

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 11

Reference:

Exhibit E, Tab 4, Schedule 3

Question(s):

Enbridge Gas discuss its proposed Research and Innovation Fund with an annual budget of \$2.601M in 2023.

- a) Please provide a table that lists and describes all activities undertaken and funded through the R&D budget approved as part of the 2015-2020 DSM Decision.
- b) Please discuss if Enbridge Gas's proposed program budgets allow for the ability for Enbridge Gas to test new program designs without leveraging the Research and Innovation Fund amounts.
- c) If the current program budgets are not designed to test new program designs, please discuss how this testing would be practically undertaken and paid for. In your response, please provide a specific example related to a currently proposed program.
- d) Please discuss what will be involved in Enbridge Gas "sustaining and updating technical resources".
- e) Please discuss if Enbridge Gas has any proposed pilot programs it is considering.
- f) Please discuss if funding through the RIF is required in order to:
 - i. allow Enbridge Gas DSM staff to undertake research in order to support changes to input assumptions included in the TRM. In your response, please indicate the portion of historical R&D costs that have been assigned to this function.
 - ii. allow Enbridge Gas DSM staff to undertake field measurement research to develop and maintain calculators and modelling tools used to estimate natural

- gas savings for custom offers. In your response, please indicate the portion of historical R&D costs that have been assigned to this function.
- iii. Conduct any other specific research that affects day-to-day delivery of proposed programs.
- g) Please provide a record of all the collaboration efforts undertaken between 2015-2021, the costs for each activity and the outcome of the effort.
 - h) Please expand on the proposed \$0.63M assigned to Market Data and indicate what external tools, subscriptions and datasets of information this funding will be used to maintain. Please discuss if any of this information can be purchased or if it all requires continual membership and fees.

Response

- a) As provided in Enbridge Gas’s application,

In the 2015-2020 DSM Multi-Year Plan and subsequent 2021 and 2022 DSM Plans, the Company had access to OEB approved funding in the Research budget and Pilot budget (applicable to the Union rate zones) in addition to the Collaboration and Innovation Fund (applicable to the EGD rate zone). Activities supported through these funds were intended to support the objectives and guiding principles of the 2015-2020 DSM Framework and remain relevant to the energy efficiency landscape in Ontario. For the DSM Plan, Enbridge Gas is proposing a continuation of the funding approved for the 2015-2020 Multi-Year DSM Plan and 2021 and 2022 DSM Plans, in an amalgamated Research and Innovation Fund (“RIF”).¹

Pilot Budget 2015-2021

CDM Collaboration		
<p>Project Overview While the IESO Framework supported it (2016-2018), Enbridge (Legacy Union Gas and Legacy Enbridge utilities working together) engaged with electrical utilities in a variety of events to promote a collaborative approach to energy efficiency marketing. Customer-facing events included information and networking trade shows co-presented by electric and gas utilities showcasing both measure-specific and whole building solutions. Enbridge was an active member of the GTHA Sales Working Group where utility professionals met to discuss common issues and developed concepts for pilots, studies and co-marketing opportunities. Enbridge was also active in all of the IESO’s CDM working groups. At these committee meetings much of the public-facing events were planned. Events included:</p> <ul style="list-style-type: none"> o Energy into Action o Power Up Durham o Ottawa Chamber of commerce event o Linemar Energy Awards o Semi-annual GTHA Sales Working Group meetings o Partnering with 13 electric LDCs representing the Greater Toronto Hamilton Area to form an ‘Energy Sales Force.’ 	Project Years	2016-2018
	DSM Spending	\$66,103
	2021 Forecast	
	Partners	Various LDC’s
	Partner Funding	
	EGI Funding	

¹ EB-2021-0002, DSM Multi-year Plan and Framework Application (Updated September 29, 2021), Exhibit E, Tab 4, Schedule 3, p. 1.

<p>o Energy efficiency sales training workshop for channel partners</p> <p>Value to Ratepayers Utility staff engaged with customers to help them understand how complimentary incentives could be combined to make upgrades easier and effect more efficiency.</p>		
Energy Star for Multifamily		
<p>Project Overview The project is to design, develop and pilot a third party energy efficient certification program for mid/high-rise residential buildings in Ontario. The concept is leverage the powerful ENERGY STAR® brand and the successful market transformation model of ENERGY STAR® for new homes. The scope is to design the program, develop the Technical Standard and Administrative Procedures, train Developers and Evaluators and certify 40 buildings in the Ontario pilot. The intent is to achieve higher energy performance through a combination of improved sizing and design, integration of high efficiency HVAC systems responding directly to occupant loads. Reduction of internal load and improving the thermal characteristics of the building envelope. All of this leads to new technologies and or advancing current systems.</p> <p>Value to Ratepayers Certification program for mid/high-rise residential buildings in Ontario. https://www.energystar.gov/partner_resources/residential_new/program_reqs/mfhr: https://sbcanada.org/wp-content/uploads/2018/06/ESMFB-Modelling-Project-Report.pdf</p>	Project Years	2017
	DSM Spending	\$140,000
	2021 Forecast	
	Partners	Enbridge
	Partner Funding	\$100,000
	EGI Funding	
IESO Embedded Energy Manager		
<p>Project Overview There were 10 Institutional Energy Managers that opted into the Energy Manager collaboration initiative. Each Energy Manager was provided a gas savings target in addition to their existing electric savings target. The savings results are pending review of the annual report that is submitted at the end of the year.</p> <p>Value to Ratepayers Participating Customers will derive greater value from their EEM. Cost effective way for Enbridge to expand delivery capacity and this will help inform future CDM collaborative efforts with IESO.</p>	Project Years	2020-2021
	DSM Spending	\$30,000
	2021 Forecast	\$20,000
	Partners	IESO
	Partner Funding	
	EGI Funding	
Waterloo Community Energy Manager		
<p>Project Overview The funding supports the salary of a Community Energy Manger for the Region of Waterloo, who will lead the implementation of its community energy plan (formally, its Community Energy Investment Strategy). The funding commitment is for a 3 year period (2018-2020) and is a collaborative effort with other electric LDCs and lower tier municipalities in the Region of Waterloo, who are providing similar contributions.</p> <p>Value to Ratepayers Waterloo is a progressive municipality and this pilot provided an innovative way at supporting the advancement of their energy plan, in which DSM programs figure prominently. https://wrcommunityenergy.ca/about-us/</p>	Project Years	2018-2020
	DSM Spending	\$64,600
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
Greenhouse Energy Profile Study		
<p>Project Overview The report was commissioned by the IESO with support of other utilities and agencies to uncover opportunities to further support growth in the sector and ensure that customers continue to have access to reliable and affordable energy.</p> <p>Value to Ratepayers</p>	Project Years	2018
	DSM Spending	\$25,000
	2021 Forecast	
	Partners	IESO, OGVG

<p>This information provides valuable data to the sector, utilities and government in helping plan for future needs, and is a first step in working together to provide innovative solutions for the sector to continue to thrive. https://www.ieso.ca/en/Corporate-IESO/Media/News-Releases/2019/10/New-Greenhouse-Study</p>	Partner Funding	~\$50,000
	EGI Funding	
My Heat Inc.		
<p>Project Overview Residential customers included in the pilot were directed to MyHEAT aerial thermal imaging of their homes online to visualize heat loss, see the assigned heat score for each home in relation to neighbours, and an overview of the recommended home retrofit program offerings to access available rebates/free energy upgrades in the case of the low-income program offering. The objective of the pilots was to assess the value of the MyHEAT data in driving leads to the home retrofit offerings and increasing participation through making unseen building envelope upgrade opportunities more visible to homeowners. Through the pilots, incremental uptake was not achieved and further commitments with MyHEAT were not pursued beyond the pilot.</p> <p>Value to Ratepayers Based on the results of the pilot, the value of the MyHEAT data in enhancing participation was not realized. This lesson has been incorporated and will be considered when considering future mass market energy literacy.</p>	Project Years	2016-2017
	DSM Spending	\$263,274
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
Pedestrian Door Air Curtain Program		
<p>Project Overview The Pedestrian Door Air Curtain Program was co-delivered in market through a shared vendor with an electric local distribution company, Alectra Utilities. While designing the offering, Union identified a co-delivery opportunity with Alectra and, together, proceeded to investigate various program offering models for integrated delivery.</p> <p>Value to Ratepayers Alectra's Small Business Lighting Program was determined to provide the best fit for initial CDM collaboration efforts in the joint franchise area. Co-delivery coordinated through one delivery agent creates an all-inclusive experience for customers with on-site audits assessing both natural gas and electric energy saving opportunities.</p>	Project Years	2017
	DSM Spending	\$26,403
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
Optimum Home Lite		
<p>Project Overview Sustainable building consultants identified and assessed the current building practices of 10 small to medium-sized builders and created workplans to assist those builders to build high performance homes and to attain the Energy Star v.17 label. Of the 10 participating builders, 8 completed the program to the point of building a Discovery Home and submitting a final report. In 2020, 11.8% of the homes built by those 8 builders who fully completed the pilot program attained the Energy Star for New Homes label. The equivalent figure for all 10 builders is 6.3%.</p> <p>Value to Ratepayers Ratepayers who will be purchasing homes constructed by smaller builders, will benefit through reduced operating costs.</p>	Project Years	2017-2020
	DSM Spending	\$257,748
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
Residential Air Sealing		
<p>Project Overview Completed 60 projects before the program was paused due to Covid-19, and to allow us to explore Health and Safety issues related to professional air sealing.</p> <p>Value to Ratepayers Gathering important inputs on costs and performance with an eye towards development of a cost effective measure.</p>	Project Years	2019-2021
	DSM Spending	\$201,437
	2021 Forecast	\$88,500
	Partners	

	Partner Funding	
	EGI Funding	
Vicot Gas Heat Pump Absorption for DHW Heating Commercial		
<p>Project Overview Demonstrate energy saving and GHG reduction benefits of a 65 kW (221,780 Btu/hr) gas absorption heat pump for DHW heating application in multi-unit residential buildings (MURBs) by conducting a field trial that includes installation, monitoring, and verification of a gas heat unit in a multi-unit building in the greater Toronto area.</p> <p>Value to Ratepayers Gathering important inputs on costs and performance with an eye towards development of a cost effective measure.</p>	Project Years	2020
	DSM Spending	\$112,200
	2021 Forecast	\$6,000
	Partners	
	Partner Funding	
	EGI Funding	
Sustainable Schools		
<p>Project Overview Performance Base pilot centered around baselining, benchmarking and target setting, with a focus on operational, maintenance and controls opportunities. Two schoolboards, 10 schools each were selected to participate. After one year, 14 out of the 20 schools demonstrated savings compared to baseline through mostly implementing low-cost/no-cost measures, resulting in average savings of ~11%, representing 27% of the total identified savings potential.</p> <p>Value to Ratepayers Sustainable Schools Benchmarking Program (2020-2021), Institutional Sector Enbridge Gas and the IESO partnered with Sustainable Schools in an initiative which focused on benchmarking data to identify schools with high energy savings potential to encourage the development of site-specific action plans for gas and electric energy savings opportunities. In all, six separate school boards participated. This work has been important in the development of the proposed Energy Performance Program put forward in the DSM Plan.</p>	Project Years	2018
	DSM Spending	\$79,981
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
Hybrid Heating Program Pilot Consulting Services		
<p>Project Overview Project management of the Hybrid Heating Pilot Incentive Program in London Ont.</p> <p>Value to Ratepayers Demonstrate how Hybrid Heating System with Smart Controls installed in approximately 110 homes can achieve a reduction in energy consumption and GHG emissions. In addition it will:</p> <ul style="list-style-type: none"> •Create awareness with homeowners/HVAC contractors/manufacturers to better understand key benefits and future market potential of Hybrid Heating with smart controls. •Identify barriers and potential solutions (i.e. training, economics, performance, acceptance, supply chain). •Measure homeowner acceptance such as, their experience and learning. <p>https://www.enbridge.com/stories/2021/september/enbridge-gas-london-hydro-pilot-project-tests-future-of-advanced-hybrid-heating</p> <p>https://london.ca/newsroom/feature/new-incentive-program-london-homeowners-helps-reduce-emissions-save-money-hybrid</p> <p>https://twitter.com/enbridgegas/status/1437854127929888778?s=19</p>	Project Years	2020-2021
	DSM Spending	\$52,500
	2021 Forecast	\$120,000
	Partners	
	Partner Funding	
	EGI Funding	
Embedded Energy Manager for Industrial Customer		
<p>Project Overview This was a pilot for the IESO Embedded Energy Manager (EEM) with a large Industrial customer.</p>	Project Years	2018
	DSM Spending	\$35,599

<p>Value to Ratepayers With help from the Enbridge EEM the Customer implemented a number of energy efficiency projects receiving ~\$500K worth of incentives that amounted to approximately 34M CCM. This pilot helped to inform the IESO Embedded Energy Manager Pilot.</p>	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
Performance Based Conservation		
<p>Project Overview This was a multi-year PBC pilot designed to demonstrate, evaluate and document a utility billing data-driven methodology to drive deep savings across large numbers of commercial and institutional buildings. It was primarily funded by IESO, with contributed from (Legacy) Enbridge & Union, local electric and water utilities.</p>	Project Years	2017
<p>Value to Ratepayers A better understanding of how performance-based conservation can be applied to the municipal sector. Lessons to inform the future Energy Performance Program. https://www.rds.oeb.ca/CMWebDrawer/Record/673832/File/document</p>	DSM Spending	\$33,963
	2021 Forecast	
	Partners	Brampton Civic Hospital City of Brampton Halton Catholic District School Board Halton District School Board Infrastructure Ontario Peel District School Board Town of Halton Hills Town of Milton Alectra Utilities Enbridge Halton Hills Hydro Halton Region W
	Partner Funding	~\$120,000
	EGI Funding	
Hybrid Heating NRCan		
<p>Project Overview Development of an estimating tool to calculate the savings from a hybrid heating system compared to other home heating options. The project is ongoing and expected to be complete by the end of 2021.</p>	Project Years	2020-2021
<p>Value to Ratepayers This tool will estimate the energy, GHG and cost savings with a hybrid heating system.</p>	DSM Spending	\$12,237
	2021 Forecast	\$110,129
	Partners	
	Partner Funding	
	EGI Funding	
Advanced BAS		
<p>Project Overview Advanced BAS claims incremental and sustainable savings compared to conventional systems by implementing a more sophisticated data processing system and an increased number of sensors and system inputs. This pilot project proposes to evaluate the potentials of advanced BAS in generating incremental energy savings from multi-unit residential buildings with existing BAS.</p>	Project Years	2021
	DSM Spending	\$0
	2021 Forecast	\$53,000
	Partners	
	Partner Funding	
	EGI Funding	

Research Budget 2015-2021

The Research Fund facilitated the development of new DSM measures and innovations to improve the efficiency of existing measures and offerings. The projects involved laboratory, in-field, and desktop studies of technologies to investigate cost, performance, and an understanding of the market. Many of these studies were led by Enbridge Gas and in other cases Enbridge Gas funded research through technology collaborations such as GTI to leverage the money spent. As it always is with discovery, not all technologies delivery on expectations. And of those that do, not all are ready for inclusion in programs currently. Enbridge Gas provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those that don't perform.

Initiative	Overview	Years	DSM Funding	2021 Budget
Yanmar VRF 2-Pipe Roof Top Unit	The objective of this project would be evaluating and substantiating the energy and GHG savings as compared to exiting RTU as the base case.	2021		\$120,000
Yanmar 3-Pipe System Research	In-field performance of this first-of-its-kind technology demonstration in Canada. Results will be published in a paper entitled "Performance Evaluation of a 3-Pipe Engine Driven Gas Heat Pump VRF System in Cold Climate" at the ASHRAE 2021 Annual Conference.	2019-2021	\$119,383	\$10,159
Virtual Audit Pilot	To assess the accuracy of consumption and potential energy savings identified by a virtual energy assessment as compared to the potential energy savings identified from traditional in-person audits.	2020-2021	\$50,000	\$44,000
Vent Seals	Project to develop a calculator to estimate natural gas savings for the installation of roof vent seals in a greenhouse.	2020	\$5,000	
Integrated Furnace and Heat Pumps	Integrated furnace and heat pump rooftop units available in Ontario.	2017	\$35,333	\$15,000
Stone Mountain Technologies ("SMTI") Gas Heat Pump Furnace Research	Field testing of 7 units and lab testing of one unit to assess energy and GHG reductions. Also gained valuable experience about the installation and in-field operation. Multiple partners that provided ~\$900K USD.	2019-2020	\$363,235	
Stone Mountain Technologies ("SMTI") Gas Heat Pump Furnace and Water Heater Research and Field Trial	Field installation, monitoring, and laboratory testing of the SMTI/Trane combi thermal gas heat pumps to evaluate performance and energy saving and GHG reduction potential of GHPs for the residential sector. Multiple partners who provided additional funding.	2020	\$180,117	
Ryerson - Net Zero	M&V of an Integrated natural gas hybrid system in a net zero home in Strathroy. Demonstration of a net zero house with natural gas.	2017-2018	\$59,708	

Gas Heat Pump demonstration - TRCA	Mitacs industry partnership with Ryerson University. Funded graduate students to model commercial gas heat pump performance for future demonstration projects.	2016-2018	\$60,000	
On Demand Controls for Domestic Hot Water ("DHW") Recirculation Systems	This project pertains to controlling the demand for domestic hot water and/or modulating the water temperature in the system.	2017-2020	\$180,123	
Gas Heat Pump Demonstration with The Atmospheric Fund	Enbridge conducted a demonstration study of two GAHPs installed as part of a domestic hot water system in a multi-unit residential building in Toronto. Partnered with TAF and Enbridge who provided \$20K funding.	2017-2018	\$20,000	
Net Zero Research Study	Enbridge contribution for Net-Zero research study conducted by CABA	2015	\$6,250	
Net Zero Energy Housing Council Annual Membership Fee	CHBA's Net Zero Energy Housing Council (NZC) supports the goal of creating a market advantage for CHBA builder and renovator members pursuing Net Zero Energy performance. The Council's work will help to meet the housing aspirations of Canadians and renew Canadian leadership in high performance housing.	2016-2018	\$15,000	
McMaster Integrated Community Energy ("ICE") Research	Evaluation of the performance of the ICE Harvest system modelling tool. ICE-Harvest system integrates electricity and heating generation and storage into intensive urban infrastructure. Multiple partners that provided ~\$2M.	2017-2019	\$10,826	
Low Income Segmentation Study	This research was undertaken to characterize the low income market: barriers and motivators to energy efficiency, channels for engagement, demographic and psychographic characteristics linked to interest in energy efficiency, etc.	2015	\$89,900	
Low Income High Eff. Furnace	Review current research and substantiation documents focused on high efficiency furnaces. Update the substantiation documents as needed specifically for Low Income Part 9 homes (Single Family & Multifamily, separately) to include current base case efficiency and market share, including upgrade install costs and other factors as needed.	2015	\$11,500	
Local Improvement Charges Commercial and Industrial Buildings and District Energy Project	Local Improvement Charges (LICs) Commercial and Industrial Buildings and District Energy Project in our proposal to Union Gas Limited for funding support for this Sustainable Buildings Canada initiative. Multiple partners that provided ~\$110K.	2016	\$10,000	

Indirect-Fired DHW Heaters	An indirect water heater uses the main furnace or boiler to heat a fluid that's circulated through a heat exchanger in the storage tank. The energy stored by the water tank allows the furnace to turn off and on less often, which saves energy.	2016-2017	\$83,928	
Indigenous Home Weatherization New Measures Test	There is a need to develop a comprehensive list of impactful DSM measures and technologies that can be considered for future Indigenous Program delivery. The team also wishes to identify key potential delivery strategies for this sector. The first phase will encompass a thorough study of housing stock on reserve to determine untapped opportunities. Enbridge received technical savings and market intelligence for Indigenous Communities.	2019-2020	\$58,391	
iFlow Phase 2 - ASHP & iFlow Fuel Switching	As an expansion of iFlow phase 1, an ASHP has been installed in each of Port Hope and Orillia site to evaluate the effectiveness of iFlow fuel switching technology by calculating the energy consumption and related utility cost savings (i.e. natural Gas and electricity) and GHG emission reduction rates.	2019-2020	\$28,650	
iFlow Phase 1, Hybrid System Hydronic Installation & Monitoring	The annual gas consumption and GHG emissions of the combo heating systems tested in this study are less than the traditional gas fired heating system (forced air gas furnace and gas storage tank water heater) by up to 29%.	2018-2020	\$60,845	\$4,375
IEA DSM Task 24 Behavior Project Support	The IEA Demand-Side Management (DSM) Task 24 developed recommendations about the influence of behavior change on effective implementation of energy-efficiency policies and programs. Multiple partners that provided funding.	2018	\$12,879	
Hybrid System with Smart Fuel Switching Controller ("SFSC") – test homes	Enbridge set up a study to evaluate the energy, cost and GHG saving for the hybrid SFSC in homes in Ottawa. Result published by NRCan in ASHRAE Winter conference W2020	2018-2019	\$52,599	
Hybrid System with SFSC With BKR - Retrofit homes	Hybrid System with SFSC with BKR at Four Homes: Vaughan, Mississauga, Chatham, Thunder Bay. Evaluate the energy and GHG saving for the dual electricity and gas system control (SFSC)	2018-2019	\$96,800	

<p>Hybrid Heating Pilot Incentive Program</p>	<p>In 2021 we intend to support the introduction of residential hybrid heating with smart controls into the Ontario marketplace through a pilot program targeting the residential retrofit sector. Objective of this project is to demonstrate how Hybrid Heating System with Smart Controls installed in approximately 75 homes can achieve a reduction in energy consumption and GHG emissions. In addition, the project is intended to:</p> <ul style="list-style-type: none"> • Create awareness with homeowners/HVAC contractors/manufacturers to better understand key benefits and future market potential of Hybrid Heating with smart controls. • Identify barriers and potential solutions (i.e. training, economics, performance, acceptance, supply chain). • Measure homeowner acceptance such as, their experience and learning. • Understand how homeowners prefer to operate the system (i.e. GHG reduction, cost reduction) • Share program pilot results with NRCan, HRAI and other stakeholders to support a collaborative industry effort to accelerate adoption of Hybrid Heating Systems that exceed 100% energy efficiency as per NRCan's Roadmap goals. 	<p>2021</p>		<p>\$500,000</p>
<p>Hybrid Heating 40,000 BTU Test (NRCan Low Use Homes (LEEP))</p>	<p>The project involves the development of an integrated gas-electric heat pump for residential heating, cooling, and domestic hot water end uses. The equipment is a fully modulating hybrid 40,000 BTU gas fired absorption heat pump with 1.5 RT electric air cooling.</p>	<p>2016-2017</p>	<p>\$55,000</p>	
<p>High Efficiency Condensing Rooftop Unit and Make-Up Air Unit Study</p>	<p>Variable Frequency Drive for non-condensing rooftop unit & Makeup airObjective: Determine technology viability for development of a prescriptive substantiation document for inclusion in the TRM. Outcome: Supply chain insights indicated that the technology uptake is slow due to limited models available in market and high cost. Technology will continue to be monitored for future opportunities and savings will continue to be captured under custom calculation.</p>	<p>2015-2018</p>	<p>\$93,266</p>	
<p>Greenhouse Industry Standard Practice (ISP)</p>	<p>Presented non statistically-representative anecdotal findings on possible ISP for new construction or major expansion greenhouse technologies. Study from 2016 is now out of date.</p>	<p>2016-2017</p>	<p>\$55,050</p>	
<p>Green Button Sponsorship</p>	<p>Support for the implementation of the Green Button Initiative led by the Ministry of Energy. Union Gas, amongst other utilities, is part of a working group to assess the potential costs and benefits of implementing Green Button in Ontario.</p>	<p>2016</p>	<p>\$100,000</p>	

Gas Substantiation Document Development	Ongoing savings reporting is information and motivational, supporting learning and guiding continuous improvement.	2017	\$29,648	
Gas Condensing Humidifiers	This study presents the outcomes of a market and technology characterization for condensing gas-fired humidifiers in Ontario and assesses the savings potential of these units in Union Gas' service territory. Gas-fired humidifiers create atmospheric steam for humidification from the heat of combustion, transferred through a heat exchanger. Condensing humidifiers save energy by increasing the overall efficiency of the burner, so that less natural gas is used to produce an equivalent amount of steam relative to other gas-fired technologies.	2016-2017	\$56,638	
Mid-Stream – new measures	Expansion of Midstream offering to incorporate suite of seven foodservice technologies: Griddles, Conveyor Ovens, Combi Ovens, Charbroiler, Rotisserie, Salamander and Upright Broiler. Undertake market research to understand baseline and market potential. Technology research to develop savings calculations algorithm and sub docs for inclusion in TRM and substantiated of all input assumptions required for inclusion in Ontario TRM.	2021		\$210,000
Food Service & Industrial End-Use Studies	Purpose was to understand the opportunity for DSM measures and the results were also used for various Achievable Potential Studies over the years. The C/I program design team proposed to develop upstream offerings; the first in Ontario for natural gas measures. A study completed an inventory natural gas consuming equipment and energy efficiency related behaviors in food service and industrial buildings. This research was used to develop midstream C/I offer.	2016	\$75,500	
eSim 2016 Sponsorship	eSim Conferences bring together building performance professionals both in Canada and internationally.	2016	\$ 5,000	
Energy Solution Center (ESC)	Energy Solutions Center, Inc. (ESC) is a non-profit organization of energy utilities and equipment manufacturers that promotes energy efficient natural gas solutions and systems for use by residential, commercial, and industrial energy users. The Center creates educational and marketing materials, case studies, training manuals, decision analysis software, and other tools and resources, and offers Technology and Market Assessment Forums (TMAFs) and virtual energy efficient technology webinars designed to enhance the success of those utility customer service professionals responsible for enhancing customer productivity, efficiency, reliability, and comfort. 55 gas distribution companies and 59 equipment manufacturers also provide funding.	2020-2021	\$ 47,653	\$ 45,821

Energy Efficiency in Carbon Policy Environments	The Company commissioned a study to provide an understanding of the relationship between carbon pricing and demand side management (DSM) programs in Ontario as well as in other jurisdictions across Canada and the US.	2017	\$ 50,000	
Residential Energy Conservation Study	Residential study that provided information in the following areas: 1. Establishing a detailed profile of the general attitudes and behaviors of Canadians and Union Gas customers with respect to key energy issues by fuel source and levels of participation in energy conservation programs. 2. Examining the perceptions of residential energy users as it relates to awareness and understanding of residential energy conservation programs and their effectiveness. 3. Understanding residential energy user perceptions of the perceived role/responsibility of governments, energy industry stakeholders, and residents in energy conservation programs. 4. Developing insights in terms of effectively engaging residential energy users in energy conservation programs including an understanding of preferred methods to receive information about or be engaged in these topics.	2017	\$ 30,800	
EndoTherm - demonstration	The demonstration project has the objective of carrying out a single residential pilot test in a hydronic space heating system to verify that the introduction of a prescribed amount of EndoTherm additive to the water of a typical hydronic heating system provides energy saving and reduces natural gas consumption.	2020	\$ 22,855	
Opinion Dynamics	EM&V Services	2015	\$50,000	
DSM Marketing and Equipment Research	Objectives were to: <ul style="list-style-type: none"> • obtain knowledge of the currently installed energy-using equipment/appliances. • understand customers' energy conservation profile including past DSM program participation and future energy conservation plans. • understand customers' decision-making processes to increase uptake of Union's DSM offerings. 	2015	\$ 85,000	
DSM In IRP Report	Union Gas has retained Dunsky's services to conduct a high-level study to review methodological approaches for the treatment of DSM within integrated resource planning, with a specific consideration for location-specific impacts on peak needs in resource planning activities.	2015	\$ 12,000	
DSM Boiler Load Controls	Centre Des Technologies (NGTC) development of a calculator to support linkageless controls for energy savings on boilers.	2015-2017	\$ 53,941	

<p>Demand Control Ventilation (“DCV”) With Variable Frequency Drive (“VFD”) Rooftop Unit (“RTU”) Research</p>	<p>Market and technical assessment of the technology.</p> <p>Objective: Assessment of technology and interactive effects to determine opportunities to reduce / update current sub doc restrictions or to develop a new a prescriptive substantiation document for inclusion in the TRM.</p> <p>Outcome: Complexities of technologies and variation in system designs created challenges in development of a prescriptive sub doc. Savings opportunities through technologies that do not meet the existing TRM requirements will continue to be captured under custom calculation.</p>	<p>2019</p>	<p>\$39,374</p>	
<p>DCV Market Expansion</p>	<p>Enbridge commissioned a substantiation document for an expanded DCV market.</p>	<p>2015-2016</p>	<p>\$43,599</p>	
<p>Consortium for Energy Efficiency (“CEE”) Membership Dues</p>	<p>14 projects and standards involving energy efficient end-use gas technologies. Approximately 42 other gas or combo gas and electric utilities, Energy Efficiency Organizations and National Laboratories that provide ~\$1.8M per year.</p>	<p>2019-2021</p>	<p>\$154,118</p>	<p>\$92,112</p>
<p>Consortium for Energy Efficiency (“CEE”) Emerging Technologies Collaborative Fees</p>	<p>11 projects involving energy efficient end-use gas and electric technologies, including a Catalog of Emerging Opportunities Assessments, preliminary research reports, and in-depth Working Group reports. 18 other gas or combo gas and electric utilities (project sponsors), other CEE members, national laboratories and numerous manufacturers who provide ~\$450K per year.</p>	<p>2016-2021</p>	<p>\$118,538</p>	<p>\$9,050</p>
<p>Commercial Kitchen Combi-Oven & Rack Oven Research</p>	<p>New measures in TRM and Custom C&I</p> <p>Objective: Determine technology viability for development of a prescriptive substantiation document for inclusion in the TRM.</p>	<p>2018-2019</p>	<p>\$71,200</p>	
<p>Cold Climate Air Source Heat Pump (“CCASHP”)</p>	<p>Performance assessment of cold climate air source heat pumps for seven homes. Partnered with NRCan and BKR Energy who provided ~\$100K.</p>	<p>2019-2020</p>	<p>\$75,609</p>	

Centre for Energy Advancement Through Technological Innovation ("CEATI")	This project will focus on low-carbon residential and commercial space and water heating through documentation of case studies, identifying associated utility program practices, and the impacts of long-term utility projections and outcomes.	2020	\$20,000	
Energy Bridge Pilot Test	Enbridge investigated Powerley's Energy Bridge and smartphone app for monitoring gas consumption by conducting an 11-week residential pilot study. The technology proved unsuccessful, as most participants indicated that they would not recommend the platform nor were they willing to pay any amount for ongoing access to the technology.	2018	\$94,470	
GAGBC Membership Renewal	Staying current with green building technologies and policies	2016-2018	\$17,550	
BKR Hybrid Heating – additional monitoring	Calculating and validating air source heat pump (ASHP) real time Coefficient of Performance (COP), Seasonal Energy Efficiency Rating (SEER), Heating Seasonal Performance Factor (HSPF), and corresponding Greenhouse Gas (GHG) emission reduction for each participating home.	2021	\$	\$22,328
BKR Energy Hybrid System with Smart Fuel Switching Controller ("SFSC")	Energy, cost and GHG reductions associated with hybrid heating at four test homes. Result published by Union Gas in ASHRAE Winter conference W2020.	2019	\$26,593	
Assoc. Of Energy Service Professionals, Silver Level Group Membership	AESP is a member-based association dedicated to improving the delivery and implementation of energy efficiency. Membership in AESP allowed Enbridge access to research, learning and networking opportunities.	2015	\$6,536	
Aquanta Domestic Hot Water Tank Control System	In-field assessment of energy savings associated with Aquanta control system	2018-2019	\$42,432	
Air Curtain Survey	Objective: Update existing substantiation document in TRM to address two shipping door types (drive through & dock-in) for Air Curtains and differentiate this technology from the new Dock Door Seal substantiation document.	2019	\$3,941	
Advanced Controllers for Forced Air Systems	Caneta PO #495 000 9059	2016-2017	\$34,925	

Accelerate Internship Modelling Study GHP In Cold Climate	Mitacs Industry partnership with Ryerson University. Funded research projects to model the viability of gas heat pump in a cold climate.	2016-2017	\$24,000	
2018/19 Base Program for Emerging Technology Program	GTI's Emerging Technology Program (ETP) is a North American, membership-based utility collaborative. ETP works to accelerate the commercialization and adoption of energy efficient technologies. Multiple partners that provide funding.	2015-2018	\$81,279	
Performance Benchmarking Project Sponsorship	Consortium for Energy Efficiency - participation in benchmarking surveys with a small group of member utilities in North America on several attributes of DSM programs (only legacy Union was a participant from 2015-2017)	2015-2018	\$72,169	
Net Zero Low-Rise Multi-Unit Residential Buildings	The results of this project will help identify the barriers and opportunities for the natural gas industry in Net Zero low-rise MURBs market in Ontario. The main focus is to study different technologies for space heating, space cooling, domestic hot water, ventilation, and power generation. The project will compare a hybrid heating system and an all-electric heating system in terms of energy, cost savings and GHG reductions in two MURBs. Partnered with CHBA, NRCan who provided ~\$2.4M.	2020-2021	\$54,407	\$1,230
Greenhouse Artificial Intelligence	To evaluate the effectiveness of artificial intelligence for the growing of vegetables in a controlled climate. The artificial intelligence is aimed at reducing energy inputs while boosting greenhouse productivity and profits. The study is using two identical sections of a greenhouse, one for the control and one for collecting data. Multiple partners who have provided funding.	2020	\$15,000	
Design Guidelines for Commercial Natural Gas Absorption Heat Pumps ("GAHP")	Development of a design guideline to provide customers and design teams a reference for integrating GAHP into an existing domestic hot water system. The purpose of the guideline is to make the design of a GAHP system simpler for design teams not familiar with the technology and easier to implement correctly.	2020	\$12,500	
Ambient Compensators Substantiation Document Development	This project was designed expand on the preliminary "Proof of Concept" study completed recently to complete a full technical and marketing analysis on the possibility of using ambient compensators to control the amount of outside air being provided by make-up air (MUA) units during cold outside conditions.	2017	\$16,828	

CIF Budget 2015-2021

Vicot 20 kW Gas Heat Pump Testing		
<p>Project Overview The project is about installing and monitoring the performance of four residential (20kW) gas absorption heat pumps (GHP) from Vicot. The unit will be used for both space and DHW heating. The units will be installed in various locations and set ups. Two of the units will be integrated with a customized air handling unit (AHU) and two other will be tested alone.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2021
	DSM Spending	
	2021 Forecast	\$21,500
	Partners	
	Partner Funding	
	EGI Funding	\$68,190
Vicot 140 kW Gas Heat Pump Testing		
<p>Project Overview The project is about testing the 140 kW GHP in a MURB supporting Heritage Gas NS. This is a gas absorption heat pump combined with condensing boiler for space heating and DHW. A pilot report will be developed by a local engineering company that will evaluate the economic and emissions performance of the system as installed.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2021
	DSM Spending	\$0
	2021 Forecast	\$17,000
	Partners	Heritage Gas, Fortis BC, Energir
	Partner Funding	\$133,200
	EGI Funding	
Gas Heat Pump Demonstration with the Toronto Atmospheric Fund		
<p>Project Overview This project aims to accelerate the adoption of GAHP equipment in multi-unit buildings in the Greater Toronto Area. To this purpose, two Toronto Community Housing Corporation (TCHC) buildings are undergoing a GAHP retrofit to improve the efficiency of their shared domestic hot water system.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2017-2018
	DSM Spending	\$20,000
	2021 Forecast	
	Partners	Union, TAF
	Partner Funding	\$20,000
	EGI Funding	
Sustainable Buildings Canada (“SBC”) Combined Heat and Power (“CHP”) Study		
<p>Project Overview Marginal electricity emission factors were used to calculate GHG saving for 6 CHP sizes for a new construction multi-unit residential building (MURB) designed to meet the energy efficiency requirements of Ontario Building Code Supplementary Standard SB-10. The CHP system reduced the GHG emissions by 10% - 14% by displacing the gas consumed in the boiler and displacing grid purchased power in all six scenarios.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2019-2020
	DSM Spending	\$79,957
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	

Stone Mountain Technologies (“SMTI”) Rinnai Gas Heat Pump Water Heaters		
<p>Project Overview Lab testing of 2 units and field demonstration of 56 units with the goal of achieving a thermal efficiency of 130%.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2019-2020
	DSM Spending	\$509,393
	2021 Forecast	
	Partners	GTI and 7 other gas utilities
	Partner Funding	\$4,812,000 US
	EGI Funding	
Start-up		
<p>Project Overview As a result of the lack of certainty during 2015 regarding the future of the CIF specifically, and the incremental budget more broadly, spending of this Fund in 2015 was limited. During 2015 approximately \$53,000 was spent. CIF spending in 2015 was largely focused on the development of future collaborative pilots, research and initiatives. While these early efforts did not generate distinct gas saving or other results in 2015, it is anticipated that they will facilitate meaningful collaboration with the Independent Electricity System Operator (“IESO”) and electric utilities in 2016 and beyond. Of note, a small commercial and industrial collaborative energy assessment effort was undertaken with Enersource Corporation (“Enersource”). The initiative involved 30 commercial and 20 industrial customer site visits. The purpose of the initiative was to generate energy efficiency awareness and engagement amongst these customer segments, identify opportunities for customers to save both electricity and gas through DSM and CDM programs, gain further insight into the needs of these customer segments, increase customer convenience and also reduce the cost of these activities.</p> <p>Value to Ratepayers Utility staff engaged with customers to help them understand how complimentary incentives could be combined to make upgrades easier and effect more efficiency.</p>	Project Years	2015
	DSM Spending	\$53,000
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
SMTI Gas Heat Pump Test for Kitchen Application		
<p>Project Overview Enbridge is planning to install a pre-production 80k Btu/hr SMTI gas fired absorption heat pump (GHP) unit to heat DHW for a restaurant. The purpose of the project is to learn about the installation and operational experiences, evaluate system performance, gather field performance data to evaluate energy savings and GHG reduction as compared to the existing gas hot water heater.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2021
	DSM Spending	\$0
	2021 Forecast	\$70,000
	Partners	
	Partner Funding	
	EGI Funding	
RTU Pilot with Toronto Hydro		
<p>Project Overview CDM Collaborative pilot with Toronto Hydro.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently. CDM collaborative pilot.</p>	Project Years	2017
	DSM Spending	\$27,967
	2021 Forecast	
	Partners	Toronto Hydro
	Partner Funding	
	EGI Funding	

Residential Prescriptive Research		
<p>Project Overview Diversify single-family residential DSM portfolio through the development of prescriptive incentive programs for building envelope measures for customers. Technology research to develop savings calculations algorithm and sub docs for inclusion in TRM.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2021
	DSM Spending	
	2021 Forecast	\$70,000
	Partners	
	Partner Funding	
EGI Funding		
Power House Hybrid (“PHH”) Net Zero Energy Emissions (“NZEE”)		
<p>Project Overview Systems are currently being commissioned. Technical results expected to begin in June. Developing a lean, clean and green POWER.HOUSE - Enbridge Inc.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2018-2021
	DSM Spending	\$605,112
	2021 Forecast	\$32,954
	Partners	Alectra, City or Markham, NRCan, Ryerson
	Partner Funding	\$3,362,101 that includes Labour, Consultants, and Equipment cost
EGI Funding		
May Ruben Project		
<p>Project Overview Multiple industry partners have collaborated to test and validate an in-field demonstration of the May Ruben Thermal Solutions (MRTS) Combined Heating and Cooling technology. Enbridge is looking to test modifications that may increase the overall efficiency of the natural gas components.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2016-2018
	DSM Spending	\$134,839
	2021 Forecast	
	Partners	CGA
	Partner Funding	
EGI Funding		
Independent Electricity System Operator (“IESO”) Training		
<p>Project Overview Training customers in the C&I sector. Energy Training & Support for Contractors & Allies Save on Energy</p> <p>Value to Ratepayers Capability Building and Training (2018-Present), C&I Sector.</p>	Project Years	2017-2019
	DSM Spending	\$109,331
	2021 Forecast	
	Partners	IESO
	Partner Funding	~\$90,000
EGI Funding		

iFLOW Combination Heating System Assessment Project		
<p>Project Overview The annual gas consumption and GHG emissions of the combo heating systems tested in this study are less than the traditional gas fired heating system (forced air gas furnace and gas storage tank water heater) by up to 29%.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2019-2021
	DSM Spending	\$281,409
	2021 Forecast	\$151,270
	Partners	Union Gas
	Partner Funding	\$61,964
	EGI Funding	
IESO Moderate Income Collaboration		
<p>Project Overview Work with IESO on the Affordability Fund. The intent was to collaborate with IESO on a modifying their moderate income offer in order to include gas measures. Enbridge were looking at co-funding arrangements, and we were going to need to put some funding toward a delivery agent. Unfortunately this never materialized.</p> <p>Value to Ratepayers EGD didn't move ahead with this collaboration.</p>	Project Years	2017-2018
	DSM Spending	\$92,203
	2021 Forecast	
	Partners	IESO
	Partner Funding	
EGI Funding		
IESO Embedded Energy Manager		
<p>Project Overview There were 10 Institutional Energy Managers that opted into the Energy Manager collaboration initiative. Each Energy Manager was provided a gas savings target in addition to their existing electric savings target. The savings results are pending review of the annual report that is submitted at the end of the year.</p> <p>Value to Ratepayers Participating Customers will derive greater value from their EEM. Cost effective way for Enbridge to expand delivery capacity and this will help inform future CDM collaborative efforts with IESO.</p>	Project Years	2020-2021
	DSM Spending	\$30,000
	2021 Forecast	\$20,000
	Partners	IESO
	Partner Funding	
EGI Funding		
Green Button Sponsorship		
<p>Project Overview Supporting the implementation of Green Button Initiative led by the Ministry of Energy. Union Gas, amongst other utilities, is part of a working group to assess the potential costs and benefits of implementing Green Button in Ontario. To date, Union Gas has provided \$100,000 in funding through the DSM research budget for this initiative. The Green Button initiative gives customers access to their energy consumption information, available through innovative third party applications. https://www.oeb.ca/industry/policy-initiatives-and-consultations/green-button-implementation</p> <p>Value to Ratepayers Green Button – A data standard that gives customers the ability to access and share their utility data in an electronic, standardized and secure way. Customers can share their data with innovative software applications that allow them to view and manage their energy and water use.</p>	Project Years	2017
	DSM Spending	\$10,000
	2021 Forecast	
	Partners	Union Gas
	Partner Funding	\$100,000
EGI Funding		
Gas Heat Pump Demonstration - Tweed library		
<p>Project Overview Robur gas heat pump project at the Tweed library. Partnered with Union and Ryerson to determine the heat pump performance characterization & feasibility analysis of natural Gas heat pumps for Canadian weather conditions.</p> <p>Value to Ratepayers</p>	Project Years	2016-2018
	DSM Spending	\$64,723
	2021 Forecast	
Partners	Ryerson, Union	

<p>Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	<p>Partner Funding</p>	
	<p>EGI Funding</p>	
Flowmix Pilot		
<p>Project Overview This project proposes a performance evaluation of FlowMix devices implementing temperature setbacks for DHW dsitribution systems at condos or apartments that were originally equipped with thermostatic mixing valves (TMV) that were set to fixed temperature setpoints for their DHW dsitribution systems</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	<p>Project Years</p>	<p>2021</p>
	<p>DSM Spending</p>	
	<p>2021 Forecast</p>	<p>\$57,000</p>
	<p>Partners</p>	
	<p>Partner Funding</p>	
	<p>EGI Funding</p>	
Energy Star for Multifamily		
<p>Project Overview The project is to design, develop and pilot a third party energy efficient certification program for mid/high-rise residential buildings in Ontario. The concept is leverage the powerful ENERGY STAR® brand and the successful market transformation model of ENERGY STAR® for new homes. The scope is to design the program, develop the Technical Standard and Administrative Procedures, train Developers and Evaluators and certify 40 buildings in the Ontario pilot. The intent is to achieve higher energy performance through a combination of improved sizing and design, integration of high efficiency HVAC systems responding directly to occupant loads. Reduction of internal load and improving the thermal characteristics of the building envelope. All of this leads to new technolgies and or advancing current systems. https://www.energystar.gov/partner_resources/residential_new/program_reqs/mfhr: https://sbcanada.org/wp-content/uploads/2018/06/ESMFB-Modelling-Project-Report.pdf</p> <p>Value to Ratepayers Certification program for mid/high-rise residential buildings in Ontario. https://www.energystar.gov/partner_resources/residential_new/program_reqs/mfhr: https://sbcanada.org/wp-content/uploads/2018/06/ESMFB-Modelling-Project-Report.pdf</p>	<p>Project Years</p>	<p>2017</p>
	<p>DSM Spending</p>	<p>\$100,000</p>
	<p>2021 Forecast</p>	
	<p>Partners</p>	<p>Union Gas</p>
	<p>Partner Funding</p>	<p>\$140,000</p>
	<p>EGI Funding</p>	
	DCKV Marketing	
<p>Project Overview Enbridge and PowerStream (LDC) collaborated to create a co-branded Demand Control Kitchen Ventilation (DCKV) campaign for the food service industry. DCKV is a dual savings technology.</p> <p>Value to Ratepayers Turnkey solution for customers to improve kitchen ventilation with energy efficient DCKV technology. Customer recieves incentive for electricity and gas savings.</p>	<p>Project Years</p>	<p>2016</p>
	<p>DSM Spending</p>	<p>\$6,000</p>
	<p>2021 Forecast</p>	
	<p>Partners</p>	<p>Powerstream</p>
	<p>Partner Funding</p>	
	<p>EGI Funding</p>	
Energy Bridge Pilot Test		
<p>Enbridge investigated Powerley's Energy Bridge and smartphone app for monitoring gas consumption by conducting an 11-week residential pilot study. The technology proved unsuccessful, as most participants indicated that they would not recommend the platform nor were they willing to pay any amount for ongoing access to the technology.</p>	<p>Project Years</p>	<p>2018</p>
	<p>DSM Spending</p>	<p>\$85,000</p>
	<p>2021 Forecast</p>	
	<p>Partners</p>	<p>London Hydro</p>
	<p>Partner Funding</p>	
	<p>EGI Funding</p>	

CHP Calculator		
<p>Project Overview Enbridge developed a Combined Heat and Power (CHP) Tool that screens CHP project viability. Enbridge partnered with Toronto Hydro to give it user rights over the tool. In exchange the LDC provides data and feedback to Enbridge to help refine the tool for accuracy and inform the Company's research on CHP gas savings.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2017
	DSM Spending	\$10,000
	2021 Forecast	
	Partners	Toronto Hydro
	Partner Funding	
	EGI Funding	
CGA Energy Technology & Innovation Canada ("ETIC")		
<p>Project Overview Leverage through low cost consortia -- Information exchange, Networking, Collaboration on projects of interest to utilities across Canada,</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2016-2018
	DSM Spending	\$132,232
	2021 Forecast	
	Partners	
	Partner Funding	
	EGI Funding	
CGA – Natural Gas Innovation Fund		
<p>Project Overview The Natural Gas Innovation Fund™ (NGIF) was created by the Canadian Gas Association (CGA) to support the funding of cleantech innovation in the natural gas value chain. Funds support the development and testing of innovative projects involving energy efficient end-use gas technologies. Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2018
	DSM Spending	\$280,050
	2021 Forecast	
	Partners	NGIF has 7 upstream and 5 downstream investors
	Partner Funding	Unknown
	EGI Funding	
Centre for Energy Advancement through Technological Innovation ("CEATI") Cannabis Research		
<p>Project Overview Technology and Market assessment of the Cannabis sector in Ontario. https://ieso.ca/en/Sector-Participants/IESO-News/2021/08/Report-on-Cannabis-Greenhouse-and-Warehouses-Energy-Management-Best-Practices</p> <p>Value to Ratepayers Identifies best practices of energy management for indoor Cannabis cultivation in warehouse and greenhouse settings.</p>	Project Years	2019
	DSM Spending	\$21,000
	2021 Forecast	
	Partners	BC Hydro, Enbridge, FortisBC, Independent Electricity System Operator, National Rural Electric Cooperative Association
	Partner Funding	~\$84,000
	EGI Funding	

CDM Collaboration		
<p>Project Overview While the IESO Framework supported it (2016-2018), Enbridge (Legacy Union Gas and Legacy Enbridge utilities working together) engaged with electrical utilities in a variety of events to promote a collaborative approach to energy efficiency marketing. Customer-facing events included information and networking trade shows co-presented by electric and gas utilities showcasing both measure-specific and whole building solutions. Enbridge was an active member of the GTHA Sales Working Group where utility professionals met to discuss common issues and developed concepts for pilots, studies and co-marketing opportunities. Enbridge was also active in all of the IESO's CDM working groups. At these committee meetings much of the public-facing events were planned. Events included:</p> <ul style="list-style-type: none"> • Energy into Action • Power Up Durham • Ottawa Chamber of commerce event • Linemar Energy Awards • Semi-annual GTHA Sales Working Group meetings • Partnering with 13 electric LDCs representing the Greater Toronto Hamilton Area to form an 'Energy Sales Force.' • Energy efficiency sales training workshop for channel partners <p>Value to Ratepayers Events such as these encouraged customers to consider energy efficiency as a holistic project rather than a fuel-specific project.</p>	Project Years	2016-2018
	DSM Spending	\$38,050
	2021 Forecast	
	Partners	Various LDC's
	Partner Funding	
	EGI Funding	
Micro-CHP Study		
<p>Project Overview Evaluate/validate functionality and performance map. Determine load following capability.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2018
	DSM Spending	\$26,160
	2021 Forecast	
	Partners	CGA
	Partner Funding	
	EGI Funding	
Affordability Fund Trust Pilot		
<p>Project Overview Experience targeting moderate income customers and collaborating with electric utility and provincial energy affordability program on delivering energy-saving measures, in order to inform future program design. https://www.affordabilityfund.org/</p> <p>Value to Ratepayers CDM Collaboration with the electric utilities on DSM programs has the potential to save ratepayers money by avoiding duplication of efforts by gas and electric utilities. Collaboration by utilities also has the potential to offer better DSM program experience</p>	Project Years	2019-2020
	DSM Spending	\$4,458
	2021 Forecast	
	Partners	Affordability Fund Trust; Peterborough Distribution Inc
	Partner Funding	
	EGI Funding	
AeroBarrier Test		
<p>Project Overview Enbridge Gas and AeroBarrier are partnering to demonstrate, measure, and analyze the energy savings that can be driven by the AeroBarrier air sealing technology in the Ontario new home residential market. The goal will be to test feasibility and measure reduction in air leakage through the application of AeroBarrier across a proposed 150-200 homes of varied size & type (stacked, detached, towns). In conjunction with Building Knowledge Inc. and through blower</p>	Project Years	2019-2021
	DSM Spending	\$40,700
	2021 Forecast	\$48,100
	Partners	

<p>door testing and the use of energy modelling software, Enbridge Gas will generate a data set that measures the energy savings that the technology can drive in the new home building industry. The demonstration test will see natural gas savings for 139 homes to inform future program design.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Partner Funding	
	EGI Funding	
Adaptive Thermostats Program		
<p>Project Overview Enbridge collaborated with Toronto Hydro to deliver Enbridge's Adaptive Thermostats program from 2016 - 2019. The dual-fuel savings generated by the technology makes it ideal to collaborate an integrated CDM and DSM program offer. Since the collaboration ended a couple of years ago, not external links are available at this time.</p> <p>Value to Ratepayers CDM Collaboration where eligible participants included Toronto Hydro customers living in gas-heated homes with central air conditioning connected. Customers were paid \$50 from Toronto Hydro + \$50 from Enbridge to total \$100 as an on-bill credit.</p>	Project Years	2016
	DSM Spending	\$10,376
	2021 Forecast	
	Partners	Toronto Hydro
	Partner Funding	\$50,000 Admin Support (+ customer rebates of \$50 per participant)
	EGI Funding	
"GTI" Utilization Technology Development ("UTD") Membership		
<p>Project Overview Development and testing of about 40 projects involving energy efficient end-use gas technologies. More than 50% of UTD's funding is attributed to energy efficiency projects.</p> <p>Value to Ratepayers Enbridge provides value to ratepayers by conducting this research, bringing the potential technologies to market, and holding back on those not yet able to perform consistently.</p>	Project Years	2019-2021
	DSM Spending	\$335,801
	2021 Forecast	\$151,000
	Partners	Approximately 20 other gas or combo gas and electric utilities, US DOE, California Energy Commission, NYSERDA & numerous manufacturers
	Partner Funding	\$5,700,000 US Plus >\$11,400,000 US
	EGI Funding	\$335,801

- b) Confirmed. “**Tests** are marginal changes to an existing program.”² and as such would be funded by the proposed program budgets.
- c) Not applicable, see part b).
- d) As stated in Exhibit E, Tab 4, Schedule 3, page 6 activities funded by the RIF will also include research required to more consistently and accurately estimate the natural gas savings generated through DSM program delivery.

Enbridge Gas conducts research on new and current Technical Reference Manual (“TRM”) measures in support of the Technical Reference Manual Maintenance and Update Process, as described in the EC’s November 2, 2017 document. As outlined in Exhibit C, Tab 1, Schedule 1, Section 8.5 of the Proposed Framework, this research is provided to the EC for their review and inclusion in the TRM.

In some cases, it may be appropriate to change the program delivery of a measure from a custom approach to a prescriptive midstream or downstream approach to facilitate more widespread participation. In these instances, Enbridge Gas would conduct research to determine an appropriate substantiation document for inclusion in the TRM.

In addition, Enbridge Gas conducts desktop and field measurement research to develop and maintain calculators and modelling tools to estimate natural gas savings for custom offers.

- e) In 2022 Enbridge Gas will continue to execute on pilot programs that are in-flight such as Hybrid heating, residential air sealing and Advanced BAS. At this point in time Enbridge Gas does not have a detailed list of proposed pilot programs it is considering for 2023 to 2027. Enbridge Gas anticipates that it would continue to pilot programs that support the early market adoption of low carbon technologies, test new collaboration with IESO and support the ongoing evolution of programs. Enbridge Gas proposes that any unused portion of the RIF budget would flow through the DSMVA (i.e. the budget will be ring-fenced).
- f)
 - i. Yes, see response to part d. Based on historical data Enbridge Gas anticipates spending an average of \$500,000 per year on TRM related research.
 - ii. Yes, see response to part d. Based on historical data Enbridge Gas anticipates spending an average of \$1,200,000 per year on Custom related research.

² EB-2021-0002, DSM Multi-year Plan and Framework Application (Updated September 29, 2021), Exhibit C, Tab1, Schedule 1, p. 20.

- iii. Enbridge Gas will also use RIF funds to investigate new “innovative program designs to address local DSM market needs.”³ Based on historical data Enbridge Gas anticipates spending an average of \$900,000 per year on Pilots.
- g) Please see response to part a). Collaboration is noted where applicable in project description.
- h) The proposed \$0.63M assigned to Market Data includes costs for the following data licenses and membership. All the information is available only for licensing and requires continual membership and fees.
1. Municipal Property Assessment Corporation: Data on building characteristics for our customer base, which includes age of the building, size, type, use of the property etc.
 2. Dun & Bradstreet Companies of Canada: Data on Industry Classification (SIC, NAICS) of our commercial and industrial customers to understand their customer segments
 3. Environics Analytics Group Ltd: Postal code level data on demographics, social values, personas and lifestyles etc.
 4. Utility Analytics Institute: Membership that enables learning and connecting with other utility data and analytics teams.

³ EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 4, Schedule 3, p. 5.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 11

Reference:

Exhibit E, Tab 4, Schedule 1, pp. 3-7

Question(s):

Enbridge Gas recommends the OEB direct OEB staff to coordinate the development of Ontario DSM evaluation protocols, and that the protocols would clarify what evaluation methodologies are used in Ontario, including those that determine net-to-gross ratios.

- a) Please file evaluation protocols from the jurisdictions noted that are closest to what Enbridge Gas is recommending for Ontario.
- b) Please explain whether overlap would exist between what Enbridge Gas is proposing for evaluation protocols and the multi-year EM&V Plans, produced by an expert Evaluation Contractor, that the OEB already publishes on its Evaluation webpage, and if/how Enbridge Gas would propose to address the overlap in order to avoid duplication of efforts.
- c) Please confirm whether Enbridge Gas has suggested alternative net-to-gross methodologies through its role in the OEB's Evaluation Advisory Committee, which includes reviewing and providing input on evaluation methodologies.

Response

- a) As per Exhibit E, Tab 4, Schedule 5, page 3,

Enbridge Gas is not requesting the adoption of evaluation protocols from other jurisdictions or program administrators. These evaluation protocols have been developed for purposes relevant to other jurisdictions, and in some cases for other fuel types that fundamentally differ from natural gas. Furthermore, Enbridge Gas is not suggesting that Ontario DSM evaluation protocols should necessarily follow the structure, content, and scope of evaluation protocols from other jurisdictions or program administrators. In some cases, these evaluation protocols may be

unnecessarily lengthy, and not focused on the critical issues that have the largest impacts on evaluation methodology effectiveness.

Instead, to be effective and efficient with ratepayer spending when developing and maintaining the Ontario DSM evaluation protocols, Enbridge Gas recommends a recurring three stage approach

which begins by identifying and selecting priority components.

As such, Enbridge Gas is not referring to specific evaluation protocols from other jurisdictions for the purpose of understanding which components should be included within Ontario DSM protocols. Enbridge Gas has referred to protocols from other jurisdictions only to identify that it is common practice for them to be developed.

Enbridge Gas is however suggesting that net-to-gross evaluation methodology should be one of the initial components of the protocols.¹

- b) Overlap would not exist. The EM&V Plan provides a list of specific evaluation studies that are being considered for execution (for example, net-to-gross studies and custom project savings verification studies). The deliverables for these studies are usually a final report on the outcomes of a utility DSM program from specific program year(s). The EM&V Plan development process does not include a consideration of appropriate evaluation methodologies. Generally, the EC will assume status-quo evaluation methodologies for the studies it lists in the EM&V Plan. These status-quo approaches may not be the most appropriate methodology, and at a minimum, should be assessed for appropriateness. For example, if a net-to-gross study were to be included in the EM&V Plan today, it would likely use the customer self-report evaluation methodology by default. Enbridge Gas has provided reasons why self-report may not be the best methodology,² and has provided evidence of other methodologies used in other jurisdictions³ that could be considered. However, without EM&V Protocols and only the EM&V Plan, there would be no consideration of appropriate evaluation methodologies for DSM in Ontario.

EM&V Protocols would not consist of a list of evaluation studies being considered to evaluate utility DSM programs. Instead, protocols would provide information about which evaluation methodologies are used in Ontario when conducting evaluation studies. Protocols would provide clarity on the evaluation methodologies used as well as a venue for continues improvement of the methodologies. Without protocols,

¹ EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 4, Schedule 5, pp. 5–7.

² Ibid, pp. 5–6; and Exhibit E, Tab 4, Schedule 5, Attachment 1.

³ Ibid, pp. 6–7, and Attachment 2.

it is difficult for Enbridge Gas, the OEB, or stakeholders to assess and ultimately improve DSM evaluation practices.⁴

- c) Confirmed. Comments and discussion on net-to-gross evaluation methodologies including alternatives to the approaches taken by the EC were provided during EAC comment periods for the 2015 custom NTG study, the 2018 custom NTG study and the 2017 prescriptive NTG study. In some cases, this has led to incremental improvements to study methodologies and approaches, however more fundamental improvements are not necessarily considered.

Both legacy utilities filed commentary on the approach taken for the 2015 NTG study in their respective 2015 Deferral and Variance Account Disposition Applications. For the Union rate zones filing, see EB-2017-0323, Exhibit A, Tab 2, pages 36-40. For the EGD rate zone filing, see EB-2017-0324, Exhibit A, Tab 1, Schedule 3.

As well both legacy utilities filed commentary on NTG approaches as part of their respective 2015-2020 DSM Mid-Term submissions.⁵

⁴ EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 4, Schedule 5, pp. 3-4.

⁵ EB-2017-0127, DSM Mid-Term Review – Part One Submission, Union Gas Limited (September 1, 2017), pp. 9-13; and EB-2017-0127 / EB-2017-0128, DSM Mid-Term Review – Comments, Enbridge Gas Distribution Inc. (September 1, 2017), pp. 18-24 and Appendix A.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Building Owners and Managers Association (BOMA)

Interrogatory

Issue 11

Reference:

EB-2021-0002, Exhibit E, Tab 4, Schedule 3, Page 2, Section 5

“The Company understands that it is a crucial time to move up the innovation adoption curve for energy efficiency technology, and Enbridge Gas believes it has a central role to play in advancing the research and innovation necessary to support energy transition through the ongoing evolution of energy efficiency technology.”

Question(s):

Will Enbridge adopt a more comprehensive R&D approach, working with other parties to address high impact knowledge gaps which can achieve the greatest carbon reductions as early as possible at the lowest life-cycle costs?

Given the urgency of the climate change challenge, is the proposed R&D funding level sufficient to enable Enbridge to play its full role?

Response

Enbridge Gas takes a comprehensive approach to support R&D activities. Specifically, Enbridge Gas supports collaborative R&D through the various stages of Technology Readiness Level (TRL) by working with various research organizations such as Gas Technology Institute and CGA's Natural Gas Innovative Fund to leverage its funding contribution.

Addressing high impact knowledge gaps is fundamental to good program design and is an objective of Enbridge Gas's R&D activities. Carbon reduction is an important consideration when identifying and prioritizing R&D opportunities but is not the sole determinant; compatibility with the DSM Framework and alignment with the priorities, goals and objectives of the OEB, including the prospect for cost effectiveness (in line with the primary objective of DSM) or providing opportunities to a broad range of ratepayers, among other things, must be given due consideration.

Enbridge Gas has proposed R&D funding levels that, to date, have been sufficient to support the activities necessary for the evolution of the Company's programs; this includes, as noted in evidence, the development of new measures through research, demonstration, and pilot programs. The proposed funding levels are consistent with historical budget levels with modest increases in line with the OEB's guidance. Furthermore, the funding levels are commensurate with the capacity of staff to oversee and execute research projects while providing flexibility through a single budget to respond to shifting program needs and opportunities.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 11

Reference:

Exhibit E, Tab 4, Schedule 3, page 2

Question(s):

For the period 2015-2021 please a description and cost for all activities funded by the Research, Pilot and Collaboration and Innovation Funds. Please indicate how these initiatives benefited the ratepayers. Please provide a complete list of the activities and related costs planned for the 2022-2027 period. If the full amount of these funds is not utilized does this flow through the DSMVA?

Response:

Please see response to Exhibit I.11.EGI.STAFF.82.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 11

Reference:

Exhibit C, Tab 1, Schedule 1, page 21

Preamble:

EGI evidence states: *“Pilots and tests could be included within Resource Acquisition and Market Transformation programs and are necessary to evolve the current portfolio of DSM programs.”*

We would like to understand EGI’s experience with pilot and tests in DSM.

Question(s):

Please provide examples of tests in the previous framework. Please describe what was learned.

Response

“Tests are marginal changes to an existing program. Tests may be changes to targeting, program criteria or incentive levels. Tests allow changes to be made without compromising or adding significant risk to the underlying program.”¹

Enbridge Gas has carried out numerous tests throughout the previous framework and has highlighted lessons learned from tests in annual reports.

Examples included but are not limited to:

¹ EB-2021-0002, DSM Multi-year Plan and Framework Application (Updated September 29, 2021), Exhibit C, Tab1, Schedule 1, p. 20.

Home Efficiency Rebate Offering Limited Time Offer

“To diversify the measure mix, Enbridge Gas launched two limited time offers (“LTO”). The purpose of the LTOs were to encouraged homeowners to think more about their entire home, beyond the furnace and air sealing, and to increase participation in attic insulation resulting in higher gas savings per home. The LTOs also enabled HVACs and insulators to work together, with homeowners, to support the goals of the offering.”²

The limited time offers available in the fall of 2019 were successful in generating enhanced uptake for attic insulation. The Company achieved a significant increase in attic insulation participation during the term of the limited time offer versus the same timeframe in 2018.

Custom Commercial Offering Limited Time Offer

“Limited time offers continue to drive increased results, by increasing the number of projects influenced during the customers’ typical budget planning cycle (i.e. prior to Q4). Early review of the incentive structure changes showed that it may not have drove additional participation from smaller customers. Enbridge Gas will continue to explore strategies to better support smaller customers.”³

Commercial/Industrial (“C/I”) Custom Offering Study Top-Up

“To motivate customers to implement recommendations from a previously incented study, Union offered an additional incentive once a resulting custom project was commissioned. Customers could receive funding for the remaining cost of the study, i.e. a 50% top-up on an engineering feasibility study (maximum of \$10,000) or a 34% top-up on a process improvement study (maximum of \$20,000). There was a limit of one top-up per study.”⁴

Affordable Housing Multi-Residential Offering Limited Time Offer

A LTO was provided to the Legacy Enbridge Gas Affordable Housing Multi-Residential customers to increase program participation early in the year. The make-up air (“MUA”) was specifically chosen as many housing providers were looking for opportunities to increase the air quality in their buildings due to COVID-19.

² EB-2021-0072, Enbridge Gas 2019 DSM Deferral and Variance Account Disposition Application (March 10, 2021), Exhibit A, Tab 4, Schedule 1, p. 30.

³ Ibid, p. 33.

⁴ EB-2020-0067, Enbridge Gas 2017/2018 DSM Deferral and Variance Account Disposition Application (July 17, 2020), Exhibit C, Tab 2, Schedule 1, p. 67.

Lessons Learned and outcomes:

- The LTO needs to be executed early in the year to assist with balancing out the usual year-end influx of projects
- Listen to your customers, analyze where common issues exist and address customer's needs. e.g., COVID related concerns for buildings
- Ensure that the incentive levels do not exceed the incremental cost of the project for both custom and prescriptive paths
- Leverage LTO to promote other Multi Residential incentives

For more information on past pilots see response to Exhibit I.11.EGI.STAFF.82a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 11

Reference:

Exhibit C, Tab 1, Schedule 1, page 21

Preamble:

EGI evidence states: *“Pilots and tests could be included within Resource Acquisition and Market Transformation programs and are necessary to evolve the current portfolio of DSM programs.”*

We would like to understand EGI’s experience with pilot and tests in DSM.

Question(s):

Please provide examples of pilots in the previous framework. Please describe what was implemented.

Response

Please see response to Exhibit I.11.EGI.STAFF.82a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 11

Reference:

Research and Innovation Fund

Question(s):

- a) Please provide a list of outcomes from the 2015 to 2020 research and innovation spending outcomes that have been reflected as enhancement in the 2023-2027 plan.
- b) How does Enbridge propose to demonstrate value for money for each year of research and innovation fund spending from 2023-2027?

Response:

- a) Enhancements in the 2023-2027 plan that are based on prior years research and innovation spending include the following:
 - o New programs/offers:
 - Prescriptive Midstream
 - Whole Building P4P
 - Low Carbon Transition
 - o Collaborations:
 - Please see EB-2021-0002, Exhibit E, Tab 4, Schedule 4, page 2 of 6
 - o New measures, include but aren't limited too:
 - Gas Heat Pumps
 - Hybrid Heating
 - Prescriptive Food Service

For a detailed list of 2015 to 2020 spending, please see response to Exhibit I.11.EGI.STAFF.82a.

- b) Please see response to Exhibit I.11.EGI.STAFF.82e.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 11

Question(s):

Please provide a summary table showing the budget and actual spending by years for each year from 2015 to 2020 for the following:

- Portfolio Administration
- Evaluation
- Research & Development

Response:

Table 1: 2015-2020 Budget – Selected Items

	2015	2016	2017	2018	2019	2020
<i>Portfolio Administration¹</i>	\$2,713,006	\$8,935,000	\$3,842,000	\$3,842,000	\$3,842,000	\$3,842,000
<i>Evaluation</i>	\$1,222,797	\$3,892,948	\$4,245,835	\$4,408,768	\$4,464,548	\$4,520,056
<i>Research & Development</i>	\$1,829,796	\$3,000,000	\$2,500,000	\$2,500,000	\$2,521,616	\$2,543,663

¹Category includes Portfolio Administration and DSM IT System Development costs, to align with 2023-2027 presentation.

Please see response to Exhibit I.6.EGI.STAFF.13f for 2015-2020 actual spending for the categories requested.