INTEGRATED RESOURCE PLANNING PROPOSAL

The purpose of this evidence is to provide an overview of the Enbridge Gas Integrated Resource Planning Proposal (the "IRP Proposal") in support of establishing an IRP framework to guide Enbridge Gas's assessment of IRPAs relative to other facility and non-facility alternatives to serve the forecasted needs of Enbridge Gas customers.

As set out at Exhibit A, Tab 2, Enbridge Gas requests that the OEB determine that the policy direction set out within the IRP Proposal is reasonable and appropriate. Approval of the IRP Proposal will allow Enbridge Gas to create actionable IRP plans to support future avoidance or deferral of infrastructure requirements. Enbridge Gas is committed to considering IRPAs, as appropriate, immediately following the identification of future expansion/reinforcement projects in the AMP. When an eligible project is identified in the asset planning process, it will be assessed for possible development of IRPAs. This approach will ensure that Enbridge Gas has adequate lead time to fully assess and put forward IRPAs that can effectively reduce peak period demands and defer the need to construct comparable facility projects. Where approvals are required for IRPA spending or other items, Enbridge Gas will seek approval from the OEB before incurring those expenses.

This Tab of evidence is organized as follows:

1. IRP Background
2. IRP Policy Proposal
3. IRP is Not a Viable Alternative to the Project
4. Conclusion

Enbridge Gas has included its IRP Proposal with this Application for three reasons:

i) To be responsive to the direction received from the OEB: (a) in recent leave to construct application decisions where the OEB directed Enbridge Gas to provide sufficient and timely evidence of how traditional Demand Side Management ("DSM") has been considered as an alternative at the preliminary stage of project development;[1] and (b) in the OEB's Report of the Board on the DSM Mid-Term Review where the OEB stated that it expects the natural gas utilities to develop more rigorous, robust and comprehensive procedures to ensure conservation and energy efficiency opportunities can be reasonably considered as alternatives to future capital projects.[2]

ii) To establish the necessary IRP policy guidance required for Enbridge Gas to be successful in considering IRPAs as non-facility alternatives to future expansion/reinforcement projects effectively and efficiently, including

[1] EB-2018-0097, Decision and Order, January 3, 2019, p. 6.
[2] EB-2017-0127/0128, Report of the Board: Mid-Term Review of the Demand Side Management (DSM) Framework for Natural Gas Distributors (2015-2020), November 29, 2018, pp. 6, 20-21.

acknowledgement of Advanced Metering Infrastructure ("AMI") as an IRP enabling element.

iii) To demonstrate that IRP is not a viable alternative to avoid or delay the proposed Project, which is required to meet demand that already exists and is forecast in the near future. This underlines the need to clarify the role of IRP, particularly in relation to high-volume transmission and distribution projects where IRPAs do not appear to be cost-effective and/or feasible.

Enbridge Gas acknowledges the OEB's expectation that IRP may be addressed in the context of the upcoming post-2020 Natural Gas DSM Framework (EB-2019-0003). Enbridge Gas does not believe that this is appropriate and submits that IRP should be reviewed and treated separately from DSM. Enbridge Gas believes it is important to clearly delineate between IRP activities and traditional DSM programming. The Enbridge Gas IRP Proposal seeks to address IRP planning and its full complement of IRPAs separately from DSM. Among other things, that is because the goals of IRP (to avoid or defer planned expansion/reinforcement projects through the reduction of forecasted peak period demand) are different from the goals of DSM (to reduce natural gas consumption, promote conservation / energy efficiency and to generally mitigate future annual load growth and related general facilities requirements).[3]

[3] This is underlined by looking at various system demand forecast types and the appropriateness of IRPAs or DSM to reduce such demands, including: design day demand, which influences design of transmission systems (i.e. Dawn Parkway System), drives related transmission system expansion/reinforcement projects and is managed as part of Enbridge Gas's Transmission System

As set out in Enbridge Gas's Written Comments filed as part of the OEB's Post-2020 Natural Gas Demand Side Management Framework Consultation,

> Enbridge Gas does not believe the third goal included in the 2015-2020 DSM Framework pertaining to natural gas infrastructure planning belongs as a goal of the Post-2020 Framework. Though DSM programs can impact infrastructure requirements, and the cost savings associated with a broad-based reduction in distribution costs are included in the DSM planning process, the linkages between DSM planning and capital asset planning are currently passive rather than active. Enbridge Gas views the DSM Framework, with a broad objective of gas conservation, and the active leveraging of DSM as an alternative to support local and regional infrastructure planning, to have separate and distinct objectives…Enbridge Gas believes separating IRP from DSM is appropriate as it will afford the assessment of IRP with the required visibility and attention necessary to comprehensively address all aspects of infrastructure planning.[4]

1. IRP Background

For the purposes of this Application, IRP refers to a multi-faceted planning process that includes the identification, implementation, and evaluation of realistic natural gas supply-side and demand-side options (including the interplay of these options) to determine the solution that provides the best combination of cost and risk for our customers.[5] Any solution may include alternatives to reduce natural gas in-franchise peak period demand growth to defer future transmission and distribution system facility expansion/reinforcement projects. In this application, Enbridge Gas refers to these solutions as IRPAs. IRPAs are determined by understanding potential transmission

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Planning and Gas Supply Planning processes; peak hour demand, which influences design of distribution systems, drives related distribution system expansion/reinforcement projects, is managed as part of Enbridge Gas's Distribution System Planning processes and is most appropriate for consideration of IRPAs; and average annual demand, which is the metric by which energy savings resulting from traditional DSM is measured under the OEB-approved 2015-2020 DSM Framework.

[4] EB-2019-0003, Written Comments, June 27, 2019, pp. 10-11.

[5] Enbridge Gas recognizes that ultimately optimal planning may expand in the future to include all energy sources (including electricity).

and/or distribution system constraints, analyzing alternative options, and assessing the costs of viable alternatives versus facility expansion/reinforcement alternatives. Any IRPA implemented must not impair the Enbridge Gas obligation to ensure there is adequate supply and transportation capability on a given design day and peak hour to meet customer needs, and that safe and reliable service is maintained.

As part of its OEB-approved 2015-2020 DSM Plan, EGD put forward a comprehensive IRP Study outline. In its decision regarding the Utilities' 2015-2020 DSM Plans, the OEB asked the Utilities to jointly complete a study scope for IRP as filed by EGD and to consider the enhancements suggested by intervenors and expert witnesses, such as the inclusion of demand response options; the role of new construction programs; and best practices in electric IRP. In accordance with the OEB's direction, the Utilities included all recommendations and enhancements into the revised IRP Scope of Work. Specifically, the Board, in its decision on the 2015-2020 DSM Plans found,

> As indicated in the DSM framework, it is appropriate that the gas utilities study and submit a methodology for assessing the appropriate role for DSM as part infrastructure planning at the mid-term DSM review.[6]

Accordingly, the Utilities jointly engaged ICF International to conduct an IRP Study. The IRP Study, discussed in more detail below, was critically important to understand the feasibility of deferring or avoiding future distribution facility expansion/reinforcement

[6] EB-2015-0029/0049, Decision and Order, January 20,2016, p. 83.

projects by reducing customer demands, and if determined to be feasible, to achieve an understanding of unresolved policy issues and next steps in the development of IRP in Ontario.[7]

The ICF IRP Study provided: (i) a review of the potential to defer distribution infrastructure with incremental energy efficiency; (ii) a jurisdictional review of natural gas IRP; and (iii) a preliminary basis for reviewing energy efficiency, one of several IRPAs, in LTC applications.

As part of the IRP Study, ICF found that based on their initial assessment of the potential to reduce peak hour demand using traditional DSM, it appeared possible that some distribution infrastructure investments may be reduced using targeted DSM (referred to as enhanced targeted energy efficiency herein). ICF also found that changes to the Utilities' (EGD and Union) internal planning processes, to Ontario's energy policies and to utility regulatory structure would be necessary to facilitate the use of enhanced targeted energy efficiency to reduce distribution infrastructure investments. While ICF's recommendations were made in the context of enhanced targeted energy efficiency and subsequent impacts on distribution infrastructure, they remain relevant to IRP initiatives more broadly.

[7] The full IRP Study was filed in response to interrogatories in EGD's Bathurst leave to construct application EB-2018-0097, Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018.

During the IRP Study (2017/2018), ICF sought to assess how other leading North American natural gas utilities addressed issues related to DSM and facilities planning. Unfortunately, ICF found no readily available precedent of a North American natural gas utility that was considering the impact of broad-based traditional DSM, geo-targeted DSM (enhanced targeted energy efficiency) or dedicated Demand Response ("DR") programs on its distribution facilities' planning process. Since the ICF IRP Study was completed, more North American utilities have engaged in activities that consider non-wires and non-pipeline alternatives to defer the need to construct new infrastructure. Critically, the IRP activities of other such North American utilities were preceded by the development and issuance of regulatory and policy guidelines by their respective jurisdictions and regulators.[8]

For electric utilities, investment in cost-effective IRP results may be easier to achieve because of the high cost of generation, transmission and distribution electricity infrastructure and the need to meet electricity demand instantaneously as compared to the nature of transmission and distribution of natural gas and related infrastructure. This does not mean to say that there are not any cost-effective IRPAs for natural gas. Indeed, the IRP Study indicated that there may be instances when IRPAs are less costly than distribution facility alternatives.[9] This makes the need for an IRP policy

[8] See, for example, initiatives and programs in British Columbia (Fortis BC), New York State (Reforming the Energy Vision and Consolidated Edison Inc.) and California (non-wires pilot regulatory incentive mechanism).
[9] Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p. ES3.

framework clear. How does Enbridge Gas assess the alternatives and what are the risk assessments that are undertaken? What is the appropriate level of cost and risk that is optimal for natural gas customers?

Once Enbridge Gas identifies the need for infrastructure expansion/reinforcement driven by increased peak period demands, facility alternatives (traditionally pipelines, compressors and ancillary facilities but could also include CNG / LNG options), non-facility alternatives (such as winter peaking service and supply options) and IRPAs with the potential to reduce peak period demand will be investigated. As part of this investigation, potential IRPAs considered to reduce natural gas consumption and thereby defer capital expenditures may include:

- Demand Response – DR programs seek to adjust the demand for natural gas by end users instead of adjusting facilities or gas supply. DR includes programs for residential, commercial and industrial customers which are designed to incent or oblige the customer to reduce or shift energy usage during peak periods. DR solutions within the natural gas sector are not as common as in the electrical sector and can be varied in nature depending on customer mix. In addition, there has been a significant trend towards commercial and industrial customers moving away from interruptible rates for their natural gas as they value certainty of supply over the cost reduction.
- Enhanced Targeted Energy Efficiency – Enhanced Targeted Energy Efficiency includes supplementing existing annual volume-focused traditional DSM with

additional spending on existing DSM programs focused solely on peak period demand reductions in specific areas, or by implementing new programs that don't fit within the current DSM construct, but which provide actual peak period reductions (e.g., targeted furnace replacement programs).

- Compressed Natural Gas – Bulk Compressed Natural Gas ("CNG") is an energy delivery option that relies on specialized over-the-road trailers (tube trailers) containing compressed natural gas being injected into Enbridge Gas systems at critical points. Once injected, the compressed natural gas provides a secondary source to serve customer demand in a targeted area. Natural gas, whether conventional or renewable, can be stored under high pressure, in a gaseous state, and injected into Enbridge Gas systems. Enbridge Gas is interested in evaluating the applicability and cost impacts of relying upon bulk CNG as a demand peak-shaving alternative for non-emergency situations.
- Low-Carbon and Non-Gas Solutions – Technologies that reduce the amount of energy/fuel used for the same output (and also reduce carbon emissions). Technologies include but are not limited to air source heat pumps and geothermal heating/cooling. Adoption of these options would reduce peak period demand, particularly where the technologies are used for heating (which is most required during peak demand periods).

This listing of potential IRPAs will continue to develop over time and as new technologies and solutions become commercially available.

2. IRP Policy Proposal

As noted, Enbridge Gas is committed to considering IRPAs, as appropriate, immediately following the identification of potential need for future expansion/reinforcement projects in the AMP. This IRP Proposal sets out the considerations that will influence how Enbridge Gas assesses and implements IRPAs that are determined to be preferred alternatives to address forecasted customer demand. In the subsections that follow, Enbridge Gas details each component of its IRP Proposal.

i) Goals of IRP for Enbridge Gas

For Enbridge Gas, IRP is aimed at reviewing and implementing alternatives that reduce natural gas in-franchise peak period demand growth to defer or avoid future transmission and distribution system facility expansion/reinforcement projects. Enbridge Gas only intends to implement IRPAs that reduce the need for future infrastructure expansion/reinforcement by reducing peak period demand (whether that is peak day, which is relevant to transmission facilities, or peak hour, which is relevant to distribution facilities).

ii) Where should IRP be considered?

IRP is a detailed process of reviewing supply and demand-side alternatives to address forecasted facility requirements. If this process was undertaken with every forecasted facility project, it would be extremely time intensive. So that resources are optimized, the first step in assessing the appropriateness of IRP alternatives to reduce, defer or avoid the need for identified facility projects is to understand which facility projects are in

and out of scope. Some basic attributes of facility expansion/reinforcement projects support a binary screening of the relevance of IRPAs, such as: the nature of the facility project, year-over-year load growth, lead time for the facility project and project capital cost. Other attributes are informative, but do not provide certainty as to the likely outcome of an IRP assessment. Table 13-1 below summarizes the various project attributes to determining the relevance of IRPAs.

Table 13-1
Project Attributes Supporting Relevance of IRPAs

Project Attributes	Eligibility
Type of Facility Project	Load growth-based expansion/reinforcement projects
Annual Load Growth	1.4% maximum forecasted load growth
Timing for Required Facility	Require a three year or greater lead time in advance of the planned leave to construct application
Project Capital Cost	$10MM and above
Complexity	The ideal area for an IRP would have low complexity and simplicity of feeds
Market Mix	A mix of residential, commercial and industrial customers provides a broader base of alternatives from which to consider
Other Attributes	Leveraging other Infrastructure

In addition to the screening criteria set out above, Enbridge Gas will also take project-specific considerations into account. For example, where there is municipal infrastructure work in a specific corridor, at a specific time, it may be appropriate to proceed with a facility expansion/reinforcement project even though it could otherwise be deferred for some limited time through investment in IRPs/IRPAs.[10]

[10] This was articulated by ICF in the IRP Study: "The desire to take advantage of other infrastructure projects and the need to minimize community disruptions can lead to upsizing or accelerating facility investments for projects where future expansions would be particularly disruptive or expensive and may

iii) What activities/projects (IRPAs) are eligible to be included within an IRP?

The goal of an IRP/IRPA is to reduce peak period demand. Enbridge Gas believes it should have the ability to use a broad range of options to achieve this goal. Some activities that will reduce peak period demand may extend beyond traditional distribution or conservation initiatives (e.g. air source heat pumps and geothermal systems which rely upon energy sources other than natural gas). As part of the IRP Proposal, Enbridge Gas is seeking confirmation that non-gas alternatives can be included in the range of possible and available IRPAs.

iv) How to determine whether to proceed with an IRP?

Having determined that a future facility expansion/reinforcement project should be evaluated as an IRP candidate, the next step is to review whether an IRP/IRPA could be successful in deferring or avoiding the facility project. It is important to note that the peak period demand savings forecast to be achieved through IRPAs will need to be higher than the peak period demand to be served by the facility project (the ICF study suggested a factor of 121%).[11] The reason for this is that the peak period demand savings may not fully materialize, so a conservative approach is required before a

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make deferral of some gas infrastructure projects impractical despite the potential for geo-targeted DSM to reduce demand." Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p. ES14.

[11] Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p. ES18.

decision is taken to defer or avoid a planned future facility expansion/reinforcement project.

Enbridge Gas proposes a two-stage process for analyzing IRPs/IRPAs. The first stage is a high-level review for reasonability that compares the cost of the facility expansion/reinforcement project with the cost of IRPAs that could reduce peak period demand sufficiently to defer or avoid the facility project. This first stage essentially captures the full cost of the proposed facility project compared to IRPA costs (each determined on a high-level, rule of thumb basis). A simplified methodology at the first stage allows for broader consideration of IRPAs in comparison to facility projects, while minimizing the costs associated with detailed analysis for every potential facility project. The IRP study findings estimate that only 14-17% of reinforcements in the sample (which only included distribution reinforcements) could feasibly be replaced by an IRPA.[12] Detailed analysis of every facility application would require a significant cost, so a simplified screening is appropriate to minimize costs to ratepayers.

Enbridge Gas will maintain a list of potential IRPAs, with high-level estimates of the cost and capacity potential for each individual IRPA for the purposes of stage 1 screening. Where an IRPA appears feasible in stage 1 screening, the evaluation will move to a second stage screening that builds upon stage 1 results by applying more specific assumptions and more detailed regional and technical information, including: customer

[12] Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p.138.

mix (including large customers whose peak demand can be mitigated); contractor availability; characteristics of housing and building stock; and prior success of DSM and other energy efficiency and conservation programs.

At the second stage, Enbridge Gas will calculate preliminary total project costs, revenue requirements, associated customer rate impacts and depreciation rates for the applicable facility expansion/reinforcement project. Similarly, Enbridge Gas will also determine the revenue requirement associated with each potential IRPA to compare against other IRPAs and facility alternatives. This approach provides transparency in comparing the costs of facility and non-facility alternatives and in quantifying projected incremental cost to ratepayers above the lowest cost alternative, should the OEB prioritize a more expensive alternative for other reasons.

It should be noted that cost/economics is only one factor to consider with respect to alternative selection. Given the OEB's role as an economic regulator, economics will normally play a central role in the decision process, even when not the sole determining factor. Reliability is also expected to play a role, in keeping with the OEB's statutory objective of protecting consumers with respect to reliability of gas service. The work done at this stage will confirm whether it is preferable to proceed with an IRPA.

v) How will Enbridge Gas proceed with an IRP/IRPA?

Once it is determined that an IRP/IRPA is preferable to an identified facility expansion/reinforcement project, Enbridge Gas will apply to the OEB for approval to recover the costs associated with that IRPA. This may be done in a rate application or as a separate stand-alone application. The application would outline the rationale for investment in IRPAs, the individual and overall costs of IRPAs, the proposed allocation and cost recovery methodologies proposed, and ongoing reporting and monitoring expectations. To provide some certainty of the effectiveness of IRPAs as early as possible, Enbridge Gas will maintain an IRP governance process to identify and, where possible, resolve flaws in the design or delivery of IRPAs, to evaluate the potential of new IRPAs and to report annually on any IRPA implemented.

vi) Cost recovery – treat IRPA investments as capital

Enbridge Gas proposes that the costs associated with planning, implementing, administering, measuring and verifying IRPAs within an approved IRP be treated in a similar manner to the capital costs that they enable the utility and ratepayers to avoid. This will allow Enbridge Gas to earn a rate of return on investments on IRPAs consistent with its allowed rate of return on avoided capital investments in facility expansion/reinforcement projects.

vii) Recognition of risk

In this IRP Proposal, Enbridge Gas is requesting that the OEB determine that Enbridge Gas's decision to proceed with IRP, as set out in this IRP Proposal, is reasonable and appropriate. This is important because there is limited jurisdictional precedent for natural gas IRP across North America. The effectiveness of IRPAs in reducing peak demand to defer future system expansion/reinforcement projects in Ontario remains uncertain and untested. The implementation, measurement and verification of IRPAs will require Enbridge Gas to invest ratepayer funds on IRPAs in advance of the typical timing of expenditure on proven facility alternatives, exposing ratepayers to the risk of higher rate impacts should IRPAs not effectively reduce forecasted demand growth, forcing Enbridge Gas to apply for leave to construct facility expansion/reinforcement projects even though ratepayers have already paid for an IRPA. In that instance, ratepayers would bear the costs of both the IRPA and the facility expansion/ reinforcement project required to ensure future demand growth is served.

viii) Monitoring and reporting

To provide transparency of the effectiveness of IRPAs implemented, Enbridge Gas proposes that an annual IRP report ("IRP Report") should be included with its annual Deferral and Variance Account Disposition and Earnings Sharing applications beginning after the first IRPA/IRP is approved. The IRP Report will provide annual and cumulative summaries of actual peak period demand reductions/energy savings generated by each IRPA compared to the initial forecasted reduction/energy savings and the actual amount

of expenditure on each IRPA to-date. Table 13-2 provides a sample template of the initial IRP Report.

Table 13-2
Proposed Monitoring and Reporting Template

Program	Annual Natural Gas Demand Reduction (GJ/m^3)			Cumulative Natural Gas Demand Reduction (GJ/m^3)	Cost ($ million)			Cumulative Cost ($ million)
	Forecast	Actual	Variance		Forecast	Actual	Variance	
Sample	5,000	5,000	0	5,000	1.1	1.1	0	

If the peak period demand reductions associated with an IRPA appears to be underperforming relative to forecast, Enbridge Gas will assess whether another proven or high-potential IRPA is available to replace it (both in terms of estimated ratepayer cost and peak period demand reduction potential) and may need to shift funding to the alternate IRPA with Board approval.

Enbridge Gas will also annually report on peak period demand in locations where IRP is implemented to understand whether IRPAs have effectively reduced peak period demand, and if not, when facility expansion/reinforcement projects may next be required. ICF concludes, and Enbridge Gas concurs, that this will be challenging to do with a high level of certainty until Enbridge Gas installs ultrasonic metering that can measure peak hour consumption (see Section ix IRP enablement below for additional detail). As ICF stated, “[t]he Gas Utilities will need regulatory approval to invest in and recover the costs of the AMI necessary to collect hourly data on the impacts of DSM

programs and measures, as well as pilot programs necessary to determine the costs, impacts, and potential penetration rates for geo-targeted DSM programs."[13]

ix) IRP enablement

The current lack of actual measured peak hourly data makes it difficult to understand the potential of IRPAs and will make it difficult to measure the effectiveness of IRPAs in reducing peak period demand going forward. This increases the risk and, potentially, the cost to ratepayers of investment in IRP.

At such time that Enbridge Gas begins to rely upon IRPAs to offset peak hourly period demands and to defer distribution system expansion/reinforcement projects, insight on actual hourly customer consumption data is necessary to ensure that DR and other IRPAs have delivered peak hour energy savings as forecasted. Access to this hourly data will enable Enbridge Gas to confidently report on the effectiveness of IRPAs to the OEB, will inform future investment in IRPAs by allowing Enbridge Gas to focus investments on the IRPAs with the highest potential to reduce peak period demand and will enable Enbridge Gas to shift funding from less effective IRPAs to new or more effective ones, as appropriate.

Enbridge Gas will bring forward in a separate proceeding a proposal that an AMI system be deployed across the legacy EGD rate zone and Union rate zones. The deployment

[13] Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p. ES36.

of an AMI system, including ultrasonic meters, will allow for the collection of the hourly data that Enbridge Gas requires to not only target IRPAs effectively but also to monitor and verify their effectiveness to ensure that the IRPAs are performing as expected and to ensure peak period demand reductions are materializing.[14]

3. IRP is Not a Viable Alternative to the Project

Enbridge Gas has applied the IRP policy principles set out in this IRP Proposal to evaluate whether IRP could support the deferral or avoidance of the Project. The conclusion is that there is no cost-effective IRP (or set of IRPAs) that will reduce peak period demand to support the deferral or avoidance of the Project.

The results of the Enbridge Gas analysis (which is equivalent to the "stage 1" analysis described above) are set out in Table 13-3. This table includes a comparison of the costs of the Project to the high-level forecasted costs of relevant IRPAs. It is clear from this analysis that IRPAs are not cost-effective as compared to the Project, as is evident by comparing the normalized average cost of the Project to traditional DSM program alternatives and program alternatives included in the 2019 Integrated Ontario Electricity and Natural Gas Achievable Potential Study ("APS"). If IRPAs cost in the same range as traditional DSM programs or as set out in the APS, then the cost for IRPAs is substantially higher than the cost of the Project. In other words, it will cost more to defer or avoid the peak period demand being served by the Project than it will cost to

[14] Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p. ES36.

complete the Project to serve that demand. That is particularly the case when one considers that it is necessary to arrange for IRPAs to meet more than the total demand served by the project (the ICF Study recommends that IRPAs cumulate to 121% of the peak demand to be served by the infrastructure project being avoided or deferred).[15]

Based on this analysis, Enbridge Gas has not undertaken a detailed review of whether there are viable IRPAs that would offset the design day demand to be served by the Project. Based on knowledge of the industry and its customers, and as discussed at Exhibit A, Tab 7, Enbridge Gas does not believe that sufficient opportunities exist that could be implemented in time to defer or avoid the need for the Project.

Table 13-3
Stage 1 Analysis of IRPAs vs. Project

Stage 1 Comparator	Capital/Incurred Cost	Capacity (GJ/d)	Estimated Annual Cost	Normalized Annual Cost ($/GJ)
Project *(Kirkwall to Hamilton Pipeline)*	$203,526,396	92,174	$10,618,935	$115.21
Traditional DSM[16]				
Residential	$ 55,550,997	11,141	$5,240,354	$470.38
Commercial	$18,761,546	7,291	$1,769,854	$242.74
Industrial	$14,472,475	5,076	$1,365,248	$268.95
APS				
Residential	$464,667,639	39,050	$43,834,008	$1,122.52
Commercial	$437,960,711	25,476	$41,314,634	$1,621.70
Industrial	$339,662,150	13,545	$32,041,727	$2,365.56

[15] Exhibit I.EGDI.SEC.1, Attachment 1, October 11, 2018, p. ES18.
[16] Based on 2016 DSM program year OEB-approved verified costs and energy savings.

In addition to the analytics provided above, Enbridge Gas has relevant information on several IRPAs that would be appropriate to consider in comparison to future facility expansion/reinforcement projects. These IRPAs include air source heat pumps, geothermal systems, and in-situ furnace replacements. Electric air source heat pumps cost on average $3,000 - $5,000 and have an estimate measure life of 20 years. Each installation of air source heat pumps has the potential to reduce average annual demand by 73 GJ for space heating. Residential geothermal systems cost on average $20,000 to $30,000 depending on a variety of factors and have a measure life of 20 years for the heat pump component and 40 years for the pipeline component. Each installation of residential geothermal systems has the potential to reduce average annual demand by 73 GJ for space heating and 89 GJ for space and water heating combined. Enbridge Gas also believes that there may be an opportunity for a furnace replacement program given the large percentage of homes (~45% according to the IESO[17]) with mid and low efficiency furnaces in place. Outside of the DSM construct, there may be an opportunity to target those low and mid efficiency furnaces for replacement with high efficiency furnaces. Transitioning to high efficiency furnaces has the potential to reduce base load and peak period demand. In general, each installation of a new high efficiency furnace would cost $3,000 to $5,000, depending on installation complexity, and has the potential to reduce average annual demand by 12 GJ.

[17] IESO's Residential End Use Survey. Page 15 (Table 13).

Table 13-4
Low Carbon Technology Alternatives

Commercialized Technology	Annual Natural Gas Savings (GJ)	Peak Day Savings (GJ/day)	Annual Emissions Savings (tCO_2e)
Electric Air Source Heat Pump	73 (space heating only)	~0.95	3.7 (space heating only)
Geothermal – heating and cooling (residential application)	73 (space heating only) 89 (space and water heating)	~0.95 (space heating only) ~1 (space heating and water heating)	3.7 (space heating only) 4.5 (space heating and water heating)
Forced Air Natural Gas Furnace[18]	12	~0.15	0.6

It is important to note that the implementation of either an electric air source heat pump or an electric heat pump via a geothermal installation will result in higher electrical loads. Although these solutions do reduce natural gas demand at site and may defer traditional facility projects, they may have unintended consequences on the electrical transmission and/or distribution system(s). If large numbers of customers switch to either electric air source heat pumps or electric heat pumps, additional stresses may be realized on the electrical grid. Furthermore, incremental electrical requirement on the grid will very likely increase the marginal electricity produced from the central gas power plants, thereby shifting the residential gas load to the central power plants. This further supports the requirement for collaboration between the electrical and natural gas utilities to ensure long term sustainable approaches to IRP.

[18] Assumed current efficiency = 0.8; Assumed upgraded efficiency = 0.95.

4. Conclusion

As demonstrated in Section 3 above and at Exhibit A, Tab 7, considering the nature and timing of design day demands driving the need for the proposed Kirkwall to Hamilton pipeline, there are no viable IRPAs to avoid or defer the Project. Stated another way, the OEB's consideration of a broader IRP framework should not cause any delay to the Project. Enbridge Gas nonetheless remains committed to considering IRPAs following the identification of potential need for future facility expansion/reinforcement projects in the AMP process.

It is also appropriate that the OEB consider Enbridge Gas's application of this IRP Proposal in relation to future Enbridge Gas projects now, as a first step towards the creation of actionable IRP plans, including:

(i) The pursuit of IRPAs that have the potential to reduce peak period demand;

(ii) The establishment of fundamental attributes of and screening criteria for IRPAs;

(iii) Confirmation that non-gas alternatives can be considered as IRPAs;

(iv) The establishment of a two-stage screening process of future facility expansion/reinforcement projects to determine the feasibility of IRPs/IRPAs;

(v) The intent to seek OEB approval of, including cost recovery of, IRPs/IRPAs through separate applications or in annual rates applications;

(vi) Treatment of the costs associated with IRPs/IRPAs in a similar manner to the avoided capital investments in facility expansion/reinforcement projects that

they enable the utility and ratepayers to avoid allowing Enbridge Gas to earn a rate of return on investments consistent with its allowed rate of return;

(vii) Recognition that ratepayers will bear the risk and subsequent cost of investment in OEB-approved investment in IRPs/IRPAs by Enbridge Gas if peak period demand reductions are not realized as forecast;

(viii) Annual monitoring and reporting on the effectiveness of IRPs/IRPAs implemented; and

(ix) IRP enablement through the installation of AMI.

Following a determination by the OEB that the IRP Proposal is reasonable and appropriate, Enbridge Gas will be able to develop specific IRP proposals for future OEB applications to defer or avoid facility expansion/reinforcement projects through reduction of peak period demands.