024? What heating region would this sCOP apply in?



- (e) Please provide Enbridge's best estimate of the seasonal COP for the most efficient residential gas heat pump by 2030 (i.e. if Enbridge is expecting the technology to improve)?
- (f) Please provide all studies and research in Enbridge's possession assessing (i) the future role that gas heat pumps can play in decarbonizing space heating and/or (ii) the expected future efficiency levels (sCOP) as the technology improves.
- (g) Is there a theoretical maximum seasonal COP for gas heat pumps?
- (h) What is a representative COP for a residential gas heat pump at -20 degrees Celsius? Does Enbridge expect this to apply to those entering the Ontario market in 2024?
- (i) What is a representative COP for a residential gas heat pump at -30 degrees Celsius? Does Enbridge expect this to apply to those entering the Ontario market in 2024?
- (j) What is Enbridge's estimate of the cost to install a gas heat pump in an average home (as a replacement to a gas furnace)?
- (k) For comparative purposes, what is Enbridge's estimate of the cost to install a cold climate air source pump in an average home (as a replacement to a gas furnace)? To the extent that this differs from the cost for a gas heat pump, please explain why.
- (l) Will Enbridge use a gas heat pump efficiency threshold for eligibility for incentives for gas heat pumps? If yes, what will that be? If not, please explain why and provide an efficiency threshold (or range of thresholds) that Enbridge believes would be reasonable for a gas heat pump incentive. If Enbridge has not made a final decision on this, please provide its initial thinking on the topic and the range of possible outcomes. Please provide the answers as seasonal COP values applicable to Ontario and as HSPF values (specifying the region).

### **Interrogatory # 10-ED-39**

Reference: Exhibit E, Tab 3, Schedule 1, Page 2

Preamble: Enbridge states:

“The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems ...”

Questions:

- (a) Has Enbridge conducted any detailed analysis of the comparative overall cost-effectiveness of hybrid systems versus electric cold climate heat pumps in the residential context? If yes, please file that analysis. If not, why not?
- (b) Has Enbridge conducted any detailed analysis to determine the conditions under which electric cold climate heat pumps are more cost-effective than hybrid systems, and vice versa, in the residential context (e.g. based on building characteristics, size of load, existing system, end-of-life date of existing equipment, etc.)? If yes, please file that analysis. If not, why not?

- (c) Please file or provide a link to any studies that Enbridge has reviewed comparing the relative benefits, costs, and cost-effectiveness of hybrid systems versus electric cold climate heat pumps in the residential context.

#### **Interrogatory # 10-ED-40**

Reference: Exhibit E, Tab 3, Schedule 1, Page 2

Preamble: Enbridge states:

“The objective of the Residential Heat Pump offering is to accelerate the adoption of ... natural gas heat pumps...”

Questions:

- (a) Has Enbridge conducted any detailed analysis of the comparative cost-effectiveness of gas heat pumps versus electric cold climate heat pumps in the residential context? If yes, please file that analysis. If not, why not?
- (b) Has Enbridge conducted any detailed analysis to determine the conditions under which electric cold climate heat pumps are more cost-effective than gas heat pumps, and vice versa, in the residential context (e.g. based on building characteristics, size of load, existing system, etc)? If yes, please file that analysis. If not, why not?
- (c) Please file or provide a link to any studies that Enbridge has reviewed comparing the relative benefits, costs, and cost-effectiveness of gas heat pumps versus electric cold climate heat pumps in the residential context.

#### **Interrogatory # 6-ED-41**

Reference: Exhibit E, Tab 3, Schedule 1, Page 6

Preamble: Enbridge states:

“The objective of the Commercial Heat Pump offering is to accelerate the adoption of natural gas heat pumps...”

Questions:

- (a) Has Enbridge conducted any detailed analysis of the comparative cost-effectiveness of gas heat pumps versus electric heat pumps in the commercial context? If yes, please file that analysis. If not, why not?
- (b) Has Enbridge conducted any detailed analysis to determine the conditions under which electric heat pumps are more cost-effective than gas heat pumps, and vice versa, in the commercial context (e.g., based on building characteristics, size of load, existing system, etc.)? If yes, please file that analysis. If not, why not?

- (c) Please file or provide a link to any studies that Enbridge has reviewed comparing the relative benefits, costs, and cost-effectiveness of gas heat pumps versus electric heat pumps in the commercial context.
- (d) Please provide the price range for commercial gas heat pumps based on the different size ranges.
- (e) Please provide the range of COP values for commercial gas heat pumps based on the different size ranges.
- (f) Please provide a comparison in the capital cost of commercial gas heat pumps with an equivalently sized commercial electric heat pumps.

## **Issue 16: Coordination with Electricity and Government Programs**

16. Has Enbridge Gas proposed a reasonable approach to ensure natural gas DSM programs are effectively coordinated with electricity conservation programs and other energy conservation and greenhouse gas reduction programs applicable in its service territory?

### **Interrogatory # 16-ED-42**

Reference: Enbridge's Residential program offerings

Questions:

- (a) How and when is Enbridge going to update its residential program offerings to account for the federal government's Greener Homes Grant?
- (b) Is there a possibility that Enbridge would re-arrange the mix of its portfolio (e.g. reduce residential programs and increase commercial/industrial programs) due to the Greener Homes Grant? If it did so, when would it refile its application?
- (c) Seeing as the Greener Homes Grant has a funding cap of \$5,000, would it be possible for Enbridge to contract with the federal government to have the federal government administer the residential budget and therein (i) increase the eligible activities that an Ontario gas customer could implement, (ii) decrease administration costs, and (iii) eliminate confusion and overlap? Does Enbridge believe this would be prudent? Please speak separately to the issue of feasibility and prudence.
- (d) Please describe the discussions that Enbridge has had with the federal government regarding its Greener Homes Grant.
- (e) Is there an expected end date or budget cap for the Greener Homes Grant?

### **Interrogatory # 16-ED-43**

Reference: Enbridge's Residential program offerings

Questions:

- (a) Please describe the nature of the federal government's commitment to provide \$40,000 in interest free green loans for home retrofits. Please provide any documentation Enbridge has on this future program.

- (b) Could the loan be repayable through Enbridge bills (e.g. the open bill program)? If not, please describe the barriers in detail. If it is unclear, please describe the potential issues and barriers.
- (c) Once this program is rolled out it will presumably increase the uptake of eligible measures. Does Enbridge agree? If not, please explain.
- (d) How and when will Enbridge adjust its free rider rates and targets for programming impacted by the federal government's proposed loan program?