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December 1, 2021

Ms. Christine E. Long
Registrar
Ontario Energy Board
2300 Yonge Street, 27th Floor
Toronto, ON M4P 1E4
Registrar@oeb.ca

Dear Ms. Long:

**Re: Small Business Utility Alliance (SBUA) – Expert Evidence from Green Energy
Economics Group
Enbridge Gas Inc. – Multi Year Demand Side Management Plan (2022-2027)
EB-2021-0002**

In accordance with Procedural Order No. 5 in this matter, please find attached the expert report of Green Energy Economics Group, dated today and prepared by Mr. Francis Wyatt and Mr. Theodore Love.

Yours truly,

Myriam Seers

Attach.

cc. James Birkelund
Enbridge Gas Inc.
Intervenors in EB-2021-0002

FORM A

Proceeding: EB-2021-0002

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is Francis Wyatt (name). I live at Cuttingsville (city), in the Vermont (province/state) of United States .
2. I have been engaged by or on behalf of SBUA (name of party/parties) to provide evidence in relation to the above-noted proceeding before the Ontario Energy Board.
3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:
 - (a) to provide opinion evidence that is fair, objective and non-partisan;
 - (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and
 - (c) to provide such additional assistance as the Board may reasonably require, to determine a matter in issue.
4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date December 1, 2021

Francis Wyatt

Digitally signed by Francis Wyatt
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Date: 2021.12.01 15:14:18 -05'00'

Signature

FORM A

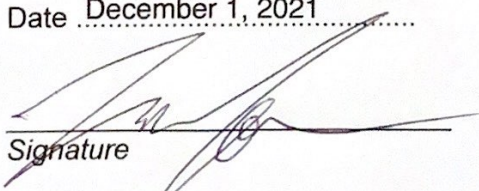
Proceeding: EB-2021-0002.....

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is Theodore Love.....(name). I live at Lincoln..... (city), in the Vermont..... (province/state) of United States.....
2. I have been engaged by or on behalf of SBUA..... (name of party/parties) to provide evidence in relation to the above-noted proceeding before the Ontario Energy Board.
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4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date December 1, 2021.....

Signature



Evidence on behalf of the Small Business Utility Alliance

Enbridge Multi Year Demand Side Management Plan (2023-2027) EB-2021-0002



December 1, 2021

Acknowledgements

The work described in this study was supported by the Small Business Utility Alliance.

All opinions, errors and omissions remain the responsibility of the authors. All reference URLs were accurate as of the date of publication.

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I EXECUTIVE SUMMARY

Green Energy Economics Group, Inc., (GEEG) is a Vermont-based energy consultancy specializing in energy-efficiency and renewable resource portfolios investing in electricity and gas savings. Founded in 2005, GEEG provides technical and strategic assistance as well as expert testimony on gas and electric energy-efficiency portfolio development, design, analysis, planning, and administration. We have a specialization in cost-effectiveness analysis and deep dives into program data. We have worked in over a dozen states, two Canadian Provinces, and China.

GEEG has been retained by the Small Business Utility Alliance (SBUA), an unincorporated organization consisting of a group of small businesses ratepayers in Ontario, to provide this evidence. GEEG was instructed by Myriam Seers of Savoie Laporte LLP to prepare this report commenting on Enbridge's evidence from the perspective of its impact on small businesses in Ontario. GEEG has reviewed Enbridge's DSM plan and interrogatory responses.

Small businesses are the backbone of the Canadian economy making up the vast majority of business entities and employing 68.8% of the labor force. Energy efficiency is extremely important to support the continued success and growth of Ontario's small businesses. It helps them lower operational expenses and supports the creation of many jobs and opportunities for existing organizations in a growing field. Ultimately, good energy efficiency program design can address equity issues and build a stronger and more inclusive economy.

There are many barriers to small business participation in DSM programs, including time and money constraints and lack of awareness. While Enbridge's DSM Plan has some elements that help address these barriers, such as moving incentives to the midstream and a commercial and industrial direct install program, there are many ways to improve these offerings. Below is a summary of the recommendations provided to improve Enbridge's ability to reach small businesses through its 2023 to 2027 DSM offerings:

1. Offer a wider array of measures and provide as streamlined a way as possible for small business customers to access them.
2. Follow Massachusetts' lead by offering a "turnkey" pathway for small business customers to seamlessly participate in a direct install program followed up by a custom measure package.
3. Prescriptive Programs
 - a. Offer all typically cost-effective measures as prescriptive measures, with incentives that cover most of the incremental measure costs, including residential type equipment.
4. Direct Install
 - a. Allow small businesses to participate in DSM programs more than once. Do not limit participation in DSM programs if previously participated in a DSM program.
 - b. Include additional direct install measures such as adaptive thermostats, boiler tune-ups, and water heating measures.
5. Custom Program

- a. Create a comprehensive custom program component tailored for small businesses that is fed in from the Direct Install program.
 - b. Offer an assessment to identify all cost-effect efficiency measures for a building.
 - c. Provide incentives for all the identified efficiency measures that cover most of the incremental measure costs.
6. Coordinate with IESO CDM when performing energy assessments for commercial buildings to treat the building as a whole and identify natural gas and electric savings opportunities at the same time.
7. Designing efficiency programs that focus on small businesses will also help indigenous businesses.
8. Reduce the potential dollar amount eligible for shareholder incentives.
9. Base the shareholder incentives on lifetime natural gas savings, rather than annual natural gas savings.
10. Promote a fuel-neutral approach in the Low Carbon Transition Program that includes electric technologies and maximizes carbon reductions.
11. Provide annual reporting on small business DSM spending, participation, and natural gas savings.
12. Notify small business stakeholders in advance of commercial program changes.

This evidence has been prepared by Theodore Love and Francis Wyatt with research assistance from Walden Kiker. Mr. Wyatt is a civil engineer with over 29 years of experience in the energy efficiency field, during which he has reviewed, critiqued, analyzed and assisted with electric, gas and other fuels demand- side management program planning, design and implementation. He has particular expertise in the commercial and industrial sectors and cost-effectiveness screening and model development. He has developed several technical reference manuals for gas and electric savings. He has played key roles in developing several efficiency and renewable economically achievable potential studies. Mr. Wyatt has collected, analyzed, and compared the DSM spending and savings by sector from many jurisdictions over the last 29 years. His curriculum vitae has been included as Attachment 1.

Mr. Love is also an expert in energy efficiency who specializes in providing economic-based insights into the design, analysis and implementation of energy efficiency and distributed energy resource programs. He has been involved in the review of energy efficiency and conservation portfolio plans and results across the United States and Canada and has authored a number of papers on program design and forecasting and have assisted with multiple energy efficiency potential studies in the Mid-Atlantic area. In addition, he serves as a co-chair on the Association of Energy Service Professional's ("AESP") Gas Topic Committee, through which I help guide discussion of natural gas energy efficiency related topics for AESP's members across North America. Mr. Love's full curriculum vitae is included as Attachment 2.

Mr. Kiker has a master's degree in International Environmental Policy from Middlebury College and assists GEEG with research on energy efficiency and conservation programs.

II BACKGROUND

II.A Overview of SBUA

Small Business Utility Alliance is an unincorporated organization consisting of a group of small businesses ratepayers in Ontario, Canada, with members located across various geographic areas, including in the Cities of Toronto and Ottawa, the Counties of Chatham-Kent, Wellington, Muskoka, Brant, Suffolk, and Norfolk, and the Niagara area. The specific purpose of the organization is to represent, protect, and promote the interests of small businesses as utility customers of electric, natural gas, water, and telecommunications services before administrative and regulatory bodies on utility and energy matters.

The organization's core mission is to ensure fair and reasonable energy costs for small business ratepayers, promote utility programs that help small businesses, support Ontario's progressive energy and climate change plans, and expand the options for small businesses to participate in clean energy, distributed energy, demand response, and other utility initiatives.

The organization was formed because small businesses have been historically underrepresented in utility matters, despite being an important customer group for utility companies and vital segment of the economy. Small business ratepayers help fund utility programs and should be encouraged to participate in the regulatory process that sets up these programs as an important stakeholder group. Small business ratepayers also have unique needs and concerns. The interests of small business customers often diverge from residential ratepayers and larger businesses on utility and energy matters, including related to rate design, revenue allocation, cost allocations between customer classes, and the designs and expenditures for utility programs. Despite the importance of this class of customers in OEB proceedings, because they usually cannot afford their own representation, most small businesses are unable to participate.

SBUA aims to address this problem by providing a mechanism and increasing the capacity for small business ratepayers to shape regulatory decisions and make their voices heard. In this process, SBUA also can hold the regulatory authorities and utilities accountable to this important ratepayer class and ensure equitable utility costs, rate design, and allocation of utility resources.

The alliance has over 50 small business members from Ontario, Canada; however, SBUA's Constitution directs its advocacy to matters that benefit the community of small business ratepayers as a whole. SBUA, therefore, does not represent the direct financial interests of any individual small business or member. If SBUA prevails in its advocacy related to utility programs, costs or otherwise, the benefits to small businesses will be dispersed across all ratepayers in the relative classes.

SBUA has a charitable purpose with any profits and assets being used solely to advance the organizations objects. No profits or assets belong to members. The types of programs and activities that SBUA carries out consist primarily of outreach and education of small business,

whereby SBUA seeks a two-way exchange of information about utility issues and opportunities for small businesses as a community to benefit from a voice in regulatory utility proceedings. In addition, SBUA has engaged in research and volunteer projects with University of Toronto students, and the organization has spent significant time and resources securing a litigation and expert team to participate on SBUA's behalf in the OEB proceedings.

II.B Definition of Small Business

While we do not provide a strict definition for what comprises a “small business”, we generally accept that Enbridge's definition for small commercial customers, those customers using less than 100,000 m³ of natural gas per year generally covers this group of customers. However, it falls short of fully addressing the many factors that go into the concept of a small business, which goes beyond the volume of energy usage. Small businesses should be examined more holistically through other factors such as number of employees, annual revenue, ownership structure and type of business. When looking to target these types of customers, we highly recommend that Enbridge goes beyond the 100,000 m³ cap approach, which we believe also covers medium sized customers¹, and include other metrics when targeting these customers for marketing, outreach, and reporting. Some working examples for small businesses include:

- Less than 100 full time employees²
- Less than \$50 million in annual revenue³

In addition, we are particularly concerned with how the smallest of commercial customers will be impacted by the DSM plan. We specify the term “microbusiness” to cover these types of businesses, such as a yoga studio or small law office. Microbusiness tend to employ less than 10 employees and they make up 73% of all businesses in Canada (ISED 2020). In our experience, these customers have been left the furthest behind by energy efficiency. While determining the number of employees a business has may be difficult for an administrator as part of its energy efficiency activity, we recommend that Enbridge utilize the definition taken up by Mass Save of a microbusiness being a nonresidential customer that uses less than 8,000 therms, which roughly rounds to 25,000 m³ per year (Mass Save 2021).

¹ For example, this roughly translates to 40,000 therms which is around the cap that Southern California Gas uses for their medium sized businesses.

² This is the definition used by Innovation, Science and Economic Development Canada (ISED 2020)

³ This aligns with the maximum revenue of \$38 million USD per year used by the United States Small Business Administration converted to CAD using a conversion rate of 0.76 CAD/USD

II.C Purpose of Evidence

The goal of this evidence is to identify and provide recommendations on overcoming challenges to participation from small and micro businesses under Enbridge's 2023 to 2027 proposed demand side management (DSM) programs. In addition, small businesses are traditionally underserved by DSM programs and this evidence will show this holds true for Enbridge and ways to address this through improvements to program design.

III ISSUE 2 – DSM PLAN SUPPORT FOR ONTARIO POLICIES

Issue 2: Does Enbridge Gas's 2023-2027 DSM Framework and DSM Plan adequately support energy conservation and energy efficiency in accordance with the policies of the Government of Ontario, including having regard to consumers' economic circumstances?

The success of small business customers is extremely important to the success of Ontario. Enbridge's DSM Plan has some elements in it that support small business, but does not go far enough to further the goals of the Government of Ontario.

Small businesses are the backbone of the Canadian economy and employ 68.8% of the labor force. More than half of Canada's small employer businesses are concentrated in Ontario and Quebec (440,306 and 249,685, respectively).⁴ Small businesses with 1-99 employees represent nearly 98% of all businesses in Ontario, and 88% of Ontarians are employed by SMEs (companies with fewer than 500 employees).⁵ On average, from 2012 to 2016, the contribution of small businesses to the Canadian GDP was 41.0 percent, the contribution of medium-sized businesses was 12.8 percent, and the contribution of large businesses was 46.2 percent. In other words, SMEs accounted for more than 50 percent of the value added to the country's output.⁶

The COVID-19 pandemic had severe impacts on small businesses across Canada and in Ontario especially. Across Canada 47% of small businesses with 5 to 19 employees that laid off at least one employee, laid off 80% or more of their staff.⁷ 68% of small businesses witnessed a decrease in revenue by 10% or more, and nearly one quarter of small businesses were unable to stay fully or partially open during the pandemic. Small businesses are also extremely prevalent among First Nations communities. 99% of the 43,305 First Nation businesses in Canada are small businesses and 24% are in Ontario. Indigenous people are creating businesses at nine times the rate of non-indigenous Canadians, highlighting the importance of bolstering small businesses during the pandemic recovery.

⁴ https://www.ic.gc.ca/eic/site/061.nsf/eng/h_03126.html#4.2

⁵ <https://occ.ca/wp-content/uploads/SME-Report-June22.pdf>

⁶ https://www.ic.gc.ca/eic/site/061.nsf/eng/h_03126.html#4.2

⁷ <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00018-eng.htm>

Natural gas provides roughly 15% of the electricity generated within the province serving approximately 3.5 million residential, commercial, and industrial customers in Ontario.⁸ In 2018 Canada consumed an average of 11.2 Bcf/d of natural gas. The largest consumers of natural gas were Alberta at 6.2 Bcf/d, followed by Ontario and B.C. at 2.7 Bcf/d and 0.7 Bcf/d, respectively.⁹ Canada's GHG emissions from power generation declined 43% between 2000 and 2017. Much of this reduction came from Ontario's phase-out of coal-fired generation. Between 2000 and 2017, Ontario's GHG emissions from electricity declined from 43.4 MT CO₂e to 2.0 MT.¹⁰

Canada's largest consuming sector for natural gas was the industrial sector, which consumed 7.8 Bcf/d in 2018. The residential and commercial sectors consumed 1.9 Bcf/d and 1.5 Bcf/d, respectively. Total energy consumption for small commercial customers in early 2021 was the lowest in four years.¹¹ Consumption declined due to the province-wide stay-at-home order.

Ontario recognizes the importance of small business to a thriving future and has developed five policy pillars to help with both the recovery from COVID and future growth¹²:

1. **Lowering Costs** - Reducing costly red tape, streamlining processes and putting more government services online, so small businesses can spend less time filling out forms and more time reaching their goals.
2. **Increasing Exports** - Finding new opportunities for small businesses to access domestic and international markets, so they can grow and create jobs.
3. **Accelerating technology adoption** - Helping small businesses create a strong online presence — while promoting the development, adoption, and commercialization of new technologies — so they can become more competitive.
4. **Developing talent** - Improving access to talent and retention, so small businesses can grow and develop a stronger talent pool for the future.
5. **Encouraging entrepreneurship, succession planning, and diversity** - Supporting the next generation of entrepreneurs and diverse business leaders to build a stronger, more

⁸ <https://activebusinessservices.com/electricity-rates-ontario/>

⁹ <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-canada.html>

¹⁰ <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-canada.html>

¹¹ <https://www.ieso.ca/en/Sector-Participants/Smart-Metering-Entity/Consumption-Data>

¹² <https://www.ontario.ca/page/ontarios-small-business-strategy>

inclusive economy — one that includes greater representation from women, Indigenous peoples, people from racialized communities, and people with disabilities.

Energy efficiency, as promoted through the Enbridge's proposed DSM plan, is a crucial piece of the puzzle for all five of the Ontario's small business pillars. It helps Ontario's small businesses lower operational expenses. The new green economy is a fast-growing field that supports the creation of many jobs and opportunities for existing organizations. DSM programs provide direct incentives to help small businesses adopt new technology. Work force development for trades relevant to building energy usage is vital. Finally, good DSM program design can address equity issues and build a stronger and more inclusive economy.

Given the importance of small business to both the economic activity and energy usage in Ontario and Canada, we believe that Enbridge has not designed a portfolio of DSM programs that adequately addresses the unique economic circumstances of small businesses. Many savings opportunities have been omitted by limiting the number of eligible measures and incentive levels for small businesses are too low to adequately address the first cost barrier.

IV ISSUE 3 – CONSISTENCY WITH BEST PRACTICES

Issue 3: Is Enbridge Gas's 2023-2027 DSM plan consistent with energy conservation industry best practices in Ontario and other relevant Canadian and U.S. jurisdictions?

Enbridge provides several program design elements that are consistent with best practices for reaching small customers, including providing a direct install program and bringing incentives midstream. On balance, we believe these efforts do not fully address the barriers that exist to participation in DSM programs by small and microbusinesses. Enbridge should utilize lessons learned from places like Massachusetts to further improve their program design and provide more equitable and successful results.

IV.A Barriers to Participation

In his 2016 report for the American Council for an Energy Efficient Economy (ACEEE) on best practices for small commercial DSM programs, Mr. Nowak identifies the following barriers to participation from these customers (p. 6 – 7).

Table 1. Barriers to Participation by Small Commercial Customers

#	Barrier	Description
1	Organization Size	These enterprises do not have the staff, such as facility managers, to oversee their energy use and make all the efficiency upgrades they might want to undertake.
2	Time and Money Constraints	Business owners require short payback times achieved with minimal time commitment on their part. They are busy running their operations and have other, higher priorities. They lack the time, capital, and cash flow to invest in many energy efficiency measures. Many energy efficiency measures require capital improvements in building equipment and systems, which may have long payback periods. Small businesses typically operate on thin margins and cannot make such long-term investments.
3	Lack of Awareness	Many small business owners are not aware of the benefits of energy efficiency or lack sufficient knowledge of how to take advantage of programs. Unless programs can target and personalize their outreach and marketing to gain the attention of small commercial customers, it can be a challenge to enhance customer understanding of program benefits and processes.

#	Barrier	Description
4	Split incentives	A very high percentage of small businesses lease space, and many leases are short term. Consequently, while tenants are responsible for paying utility costs, they are not generally in control of the building energy systems (HVAC, building envelope, etc.) and see no reason to invest in the landlord's building.
5	Relatively Small Energy Bills	Thus, a relatively small dollar saving potential. As noted above, energy is just one of myriad responsibilities facing the small business owner. Many believe that the modest dollar savings they could expect is simply not worth the effort.
6	Perceived Disruption Potential	Business owners sometimes fear that the retrofit process will disrupt ongoing business or that changes will not be well received by employees or customers.

Nowak (2016) also identifies a number of other barriers for small commercial customer participation specifically in natural gas programs. These include the smaller opportunities for gas savings compared to electric savings, size and complexity of higher saving gas measures, expertise of auditors in identifying gas savings, and the challenge of integrating delivery between single fuel utilities.

We believe these barriers are as high as ever and that Enbridge should take steps to address them in the design of its DSM programs.

IV.B Overview of Best Practices

Nowak (2016) provides the following recommendations for addressing the previously identified barriers to small commercial program success.

Table 2. Best Practices to Reach Small Commercial Customers

#	Barrier	Description
1	Provide Streamlined Installation and Lighting Measures	Use direct install or another program delivery method that makes participation simple, easy, and convenient. Employing preferred or contracted vendors also reduces costs through volume replication of similar installations. Lighting delivers cost-effective savings through a small set of efficiency measures to a variety of businesses in most industries and customer subsegments.

#	Barrier	Description
2	Segment the Market	Classify the small business customer base into subsegments with common characteristics and energy needs, and then offer customized approaches tailored to each in order to improve participation, customer satisfaction, and depth of savings. Design program structure and services (measures, incentive levels, and delivery pathways) appropriate to each customer type.
3	Tailor and Target Marketing and Communications to Customer Needs	In concert with segmentation, craft marketing messages for each industry subsector and present them in a customized, personalized way. Generic messages may not be perceived as relevant. Use customer and market data analytics to segment and target potential high-savings customers in order to increase participation and reduce marketing cost per business.
4	Offer Financing to Encourage Comprehensive Retrofits and Deeper Savings	Address the up-front cost barrier and provide needed project funds by offering loans to program participants. We found a high correlation between the largest, best-performing small business programs and those that offer financing, especially on-bill financing and on-bill repayment. The highest correlation was with programs that offer 0% financing. Participation drops off dramatically when any interest rate at all is charged. Zero-interest loans avoid numerous lending and credit law entanglements as, technically, these are not loans at all, but rather scheduled payments of the customer's copay over time. Pairing convenient low- or no-interest financing with high measure rebates can reduce customers' share of project costs and provide them with an instant positive cash flow. This can be important for businesses with low profit margins and high energy use.
5	Offer a Wide Set of Eligible Measures	For many industry segments, lighting is not the greatest user of energy, and for some it is less than one-quarter of the total. Deep savings are not possible unless programs offer non-lighting measures. Many programs offer programmable thermostats, refrigeration, and natural gas saving measures that are a natural fit for the direct install model. Effective advance market segmentation research will reveal appropriate measure packages by customer type.

#	Barrier	Description
6	Provide Dedicated Project Process Managers	Expand program participation by providing direct technical assistance and support on energy efficiency, perhaps in collaboration with local organizations. Conducting energy assessments and walking customers through the program and measure installation process can help reach underserved market segments.
7	Establish Partnerships	Chambers of commerce, small business advocacy organizations, and community groups can provide access to more commercial customers and engage them as trusted local partners in ways that utilities on their own generally cannot. This paves the way for increased program awareness and participation.

Enbridge's 2023 – 2027 Plan addresses some of these best practices but falls short in many areas, as discussed more specifically in other sections. In particular, Enbridge could improve the direct installation of measures in the commercial and industrial direct install offering, offer a broader offering of prescriptive commercial measures, target more specific small and microbusiness market segments, and ramp up partnership activity, especially with programs offering electric measures.

IV.C Top Performing Jurisdictions

In order to supplement the findings from Nowak (2016) and provide more recent results, we examined the current small business-related practices from the leading jurisdictions in the United States and Canada. The following tables show the five top states as ranked by net gas savings as a percentage of residential and commercial sales from the 2019 and 2018 ACEEE Scorecard compared to the same year's results from Enbridge.

Table 3. Top States by Gas Savings as a Percent of Sales (2019)

Order	State / Admin	% of Commercial and Residential Retail Sales ¹	CAD\$ / m ³	2019 Gas Spending (CAD\$ million)	2019 Net Incremental Gas Savings (Million m ³)
1	California	1.05%	\$2.17	511.5	235.4
2	Massachusetts	0.91%	\$3.90	370.9	95.1
3	Rhode Island	0.91%	\$2.81	39.9	14.2
4	Michigan	0.90%	\$0.79	127.4	162.0
5	Minnesota	0.84%	\$1.09	87.2	80.1
	Enbridge	0.73%	\$1.20	138.4	115.7

Table 4. Top States by Gas Savings as a Percent of Sales (2018)

Order	State / Admin	% of Commercial and Residential Retail Sales	CAD\$ / m ³	2018 Gas Spending (CAD\$ million)	2018 Net Incremental Gas Savings (Million m ³)
1	Michigan	1.47%	\$0.53	125.8	238
2	Minnesota	1.20%	\$0.75	75.3	101
3	Rhode Island	1.17%	\$2.27	35.2	16
4	Massachusetts	1.12%	\$2.98	323.0	108
5	California	1.01%	\$2.07	463.7	224
	Enbridge	0.69%	\$1.25	135.3	108

All five states were the same for 2019 and 2018, and all achieved around 1 percent savings as a percent of sales. Given the difference in climate and heating load between California and Ontario, we feel that it does not make for as ready a comparison, while the other four states, Massachusetts, Rhode Island, Michigan, and Minnesota, all provide good comparable jurisdictions for comparing results and best practices.

For comparison, Enbridge is planning on acquiring savings as percent of general service sales from 0.68% in 2023 to 0.72% in 2027, values similar to what they acquired in 2018 and 2019. With costs that are on the low-end of those from other jurisdictions.

IV.D Comparison of Commercial and Small Business Offerings

We have reviewed annual reports for the previously identified jurisdictions and provided the following comparison matrix of program offerings from Enbridge with those offered by the leading jurisdictions. As well as a description of the ways in which the portfolios address small business customers.

Table 5. Comparison of Program Components

State	Administrator	Downstream Prescriptive	Midstream Prescriptive	Custom	Direct Install
MA	Mass Save	Yes	Yes	Yes	Yes
RI	NationalGrid	Yes	Yes	Yes	Yes
MI	Consumers Energy	Yes	No	Yes	Yes
MI	DTE	Yes	Yes	Yes	Yes
MI	SEMCO	Yes	No	Yes	No
MN	CenterPoint	Yes	No	Yes	Yes
MN	MERC	Yes	No	Yes	Yes

State	Administrator	Downstream Prescriptive	Midstream Prescriptive	Custom	Direct Install
MN	Xcel	Yes	No	Yes	Yes
BC	FortisBC	Yes	No	Yes	Yes

In the overall types of programs that it is offering, Enbridge has provided a framework that is similar to leading jurisdictions. However, when we look to see the ways in which these programs are meeting the needs of small businesses, we start to see differences between Enbridge and other leading program administrators.

IV.D.1 Massachusetts

Massachusetts offers a statewide suite of programs, Mass Save. The main way that Mass Save addresses small business customers is through the “turnkey pathway”. This is a program pathway under their Existing Building Program that is exclusively for eligible small business customers (defined as having annual usage of under 1.5 million kWh and/or 40,000 therms). The Turnkey pathway includes a free energy assessment, the direct-install services of gas and electric measures provided by PA-contracted lead vendors, and up to a 100% incentive for additional measures. The most recent Three-Year Plan (Mass Save 2021) includes many different highlights around strategies on how to address equity issues and barriers to small and micro business customers participating in energy efficiency programs. The Mass Save Three Year Plan is a leading example on how to undertake program design to reach small commercial customers and Enbridge should follow Massachusetts’ lead in the development of its small business direct install offerings.

IV.D.2 Michigan

The three largest natural gas utilities in Michigan have different approaches to serving small businesses. Consumers Energy’s Small Business Program targets small business customers who are less likely to participate in other program offerings. The program offers highly discounted services for direct installation of efficient lighting, free assessments, and other low-cost energy-saving measures.

DTE Energy (DTE) offers the C&I Small Business Platform, which provides small business customers with a path to energy savings and a means to begin their energy efficiency journey. This platform includes the Business Energy Consultation program which provides a walkthrough assessment, engagement with trade allies, and the direct installation of measures including smart thermostats and LED bulbs. This seems to include a more tailored engagement strategy than Consumer’s program.

In 2020, SEMCO began to develop strategies to engage small- to medium-sized customers and trade allies in the its C&I Program. During the 2020 program year, 57 percent of customer participation came from small-to-medium businesses. With the increased focus on smaller

business customers, the program continued with a dedicated small business energy advisor and offered a subsidized low-interest loan program to small-medium business customers in partnership with Michigan Saves.

Similar to Massachusetts, Michigan seems to be finding success with a highly targeted direct install program with lots of assessments offered at no cost and, for SEMCO, a financing option.

IV.D.3 Minnesota

The three largest utilities in Minnesota that make up the vast majority of the state's gas sales volume are CenterPoint, Minnesota Energy Resource Company (MERC), and Xcel Energy (Xcel). The 2021 through 2023 Triennial Conservation Improvement (CIP) are approved with some small modifications ongoing. Unlike Massachusetts and Michigan, the gas utilities in Minnesota do not have as clearly established small business energy efficiency programs. MERC offers the Commercial Sector Support Program which includes small business assessments with direct install measures. Xcel specifically targets its Business Energy Assessments, Refrigeration Rebate and Outreach and Education programs to small businesses as well as support for a streamlined ASHRAE Level 1 audit. CenterPoint has no specific small business offerings outlined in their current offerings or program plans, but they do offer a broad array of prescriptive commercial measures.

IV.D.4 FortisBC

To provide a comparison with a large Canadian gas DSM program administrator, we examined FortisBC's approach to small commercial customers. FortisBC is planning on more than doubling their C&I sector spending from 2018 levels of \$13.3 million to \$28.3 million by 2022. This is accompanied by a corresponding growth in savings for the C&I sector, with savings going from 6.0 m³ in 2018 to a projected 21.6 m³ in 2022. These large gains are even after FortisBC has cut its 2021 and 2022 forecast for commercial program activity (Fortis BC 2021). This contrasts with Enbridge holding spending flat to slightly up for the C&I sector as a whole and only slightly increase savings.

The main way that FortisBC works with small businesses is through the Commercial Energy Assessment Program. This program identifies inefficiencies at the participant's facilities via an on-site walkthrough assessment by an energy-efficiency consultant. The consultant then produces a report that describes the observed inefficiencies, outlines proposed solutions, and identifies any applicable incentive programs. FortisBC then forwards the report to the participant. Simple measures, such as low-flow faucet aerators and pre-rinse spray valves, are provided to the participant at no charge. This program is similar to Enbridge's C&I Direct Install offering but includes a more comprehensive audit, additional direct install measures, and a more tailored approach to achieving additional energy savings.

FortisBC has also had success engaging with smaller customers by offering a very broad array of prescriptive measures. Some examples include one and two stage unit heaters for poultry farms and thermal curtains for greenhouses (FortisBC 2020).

IV.E Recommendations

- Offer a wider array of measures and provide as streamlined a way as possible for small business customers to access them.
- Follow Massachusetts' lead by offering a "turnkey" pathway for small business customers to seamlessly participate in a direct install program followed up by a custom measure package.

V ISSUE 10 – OPTIMAL PROGRAM DESIGN

Issue10: Has Enbridge Gas proposed an optimal suite of program offerings that will maximize natural gas savings and provide the best value for rate payer funding?

Enbridge has not provided an optimal suite of program offerings as it relates to small business customers. Enbridge has included the main avenues for intervention including a prescriptive pathway, custom pathway, and direct install pathway, but each of these offerings requires modifications and updates to maximize natural gas savings for small and microbusiness. The prescriptive measure list is too restrictive and does not include many measures that would help a large percentage of small businesses, such as adaptive thermostats. Similarly, the list of measures offered by the direct install program is very limited and should be expanded. The restriction on participation for the direct install program to customers who have not participated in any other program for three years may dissuade many small business customers who otherwise would have been interested in going deeper with their energy savings from participating. Finally, the custom program should have a pathway tailored to the needs of small business, including outreach targeted at specific industries and higher incentives.

V.A Commercial and Industrial (C&I) Overview

The following two graphs illustrate Enbridge historical and planned spending and savings on commercial and industrial DSM programs, with the Commercial Total line excluding industrial.

Figure 1. Enbridge's Commercial and Industrial Program Spending Over Time

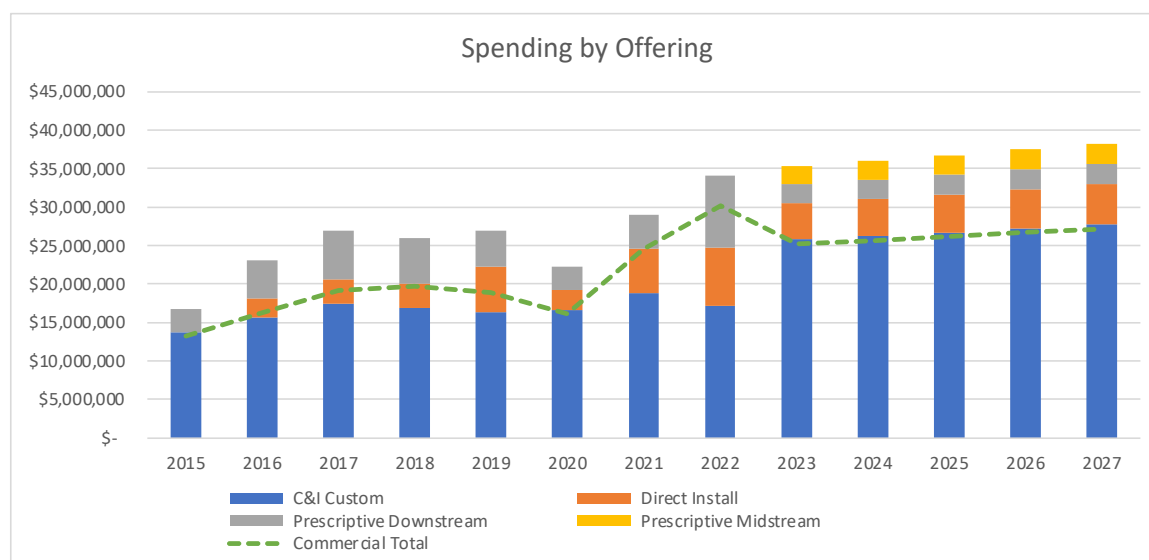
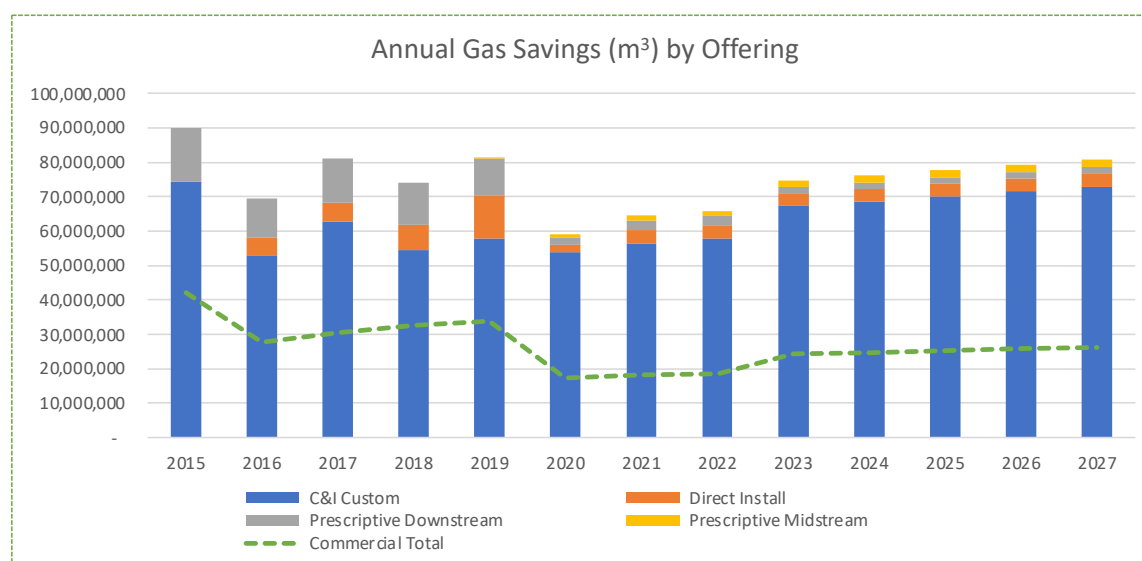


Figure 2. Enbridge's Commercial and Industrial Program Savings Over Time



Planned spending on commercial offerings increase slightly from historical spending, but savings remain flat and never reach the historical savings from 2015 to 2019. The one program that does show an increase in planned spending and savings is the C&I Custom Offering. This graph shows that any growth in savings for the C&I programs comes from the industrial customers, given that the majority of savings come from industrial customers in the C&I Custom offering. In fact, the savings and spending for commercial customers are flat to down from historical levels.

In its DSM Plan, Enbridge recognizes the additional barriers that small commercial customers face and has made some attempts to specifically address small commercial customers, but has failed to design programs that will likely increase participation of small commercial customers to any significant degree.

V.B Comparison to Residential Offerings

Small commercial customers face many of the same barriers to efficient measure adoption as residential customers. This may include a lack of capital for the initial equipment purchase, insufficient staff resources and expertise to research the higher efficiency options. Many small businesses also have buildings of a similar size to residential and utilize residential type equipment for space, water heating, and controls. Given this, small commercial customers should have access to offerings and incentives that are available to residential customers. The residential offerings proposed by Enbridge will not be available for small commercial customers participation. The residential offerings include custom whole home treatment, adaptive thermostats, and shell measures including air sealing and insulation.

Therefore, small commercial customers should be eligible to participate in the residential offerings which include incentives for whole building, shell measures and adaptive thermostats that would likely be appropriate for small businesses. Many small commercial customers do not

have building types that are applicable to the few measures that are eligible in the Direct Install Offering. For example, many small businesses do not have loading docks or shipping doors to benefit from dock door seals or air curtains for shipping doors.

V.C Prescriptive Programs

Prescriptive programs intervene at the time of equipment replacement and represent a lost opportunity if the purchaser is not convinced to choose the more efficient option. The following figures show the historical and planned spending and savings on the Commercial Prescriptive Offerings. These graphs include the midstream and downstream offerings together to make them more comparable over the long term.

Figure 3. Enbridge's C&I Prescriptive Offerings Spending Over Time

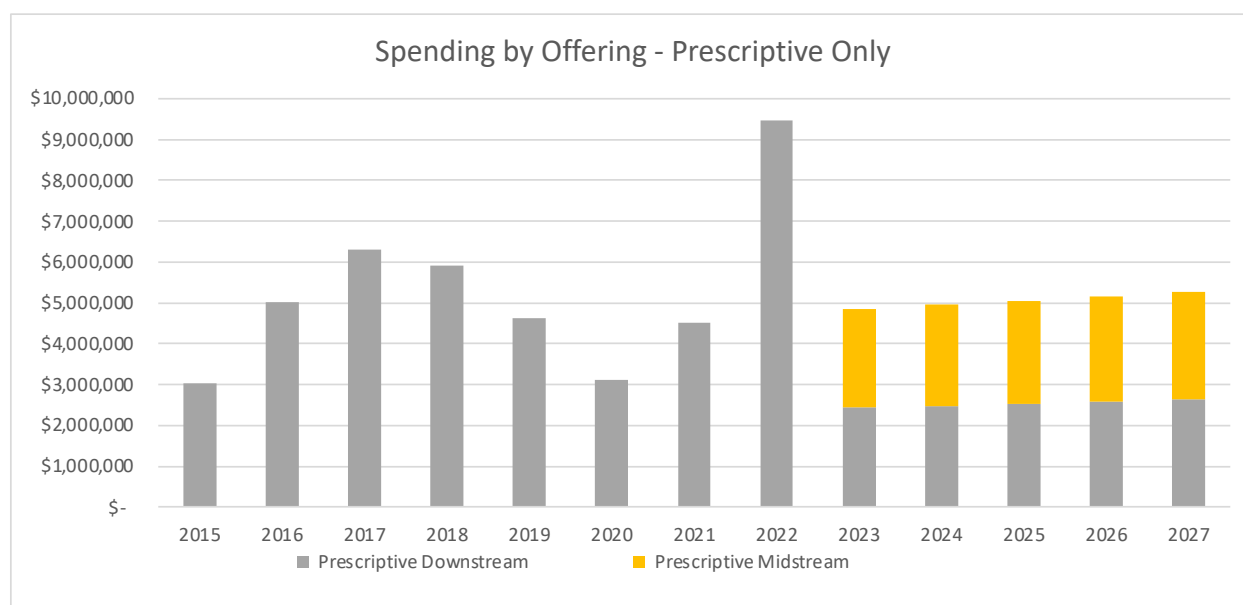
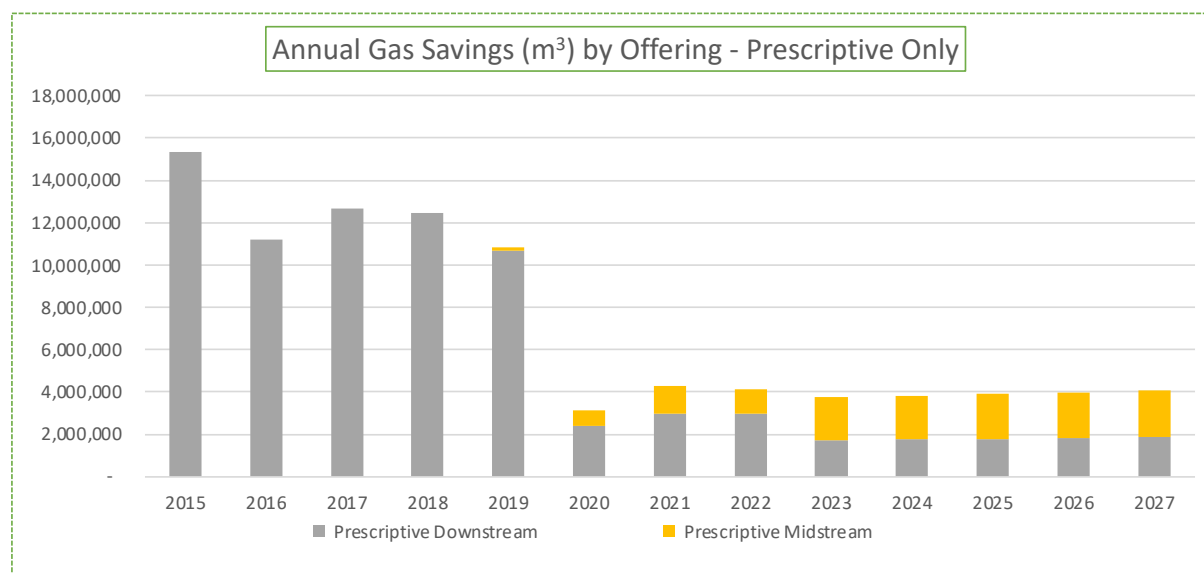


Figure 4. Enbridge's C&I Prescriptive Offerings Savings Over Time



The planned spending for the C&I Prescriptive Offerings is around 2019 totals, and less than some previous years. However the, projected savings have fallen dramatically since 2019 and are holding relatively steady at these lower values.

Shifting the program offerings upstream is in line with best practices for reaching smaller commercial customers, but this shift does not appear to drive any additional savings. To avoid lost opportunities, more should be done to increase the savings from the Commercial Prescriptive Offerings.

One method of increasing efficient measure uptake is to increase incentive levels. The Prescriptive Downstream Offering is planned to provide incentives averaging 42% of the incremental cost. The Prescriptive Midstream Offering is planned to provide incentives averaging only 14% of the incremental cost. Good program design for reaching smaller customers would be to provide an incentive that offsets the majority of the participants' incremental cost for prescriptive measures to remove the first cost barrier to opting for the efficient equipment. Increasing the incentive levels would not only increase participation but would also keep more money in participants' pockets.

Measures with a higher cost relative to the savings were excluded from the program¹³, but these are precisely the types of measures that are unlikely to be adopted by small commercial customers without some financial assistance and additional information. To exclude any cost-effective measure reduces the net economic benefit to Enbridge's small commercial customers and to Ontario overall.

¹³ Interrogatory Response Exhibit I.10c.EGI.STAFF.49

Enbridge also made the decision to exclude measures with historically high uptake.¹⁴ Larger businesses may have shifted their purchasing decisions to the higher-efficiency equipment, but this is less likely for smaller businesses. Often first cost is the primary consideration for small businesses, and they might not have the time or resources to investigate higher-efficiency options and whether the energy savings justifies the additional cost. Smaller businesses often operate on small margins and may not be able to afford the higher efficiency equipment in the short run, even if the energy savings would benefit them in the long run.

Overall, best practices for reaching small customers are to provide as wide a variety of measures as possible while lowering the cost to participate as much as possible. The following is a list of some measures offered by other gas utilities that have not been included in Enbridge's Prescriptive or Direct Install Offerings, and we encourage Enbridge to use this list to help expand their measure offerings:

- Condensing Boiler
- Low Flow Spray Valve
- Connected/Wi-Fi (adaptive) Thermostat
- Roof Insulation
- HVAC Controls
- Vortex Deaerators
- Pipe and Tank Insulation
- Thermal Curtains in Greenhouses
- Infrared Heaters
- Steam Traps Survey
- Steam Traps Replacement
- Domestic hot water recirculation controls
- Hydronic Additives
- Boiler/Furnace Tune-ups
- Retro-commissioning
- Behavioral - Energy Reports
- Faucet Aerators
- Dishwashers
- Pasta Cooker
- Rotisserie Oven
- Turbulators for commercial boiler
- Modulating burner replacement for commercial boiler
- Stack damper for commercial boiler
- Boiler Reset Control
- Boiler Cut-out Control
- Linkageless boiler controls
- Stack Economizer

¹⁴ *ibid*

- Pipe insulation - hydronic heat
- Green Garage Doors Hinge
- Modulating Clothes Dryer
- Showerheads

V.D Direct Install Program

The following figures show the historical and planned spending and savings for the C&I Direct Install Offering. This is the program most likely to engage small and microbusinesses.

Figure 5. Enbridge's C&I Direct Install Offering Spending Over Time

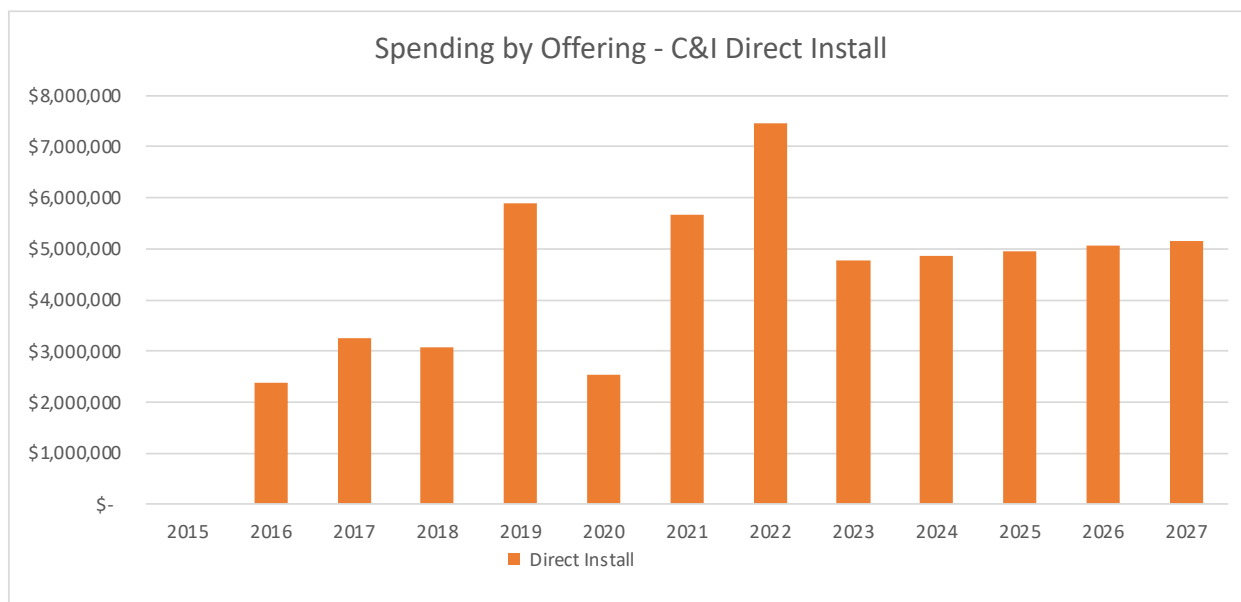
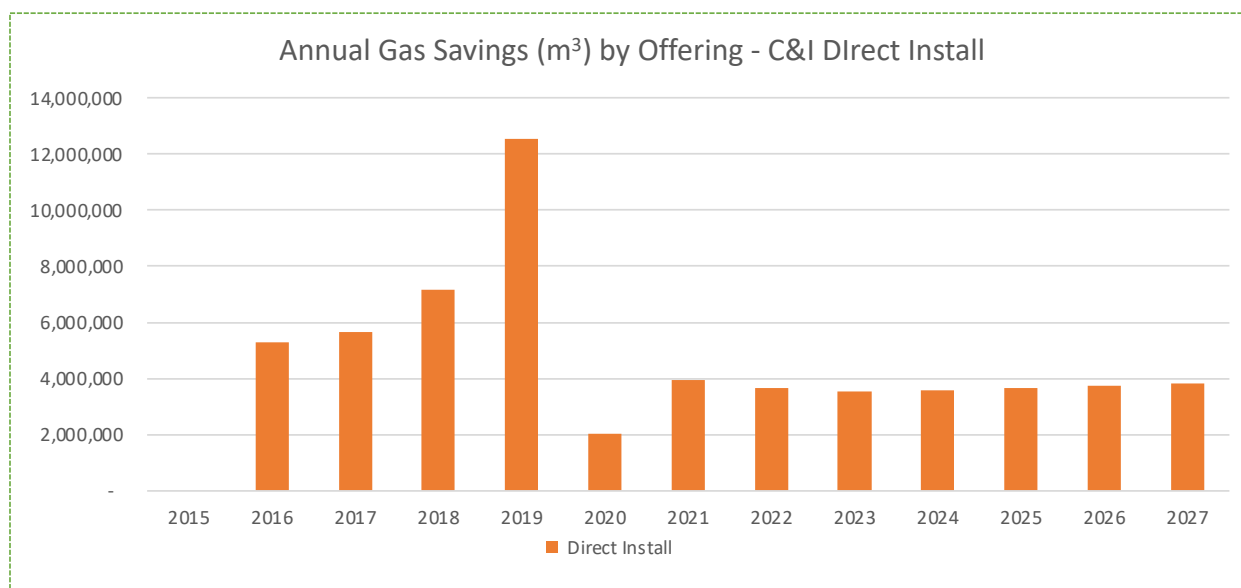


Figure 6. Enbridge's C&I Direct Install Offering Savings Over Time



While planned spending in the Direct Install Offering is slightly lower than in some of the past years, savings are dramatically less. It is not clear what is contributing to the decline in savings. Incentive levels appear reasonable at 75-80% of the incremental cost.

While the Direct Install Offering is meant to specifically target small commercial customers, it is severely limited by the types of measures that it offers. The only measures considered for offering in the Direct Install Offering were those in the TRM and not included in the Midstream Program. Enbridge has added a few measures, but continues to limit program participation to a small number of options: air curtains – shipping doors, dock door seals, demand control kitchen ventilation, destratification fans, pedestrian-door air curtains and add-on ventilation measures. While these are all fine measures, there are many more cost-effective measures that could be offered in this program that have broader application, such as adaptive thermostats, boiler tune-ups, and hot water saving measures.

An additional limiting factor for small business participants is the requirement that customers have not participated in any DSM programs in the past 3 years. This eligibility limitation is overly restrictive and is counter-productive for a program that is targeting small businesses and supposedly trying to overcome market barriers to efficient measure adoption. This makes even less sense when one of the main ways to leverage customer interactions is by providing additional services to past customers. For example, a dry cleaner that installs a single steam trap should not be precluded from receiving an assessment to see where else they can save energy, especially after they have expressed an interest in doing so in the first place.

We recommend that the restriction due to participation within the last 3 years be eliminated and that a wider array of measures should be included. At a minimum, this includes:

- Adaptive thermostats
- Boiler tune-ups
- Simple water heating measures (low-flow aerators, pre rinse spray valves, pipe wrap, etc..)

V.E Custom Program

The following figures show the historical and planned spending and savings for the C&I Custom Offering. Commercial and Industrial are shown separately.

Figure 7. Enbridge's C&I Custom Offerings Spending Over Time

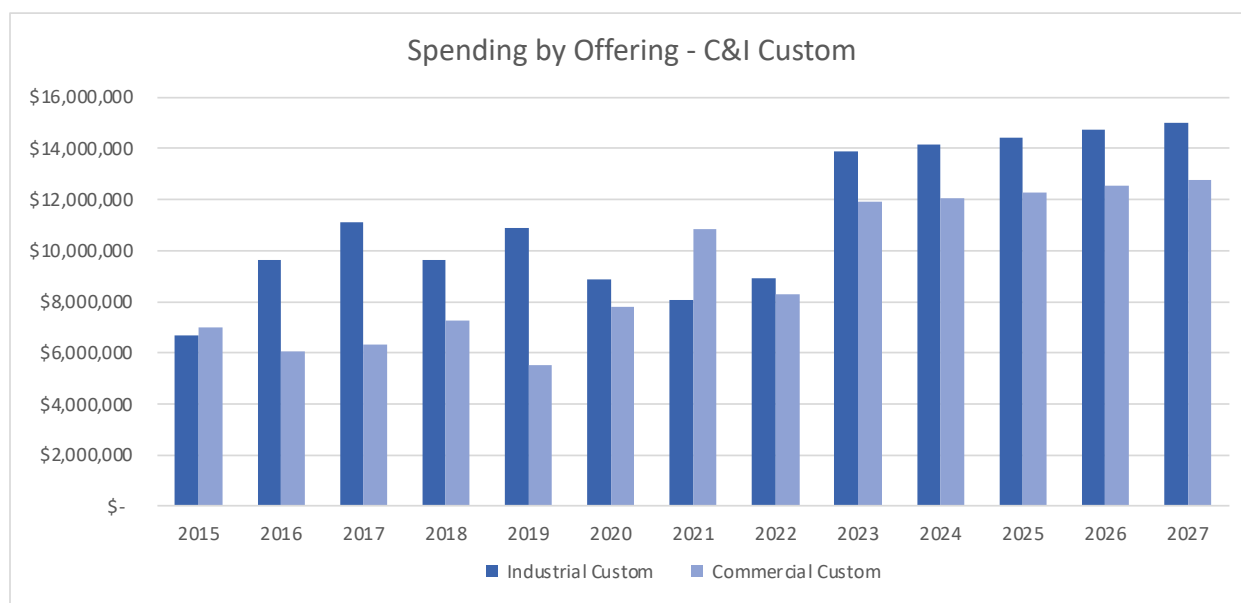
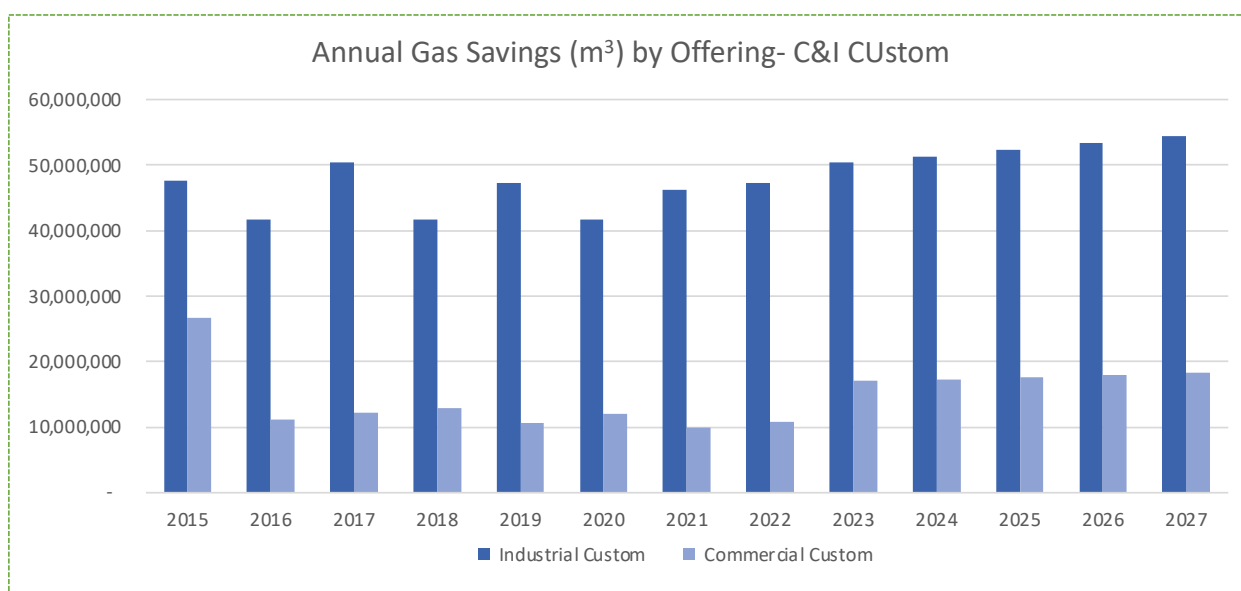
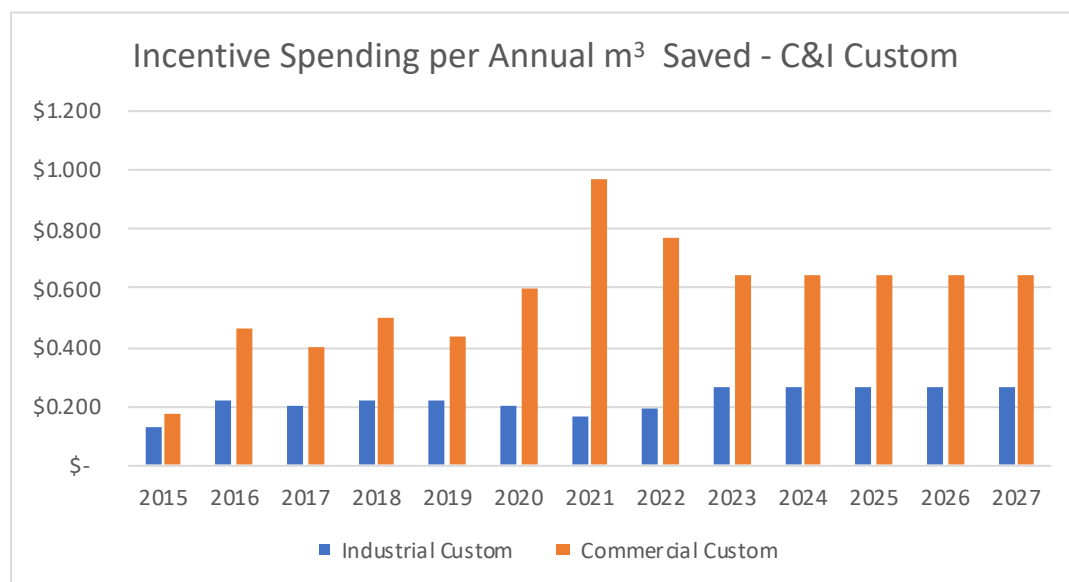


Figure 8. Enbridge's C&I Custom Offerings Savings Over Time



Both spending and savings are planned to increase for the C&I Custom Offering. It's not clear how much of the spending and savings will be for small commercial customers. With an incentive based on \$0.25/m³ gas saved and not to exceed 50% of the incremental cost, not many small commercial customers are likely to participate.

Figure 9. Enbridge's C&I Custom Offering Incentive Unit Cost Over Time



Further refinements to the C&I Custom offering could be made to increase small business participation, including providing an increased incentive for microbusinesses above what is provided for large commercial customers. Also, additional outreach and recruitment efforts should be done through more detailed market segmentation. Some sectors to differentiate are: agriculture, restaurants, hospitality, warehousing, and dry cleaning.

V.F Low Carbon Transition

As part of the Enbridge Gas Low Carbon Transition Program, Enbridge is planning on including a Commercial Heat Pump Program Offering that promotes the adoption of natural gas heat pumps. While perhaps a gas heat pump would reduce carbon emissions compared to a natural gas furnace or boiler, an electric heat pump would likely reduce carbon emissions further. Instead of only promoting gas heat pumps that still have carbon emissions, Enbridge should also be educating its customers about electric heat pumps. This program should be fuel neutral and provide information on the most appropriate, economically feasible option with the lowest carbon emissions options.

V.G Indigenous Peoples

Small businesses are also extremely prevalent among First Nations communities. 99% of the 43,305 First Nation businesses in Canada are small businesses and 24% are in Ontario. Indigenous people are creating businesses at nine times the rate of non-indigenous Canadians. Therefore, designing efficiency programs that focus on small businesses will also help indigenous businesses.

V.H Recommendations

- Prescriptive Programs
 - Offer all typically cost-effective measures as prescriptive measures, with incentives that cover most of the incremental measure costs, including residential type equipment.
- Direct Install
 - Allow small businesses to participate in DSM programs more than once. Do not limit participation in DSM programs if previously participated in a DSM program.
 - Include additional direct install measures such as adaptive thermostats, boiler tune-ups, and water heating measures.
- Custom Program
 - Create a comprehensive custom program component tailored for small businesses that is fed in from the Direct Install program.
 - Offer an assessment to identify all cost-effect efficiency measures for a building.
 - Provide incentives for all of the identified efficiency measures that cover the majority of the incremental measure costs for small businesses.
- Do additional market segmentation to specifically target different small business industries with a particular focus on helping indigenous businesses.
- Promote a fuel-neutral approach in the Low Carbon Transition Program that includes electric technologies and maximizes carbon reductions.

VI ISSUE 16 – COORDINATION WITH ELECTRIC PROGRAMS

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

Enbridge has made some efforts towards coordination with electricity conservation programs, but more is needed. Whenever a building energy assessment is performed as part of the Commercial Custom or Direct Install Offerings, coordination with the IESO CDM programs should result in examining both gas and electricity energy savings opportunities at the same time.

The OEB's December 1, 2020 DSM Letter provided direction that Enbridge Gas should

“(E)ndeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible, including modifying the participant eligibility requirements of its current low-income program in order to be consistent with the electricity income-tested CDM program eligibility requirements. The centralization of electricity CDM programs under the IESO may lead to new opportunities for DSM-CDM collaboration and a greater level of overall energy savings. The OEB expects Enbridge Gas to file evidence addressing linkages to the new electricity CDM framework and to identify opportunities for efficiencies, program cost reductions, and increased natural gas savings.”

Further, to reflect this direction, the Proposed Framework includes the following guiding principle: “Where appropriate, Enbridge Gas should coordinate DSM and electricity CDM efforts to achieve efficiencies.”

Both the OEB and Enbridge Gas mention the importance of coordination between Enbridge Gas DSM and IESO CDM programs, but there are very few specifics for where this will occur in the commercial sector. The one clear example of coordination is in the foodservice industry.

“Demand Control Kitchen Ventilation (“DCKV”) (2020-Present), Commercial Sector Enbridge Gas launched its DCKV direct install offering in late 2018, providing turnkey solution for customers to improve kitchen ventilation with energy efficient DCKV technology. In 2020, this offer was jointly delivered with the IESO, providing customers with a single point of access to gas and electric incentives.”¹⁵

This is a good example of the type of coordination that should occur between the Enbridge Gas DSM and IESO CDM programs. But much more coordination is needed. One of the most valuable points of coordination is when an energy assessment is performed on a building.

¹⁵ Filed: 2021-05-03, EB-2021-0002, Exhibit E, Tab 4, Schedule 4, Page 3 of 6

Whenever an energy assessment is performed as part of the Commercial Custom or Direct Install Offerings, all energy efficiency opportunities should be examined at the same time – both natural gas and electricity. This is especially important for small businesses, that may find it difficult to find time to arrange for an assessment. The customer should not have to coordinate two separate assessments – one for natural gas and another for electricity savings opportunities. There are also interactions between natural gas and electricity usage and the building energy usage should be looked at holistically. Some efficiency measures – such as insulation – will produce both gas and electricity savings and may not be cost effective if counting only natural gas or electricity savings. Coordinating natural gas and electricity assessments to occur simultaneously will also reduce the cost of the assessment compared to if two separate assessments were done, something small businesses are particularly averse to.

VI.A Recommendations

Coordination between Enbridge Gas and IESO CDM should occur when building energy assessments are performed as part of the Commercial Custom or Direct Install Offerings.

VII ISSUE 13 – COST EFFECTIVENESS

Issue 13: Are Enbridge Gas's proposed updates to the treatment of input assumptions, cost- effectiveness screening, and avoided costs appropriate?

The Commercial Program is very cost effective with a TRC-Plus BCR of 4.37, and net benefits of \$102,967,845. While it is necessary to have a BCR that is greater than 1.0 to achieve cost effectiveness, having such a high BCR can be an indication that there are many other untapped cost-effective measures missing from the plan. Rather than maximizing the BCR a higher aspiration should be to maximize net benefits. Net benefits represent the money that will be saved and end up in customers pockets and ultimately circulated in Ontario's economy.

We recommend that Commercial Program spending be increased by adding additional eligible measures and increasing the incentive levels paid to small businesses. Increasing additional measures will increase the TRC-Plus cost, but as long as the additional measures are cost effective, the net benefits will be higher. Increasing incentive levels does not directly increase TRC-Plus costs, since it is simply a transfer payment from Enbridge to participants, but increasing incentive levels will indirectly increase the TRC-Plus cost by increasing the number of participants and number of installed measures. But again, if the additional measures are cost effective, this will result in higher net benefits.

VII.A Recommendations

- Increase net benefits by adding additional eligible measures.
- Increase the incentives to small business to drive more participation and increase overall net benefits.

VIII ISSUE 6 – REASONABLENESS OF COSTS AND BILL AND RATE IMPACTS

Issue 6: Does Enbridge Gas's proposed budget, including program costs and portfolio costs result in reasonable rate impacts while addressing the OEB's stated DSM objectives in its letter issued on December 1, 2020, including having regard to consumers' economic circumstances?

Enbridge provided 2023 planned DSM bill impacts for representative small commercial customers in its interrogatory response Exhibit I.10.EGI.SBUA.5, Attachment 1. The projected total bill impacts are 1.4%, 3.0%, and 2.6% for EDG Rate 6, Union South Rate M2, and Union North Rate 10, respectively. These are very reasonable, especially given that participants with efficiency savings will enjoy a reduction in their natural gas bills in subsequent years to follow the DSM investments.

IX ISSUES 8 AND 9 – SHAREHOLDER INCENTIVE

Issue 8: Are Enbridge Gas's proposed shareholder incentives appropriate?

While it is reasonable to provide an incentive for Enbridge to meet its savings targets, the proposed incentives are too generous. If Enbridge were to receive a 100% shareholder incentive, then the customer bill impacts from the shareholder incentive as a percentage of the DSM budget bill impacts would be 10%, 6%, and 4% for EDG Rate 6, Union South Rate M2, and Union North Rate 10, respectively. If Enbridge were to receive a 150% shareholder incentive, then the customer bill impacts from the shareholder incentive as a percentage of the DSM budget bill impacts would be 20%, 11%, and 8% for EDG Rate 6, Union South Rate M2, and Union North Rate 10, respectively. This represents too much of a bill impact for spending that does not directly benefit the customer, relative to bill impacts from DSM spending that does provide a direct benefit to the customer by lowering their natural gas usage for years to come.

The savings targets on which the shareholder incentives are based are annual gas savings. This does not account for the lifetime of the gas savings. It would be better to base the shareholder incentives on lifetime natural gas savings so as to put more focus on longer-lived efficiency measures. It does not make sense to receive the same performance incentive for gas savings that last only one year as it does for savings that last 20 or more years.

IX.A Recommendations

- Reduce the amount of the performance incentive to reduce the cost to small business customers relative to the cost of program services.
- Base the savings target on lifetime savings to promote longer-lived measures which provide more overall benefits.

X ISSUE 17 – STAKEHOLDER ENGAGEMENT PLAN

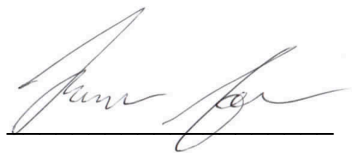
Issue 17: Is Enbridge Gas's stakeholder engagement proposal reasonable, including its engagement with Indigenous communities?

Stakeholders (such as SBUA) that are interested in how small businesses are being served by Enbridge's DSM programs need to periodically have access to information detailing progress on the treatment of this underserved and hard-to-reach market. This could be accomplished by providing annual reporting of DSM spending, participants, and natural gas savings for small business customers. This reporting could also include any activity specifically undertaken with indigenous businesses and/or participation by such business.

XI SUMMARY OF RECOMMENDATIONS

Below is a list of specific recommendations to improve Enbridge's 2023 to 2027 DSM Plan for small business:

1. Offer a wider array of measures and provide as streamlined a way as possible for small business customers to access them.
2. Follow Massachusetts' lead by offering a "turnkey" pathway for small business customers to seamlessly participate in a direct install program followed up by a custom measure package.
3. Prescriptive Programs
 - a. Offer all typically cost-effective measures as prescriptive measures, with incentives that cover most of the incremental measure costs, including residential type equipment.
4. Direct Install
 - a. Allow small businesses to participate in DSM programs more than once. Do not limit participation in DSM programs if previously participated in a DSM program.
 - b. Include additional direct install measures such as adaptive thermostats, boiler tune-ups, and water heating measures.
5. Custom Program
 - a. Create a comprehensive custom program component tailored for small businesses that is fed in from the Direct Install program.
 - b. Offer an assessment to identify all cost-effect efficiency measures for a building.
 - c. Provide incentives for all the identified efficiency measures that cover most of the incremental measure costs.
6. Coordinate with IESO CDM when performing energy assessments for commercial buildings to treat the building as a whole and identify natural gas and electric savings opportunities at the same time.
7. Designing efficiency programs that focus on small businesses will also help indigenous businesses.
8. Reduce the potential dollar amount eligible for shareholder incentives.
9. Base the shareholder incentives on lifetime natural gas savings, rather than annual natural gas savings.
10. Promote a fuel-neutral approach in the Low Carbon Transition Program that includes electric technologies and maximizes carbon reductions.
11. Provide annual reporting on small business DSM spending, participation, and natural gas savings.
12. Notify small business stakeholders in advance of commercial program changes.

A handwritten signature in black ink, appearing to read 'Theodore Love', written over a horizontal line.

Theodore Love

A handwritten signature in black ink, appearing to read 'Francis Wyatt', written over a horizontal line.

Francis Wyatt



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- SEMCO Energy Gas Company (SEMCO). 2020. *2019 SEMCO Energy Gas Annual Report*. Michigan Public Service Commission: Case No. U-20710.
- Xcel Energy (Xcel). January 22, 2021. *2021 - 2023 CIP Triennial Plan*. Docket No. E,G002/CIP-20-473

RESUME

Francis E. Wyatt, P.E.
President, Green Energy Economics Group, Inc.
950 Button Hill Road, Cuttingsville, VT 05738
(802) 492-2239
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Mr. Wyatt has over 29 years of experience in the energy efficiency field, during which he has reviewed, critiqued, analyzed, and assisted with electric, gas and other fuels demand-side management (DSM) program planning, design and implementation. He has particular expertise in the commercial and industrial sectors and cost-effectiveness screening and model development. Mr. Wyatt has developed several technical reference manuals for gas and electric savings. He has played key roles in developing several efficiency and renewable economically achievable potential studies. Mr. Wyatt has collected, analyzed, and compared the DSM spending and savings by sector from many jurisdictions over the last 29 years.

PROFESSIONAL EXPERIENCE

November 2005 – Present

President, Green Energy Economics Group, Inc., Cuttingsville, VT.

Consultancy specializing in energy-efficiency and renewable resource portfolios investing in electricity and gas savings, co-founded with John Plunkett, a co-worker since 1992. Develop cost-effectiveness screening models for program planning or project-specific analysis. Develop input assumptions for demand-side management programs cost-effectiveness screening. Work on analyses projecting economic and achievable energy-savings potentials. Plan, design and assist with implementation of efficiency programs.

1996 – 2005

Senior Analyst, Optimal Energy, Inc., Bristol, VT.

Developed state- or utility-specific cost-effectiveness screening models for program planning or implementation. Provide follow-up on-site training for using screening models. Develop demand-side management programs, including costs, savings, incentive structure and screening for cost-effectiveness. Focus on commercial and industrial programs and energy-saving measures. Review and critique of utility IRP filings in contested regulatory proceedings. Work on electric and gas analyses projecting technical, economic, and achievable energy-savings potentials. Developed electric energy and peak load profiles for a comprehensive list of residential and non-residential efficiency measures.

1992 – 1996

Analyst, Resource Insight, Inc., Middlebury, VT.

Reviewed, critiqued, and compared utility demand-side management programs. Analyses included program costs, energy impacts, customer participation, program descriptions, implementation, and comparison with other utility programs.

1989 – 1992

Civil Engineer, Enman Engineering, Clarendon, VT.

Designed sewage disposal systems, water systems, roads, site grading and storm drainage. Drafted plans using AutoCAD. Conducted preliminary site investigations and construction observations. Assisted clients with obtaining state and local permits.

1987 – 1989

Civil Engineer, Nowlan Engineering, Ludlow, VT.

Designed and drafted sewage disposal systems and water supply. Assisted clients with obtaining town and state permits for subdivisions, sewage disposal and water supply.

1984 – 1985

Solar Engineer, Environmental Solar Design, N. Hollywood, CA.

Designed solar hot water systems, purchased all parts for installations, obtained city permits, coordinated crews and customers for job installations, and installed solar hot water systems for commercial and residential customers.

EDUCATION

B.S., Agricultural Engineering, University of Missouri, Columbia, Missouri, 1982.

B.S., Agriculture, Agricultural Mechanization, University of Missouri, Columbia, Missouri, 1982.

Member, Tau Beta Pi, an honorary engineering society.

AFFILIATIONS

Professional Engineer in Civil/Sanitary, State of Vermont, Vermont Society of Professional Engineers.

HIGHLIGHTS OF PROJECT EXPERIENCE

ONGOING AND PAST ASSIGNMENTS (GEEG) – 2006-PRESENT

Nova Scotia

- Provided review and comments on proposed DSM portfolio and DSM potential study. Member of the DSM Advisory Group (DSMAG). Work is performed on behalf of the Consumer Advocate of Nova Scotia. 2019 - Present.

Vermont

- Reviewed and analyzed program proposals for the Community Energy & Efficiency Development Fund (CEED Fund), including the development of scoring and rebalancing mechanisms and reviewing and revising cost-effectiveness analyses for consistent

comparisons for innovative concepts not already addressed by conventional DSM programs. August 2012 – 2017.

- Cost-effectiveness screening model and analysis for 5-year investment of \$9 million Energy Efficiency Fund, supplementing Efficiency Vermont investment, on behalf of Green Mountain Power. February 2007 – 2010.
- Worked on development of the efficiency portions of the economic model used for assessing the options for meeting the reliability gap in the St. Albans region of Vermont for Green Mountain Power. 2013.
- Providing technical support for program planning, development and implementation for Efficiency Vermont, the world's first Energy Efficiency Utility, as part of multi-organizational enterprise operating under a contract with the Vermont Public Service Board to deliver statewide energy-efficiency programs for the customers of Vermont's twenty-one electric utilities. Cost-effectiveness screening tool development, maintenance and training. Technical support on program planning, including development of technical reference manual for efficiency measures. Developed energy and peak load profiles for residential and non-residential efficiency measures. Forecasting and bidding tool development for ISO New England forward capacity market. 2000 – 2014.
- Assist Vermont Gas Systems with transition to an energy efficiency utility. Represent VGS at multifamily and commercial benchmarking working group meetings. July 2015 – 2017.

New Jersey

- Participated in developing the analysis for electric and natural gas energy efficiency potential in New Jersey for the New Jersey Board of Public Utilities. 2019.

Pennsylvania

- Program design, implementation planning, regulatory support, technical reference manual development and portfolio and project cost-effectiveness tools for Philadelphia Gas Works. Assisted with testimonies before the Pennsylvania Public Utility Commission in Docket R-2009-2139884, December 2009 and April 2010 and Docket P-2014-2459362, 2015. August 2008 – present.
- Program design, implementation planning, regulatory support, technical reference manual development and portfolio and project cost-effectiveness tools for UGI Gas, including a CHP program. July 2015 – present.
- Energy efficiency program design and implementation assistance, including cost-effectiveness analysis and net-to-gross ratios for UGI Electric. July 2016 – present.
- High-level achievable potential analysis and subsequent portfolio design and cost-effectiveness analysis for Peoples Natural Gas of Pennsylvania. June 2017 – 2019.

- Provided energy-efficiency potential analysis and support on preparation of testimony regarding Peoples Gas of Pennsylvania. On behalf of Citizens for Pennsylvania's Future, July – September 2013.
- Analysis and assistance with direct and surrebuttal testimony for Citizens for Pennsylvania's Future (Pennfuture) on appropriate levels of efficiency portfolio investment in two rate cases before the Pennsylvania Public Utility Commission: Docket Nos. 00061366 and 00061367 re Metropolitan Edison Company and Pennsylvania Electric Company; and Docket No. R-00061346 re Duquesne Light Company. May - August 2006.

Wisconsin

- Portfolio and project cost-effectiveness calculator development. Cost-effectiveness analysis, assistance with contractor selection and regulatory support for 3-year energy-efficiency portfolio for Focus on Energy in Wisconsin. June 2011 – 2013.

Louisiana

- Empirical costs projections and cost-effectiveness analysis of alternative energy-efficiency resource acquisition scenarios for Entergy New Orleans, prepared for the Alliance for Affordable Energy and submitted as comments to the City Council. April-May 2013.

Minnesota

- Subcontractor to Optimal Energy Inc. for the state of Minnesota electric and gas potential studies for the Minnesota Department of Commerce, Division of Energy Resources. Developed agricultural measure characterizations. June 2017 - January 2018.

Texas

- Cost and savings analysis on proposed Public Utility Commission rules for utilities pursuing statutory DSM savings goals, on behalf of the Sierra Club. May-June 2012.
- Analysis of and report on achievable savings and costs for Austin City Council consumer advocate, "Energy Efficiency Resource Acquisition Options for Austin Energy." April 2012.

District of Columbia

- Developed multi-measure cost-effectiveness screening tool for the District of Columbia Sustainable Energy Utility, as a subcontractor to Vermont Energy Investment Corporation. November 2011 – 2014.

Illinois

- Portfolio and project cost-effectiveness calculator development. Cost-effectiveness analysis, assistance with contractor selection and regulatory support for 3-year energy-efficiency portfolio for Peoples Gas in Illinois. September 2008 – June 2012.

Oklahoma

- Energy efficiency potential analysis in support of comments on PUC rulemaking regarding DSM programs on behalf of the Sierra Club, December 2013 – January 2014.
- Analysis, technical assistance and testimony support on potential for energy-efficiency investment to substitute for fossil generation in proceedings before the Oklahoma Commerce Commission on behalf of the Sierra Club, May - December 2011.

Connecticut

- Analysis and testimony support regarding long-range energy-efficiency procurement plan of the Energy Conservation Management Board, on behalf of the Connecticut Office of Consumer Counsel. Fall 2008.

Florida

- Analysis and assistance with direct testimony on the effect of economically achievable energy efficiency on the need for new coal-fired generation, on behalf of the Sierra Club and other environmental intervenors, Florida Public Service Commission Docket No. 070098-EI. March-April 2007. The PSC denied the requested certificate of public good in June 2007.

British Columbia, Canada

- Analysis and testimony support on FortisBC Gas and FortisBC Electric long-term DSM plans, submitted to the British Columbia Utilities Commission, on behalf of the BC Sustainable Energy Association and Sierra Club (BC Chapter). December 2013 – May 2014.
- Analysis and testimony support on adequacy of BC Hydro's 2012-14 DSM Plan, submitted to the British Columbia Utilities Commission, BCUC Project No. 3698592, on behalf of the BC Sustainable Energy Association and Sierra Club (BC Chapter). August 2011 – May 2012.
- Analysis and testimony support on reasonableness of gas DSM Plan by Fortis Energy Utilities before the British Columbia Utilities Commission, BCUC Project No. 3698627, on behalf of the BC Sustainable Energy Association and Sierra Club (BC Chapter), May – November 2011.
- Analysis and testimony support on assessment of FortisBC Electric's long-term DSM plan, before the BCUC, on behalf of BCSEA/SCBC, August 2011 – March 2012.
- Analysis and support for direct testimony on assessment of BC Hydro's long-term DSM plan, before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada. November 2008 – March 2009. October 2011 –present.
- Analysis and support for direct testimony on assessment of Terasen Gas conservation plans before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada. October 2008.
- Provided analysis for direct testimony on energy-efficiency investment spending and savings, British Columbia Hydro and Power Authority, 2006 Integrated Electricity Plan and Long Term

Acquisition Plan, Project No. 3698419; and F2007/F2008 Revenue Requirements Application, Project No. 3698416, on behalf of the Sierra Club of Canada (British Columbia Chapter), British Columbia Sustainable Energy Association, and Peace Valley Environment Association. September 2006 – January 2007.

People's Republic of China

- Developed portfolio and project economic and financial analysis tools for use in China, and provided remote and in-person training sessions on use. For Natural Resources Defense Council and Institute for Sustainable Communities. August 2008 – September 2010.
- Conducted economic and financial analysis and report for factory efficiency retrofits for Guangdong Economic and Trade Commission, China, on behalf of the Institute for Sustainable Communities October 2007-2008.
- Developed and populated project and portfolio economic and financial models for a pre-feasibility analysis for the Asian Development Bank of a potential loan to support a \$100 million demonstration Efficiency Power Plant (EPP) project in Guangdong province, China, focusing on industrial, commercial and institutional retrofits. June 2006 – December 2007.
- Developed cost-effectiveness screening model and conducted benefit/cost analysis of efficiency program portfolios for Jiangsu province and Shanghai municipality, including assessment of 300-MW Efficiency Power Plants for prospectus by Asian Development Bank. Conducted economic and financial analyses and reports for factory efficiency retrofits Worked on behalf of the Natural Resources Defense Council. (July 2003 – 2008)

PRIOR ASSIGNMENTS (OPTIMAL ENERGY) – 1996-2005

- Developed DSM measure and program cost-effectiveness screening tools to be used by Massachusetts utilities and led training sessions for using the tool. Derived measure and program screening inputs for commercial and industrial programs considered by Boston Edison Company and Commonwealth Electric and Gas Company, for the Massachusetts Collaborative Non-Utility Parties. Developed cost-effectiveness protocols for measures to be installed in a small commercial retrofit program. Developed a custom measure cost-effectiveness and rebate-calculating tool. (1999 –2005)
- Developed DSM custom commercial and industrial measure cost-effectiveness and rebate-calculating screening tool for Cape Light Compact and NSTAR and led training sessions for using the tool. Derived measure screening inputs for commercial and industrial programs. (2003 – 2006)
- Developed cost-effectiveness screening model and assisted with analysis for assessment of economically achievable potential for distributed resources to solve a variety of transmission and distribution contingencies in the “southern loop” of Vermont, on behalf of the Vermont Electric Power Company and Central Vermont Public Service. (2005-2006)

- Part of team estimating the economic and achievable efficiency potentials for natural gas savings in New York State. Developed the portfolio cost-effectiveness screening model used in the analysis. Developed input assumptions for the commercial sector. Integrated the residential, commercial and industrial analyses. (July 2005 – March 2006)
- Developed demand-side management portfolio and project cost-effectiveness screening models for New Brunswick, Canada. Provided training on use of models. (2005-2006)
- Consultant to the Long Island Power Authority in developing and analyzing a portfolio of C&I market transformation and retrofit programs. The project included performance of measure and program level quantitative cost-effectiveness analysis and budgeting, relying on both primary and secondary data sources. Involved with follow-up implementation and evaluation planning tasks, including specific rebate levels, efficiency requirements, savings algorithms, and developing a custom measure cost-effectiveness and rebate-calculating tool. (1998 – 2006)
- Performed analysis of economically achievable potential for energy-efficiency resources to offset loss of output in the event of early retirement of the Indian Point nuclear generation station, on behalf of the National Academy of Sciences. (May-October 2005)
- Developed technical reference manual with savings algorithms and performed analysis for written testimony recommending energy-efficiency portfolio investment levels and savings goals in utility merger application before the Pennsylvania Public Utility Commission, Joint Application of PECO Energy Company and Public Service Electric and Gas Company for Approval of the Merger of Public Service Enterprise Group with and into Exelon Corporation, on behalf of the Pennfuture Parties. (June 2005)
- Consultant to the Northeast Energy Efficiency Partnerships, a regional nonprofit pursuing market transformation in efficiency markets. Developed demand-side management program cost-effectiveness screening model. Economic analysis and report on cost-effectiveness of NEEP initiatives involving C&I motors, C&I lighting, C&I HVAC, C&I New Construction, performance of existing C&I buildings, industrial efficiency, clothes washers, and residential lighting. Cost-effectiveness of codes and standards analyses. Estimated potential electricity savings for New England. (1998 – 2005)
- Provided review and advice on development of demand-side management project, program and portfolio cost-effectiveness software for BC Hydro (Canada). (2004)
- Contributed to commercial and industrial analysis for report on Opportunities for Accelerated Electrical Energy Efficiency in Quebec 2005 – 2012, on behalf of Regroupement National des Conseils Regionaux de L'environnement du Quebec, Regroupement des Organismes Environnementaux en Energie and Regroupement pour la Responsabilite Sociale des Entreprises. (April – May 2004)
- Developed cost-effectiveness screening model and screened agricultural efficiency measures for EnSave Energy Performance, Inc. (2004)

- Provided support for report on performance incentives for administrators of conservation and load management programs in Connecticut, on behalf of Connecticut Office of Consumer Counsel. (November – December 2003)
- Integration of industrial, commercial, residential, and renewable results; cost-effectiveness screening tool creation; and commercial analyses assessing technical, achievable and economic potential for energy-efficiency and renewable resources in New York State and five sub regions over 5, 10 and 20 years, on behalf of New York State Research and Development Authority. (January 2002 – August 2003)
- Integration of industrial, commercial, and residential results; cost-effectiveness screening tool creation; and commercial and industrial analyses projecting potential for demand-side resources to defer the need for major transmission upgrades, on behalf of Vermont Electric Power Company. (November 2001 – April 2003)
- Integration of industrial, commercial, and residential results; cost-effectiveness screening tool creation; and commercial and industrial analyses updating statewide projection of economically achievable efficiency potential for state of Vermont, on behalf of the Vermont Department of Public Service. (October 2001 – February 2003)
- Contributed to commercial and industrial analysis for report on potential for energy efficiency in Michigan, on behalf of the American Council for an Energy-Efficient Economy. (September – December 2002)
- Contributed to commercial and industrial analysis for report on potential for electrical efficiency savings in Maine, on behalf of the Maine Public Advocate. (July – October 2002)
- Consultant to the New Jersey Clean Energy Collaborative – developed the program cost-effectiveness screening model used for planning purposes, developed the commercial custom cost-effectiveness measure screening tool used in program implementation, and conducted program cost-effectiveness screening for the commercial and industrial efficiency programs (2000 – 2001)
- Provided support for the assessment of Centra/Union Gas (Canada) DSM programs, for the Green Energy Coalition. (1996)
- Provided technical support to the United Illuminating Company with its cost-effectiveness screening of proposed DSM programs. Developed cost-effectiveness screening tool and provided training on its use. Reviewed inputs and assured proper use of the screening tool. (1999)
- Characterization of efficiency resources, DSM program design, evaluation of program design and implementation procedures for Citizens Utilities Company. Developed commercial and industrial measure characterizations and savings algorithms. (1998 – 1999)

- Support to the Burlington (VT) Electric Department in development of its 1997 Energy Efficiency Plan. Services included program planning, measure characterization and program design. (1997)
- Contributed to the design, analysis and negotiation of commercial, industrial and residential core DSM programs for the state of Vermont, for the Vermont Department of Public Service. These core programs became the basis for Vermont's Efficiency Utility. Work included establishing baseline efficiencies; estimates of energy-efficient measure costs, savings and participation; cost-effectiveness screening of measures and programs. (1995 – 1999)
- Developed rebate-calculating and cost-effectiveness spreadsheet for commercial comprehensive early HVAC retirement, for Potomac Electric Power Company. (1997)
- Reviewed measure and program screening of commercial, industrial and residential DSM programs, for the Maryland Office of People's Counsel. Offering suggestions for more accurate screening assumptions and improvements in program designs to increase cost-effectiveness. (1997)

PRIOR ASSIGNMENTS (RESOURCE INSIGHT) – 1992-1996

- Technical assistance on DSM program development in the Potomac Electric Power Company collaborative, for the Maryland Office of People's Counsel. Work included characterizing new energy-efficiency measures and screening for cost-effectiveness, primarily in the commercial sector. Contributed toward the development of baseline and minimum-qualifying efficiencies, and incentive structures. (1992 – 1997)
- Developed costs and savings of commercial and industrial DSM program enhancements for Florida Power Corporation, for the Legal Environmental Assistance Fund and Florida Power Corporation. (1996)
- Reviewed Jersey Central Power and Light's proposed commercial and industrial DSM programs, for the Mid-Atlantic Energy Project. Suggested specific improvements to programs. (1995 – 1996)
- Provided analysis used in negotiations with MidAmerican Energy Company on IRP and DSM program design issues, on behalf of the Iowa Office of Consumer Advocate. Contributed toward the development of innovative Comprehensive Early HVAC Retirement programs for the commercial market. Quantified all program impacts and costs, and performed economic analysis of the program. (1995)
- Contributed to development of commercial and industrial new construction and HVAC retirement programs for Interstate Power, on behalf of the Iowa Office of Consumer Advocate. Quantified measure and program projected impacts and costs. Support for revisions to Interstate Power's IRP filing to include the above programs. (1995)
- Provided analysis for a critical review of Florida Power and Light's integrated resource plan. This project involved assessing the completeness and appropriateness of FPL's IRP process

and outcomes, focusing on the development, analysis and screening of its proposed commercial and industrial DSM programs, for the Legal Environmental Assistance Fund. (1995)

- Analysis and testimony regarding fuel-switching and other DSM program options. Before the Vermont Public Service Board Investigation into Least-Cost Investments, Energy Efficiency, Conservation and Management of Demand for Energy In Re: Fuel-Switching Issues Specific to CVPS Docket 5270-CV-1 In Re: CVPS program designs Docket 5270-CV-3, for the Vermont Department of Public Service, (November 1994 – October 1995)
- Technical assistance analyzing need for power and DSM program changes. Delmarva Power & Light Company Dorchester Power Plant Certificate of Public Convenience and Necessity. Maryland PSC Case No. 8489, for the Maryland Office of People's Counsel. (January 1993)
- Estimated the economically achievable electrical efficiency savings for residential, commercial/industrial, lost-opportunity and retrofit markets in the United Kingdom, for the Conservation Law Foundation. (1993)
- Support for the quantification of costs, savings and cost effectiveness screening of a full portfolio of proposed demand-management programs for Ontario Hydro (Canada), for the Coalition of Environmental Groups. (1992)
- Provided technical assistance for determining DSM potential savings. In the matter of the application of the Detroit Edison Company for authority to amend its rate schedules governing the supply of electric energy and to amend other miscellaneous rates, for the Michigan United Conservation Clubs. Michigan PSC Case No. U-10102. (November 1992)

PRIOR ASSIGNMENTS (ENVIRONMENTAL SOLAR DESIGN) – 1984-1985

- Designed, permitted and installed solar hot water systems for commercial and residential customers. (1984-1985)

THEODORE M.
LOVE

2534 Downingsville Rd. | Lincoln, VT 05443
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tlove@greenenergyeconomics.com

Professional Experience

Green Energy Economics Group, Inc. – Cuttingsville, VT

<i>Partner</i>	2017 to Present
<i>Senior Associate and Data Scientist</i>	2013 to 2017
<i>Associate</i>	2010 to 2013
<i>Analyst</i>	2007 to 2010

For over 14 years, Theodore “Theo” Love has been providing economic-based insights into the design, analysis, and implementation of energy efficiency and distributed energy resource programs and portfolios in twelve states, three Canadian provinces, and China. He has a particular focus on EE/DER policy analysis, program design and implementation, cost-effectiveness testing, financing, and building scalable tools to analyze everything from individual projects to programs to portfolios.

Alter & Rosen, LLP –New York, NY	2007 to 2010
<i>Consultant</i>	

Managed the development of an online database management system for musical copyrights and brought on board paying beta users. Managed data entry, reporting, termination and reversion issues for transactions involving musical copyright catalogues valued at over \$100 million.

AllianceBernstein LP –White Plains, NY	2006 to 2007
<i>Client Reporting Analyst</i>	

Oversaw the monthly and quarterly report process for clients domiciled outside the United States. Increased by 150% the amount of accounts that met a fifth business day deadline. Transferred firm’s quarterly reporting process to new system.

Education

Clark University – Worcester, MA

B.A. Magna cum Laude, *Mathematics and Computer Science*, 2006.

Kansai Gaidai University: Hirakata City, Osaka Japan.

Study Abroad Program, Spring Semester 2005

General Assembly: New York City, NY

Data Science Intensive Course, 2015

Recent Project Experience

Green Energy Economics Group, Inc.

Economic and Policy Analysis

Small Business Utility Advocate - California

(June 2020 – Present)

- Performing data analysis of underserved small and medium business customers as part of the California Energy Efficiency Coordinating Committee (CAEECC) Underserved Working Group for Small and Medium Business (SMB).
- Prepared report and analysis of arrearages for small businesses due to COVID-19 and assisted with policy recommendations and comments on strategies to address COVID-19 related debt (Do. No. 21-01-014)
- Assisted with analysis and comments for ongoing docket on clean energy financing (Do. No. 20-08-022)
- Provided comments on program design of CleanPowerSF's Food Service Program (Do. No R13-11-05)

Gas Topic Committee Co-chair

Association of Energy Service Professionals (AESP)

(January 2019 – Present)

- Co-chair of the topic committee that oversees gas energy efficiency activity in North America. Leader of regular member calls and active participant in conference planning.

Benefit Cost Analysis Expert

Public Service Enterprise Group (PSEG) – New Jersey

(October 2020 – Present)

- Provided assistance with calculation of six economic tests for PSEG's energy efficiency and conservation portfolio, including development of calculation engine and launch as a subcontractor to ANB Enterprises.

Economic and Policy Analysis

Consumer Advocate – Nova Scotia

(March 2019 – Present)

- Provided analysis and written testimony on Efficiency One's (E1) 2020 – 2022 DSM Plan (Matter No. M09096) as it relates to spending and savings levels, affordability, and allocation of funds in Matter No.
- Provided comments on the 2019 DSM Potential Study's economic analysis and projection assumptions and approach
- Member of DSM Advisory Group (DSMAG) on behalf of the Consumer Advocate of Nova Scotia to provide ongoing support

Development and Implementation of Energy Efficiency and Conservation Plans

UGI Utilities, Inc. – Pennsylvania

(June 2015 – Present)

Assist UGI Utilities, Inc. and PNG with the development and approval of Energy Efficiency and Conservation (EE&C) Plans for their UGI Gas PNG Gas, and UGI Electric divisions, including:

- Ongoing evaluation and portfolio planning activities for both UGI Gas and UGI Electric energy efficiency portfolios.
- Developing an achievable efficiency scenarios for UGI Gas and PNG Gas.
- Designing a five-year, \$27 million energy efficiency and conservation plan for UGI Gas. Submitting direct testimony on behalf of UGI Gas, Inc. on the design and implementation of the proposed plan (Docket No. R-2015-2518438)
- Designing a five-year \$15 million energy efficiency and conservation plan for PNG Gas. Submitting direct testimony on behalf of PNG Gas, Inc. on the design and implementation of the proposed plan (Docket No. R-2016-2580030)
- Assisting with the design and implementation and reporting of the UGI Electric's voluntary EE programs. Designing and assisting with approval for a five-year \$7.2 million electric energy efficiency and conservation plan (Docket No. M-2018-3004144)

Strategic Planning and Implementation of DSM Portfolio

Philadelphia Gas Work's (PGW) - Philadelphia, Pennsylvania (August 2008 – Present)

- Assisting with ongoing program planning and implementation of both the Low-Income Usage Reduction Plan (LIURP) and the market-rate DSM portfolio.
- Provided supporting testimony and analysis for the Phase III market-rate DSM plan under Docket No. P-2014-2459362.
- Designed Phase II plan with PGW and submitted direct testimony supporting the plan on behalf of PGW (Docket No. P-2014-2459362)
- Member of lead consulting team that aided in the design and approval of PGW's five-year, \$54 million portfolio of DSM programs;
- Providing ongoing technical assistance in the development of PGW's \$35 million Phase II five year plan.
- Providing ongoing technical support in program design and implementation, including the roll-out of six programs that, combined since inception, have saved 120,000 MMBtus at a cost of approximately \$17 million;
- Developed specifications for and currently collaborating with internal PGW staff on database system to track weatherization projects, rebate applications, and other information pertaining to PGW's DSM portfolio;
- Developed multiple Excel-based tools used by contractors to perform field audits, provide QA/QC, and track ongoing progress for contractors, programs, and the portfolio as a whole;
- Provided research and analysis support for multiple rounds of expert testimony before the Pennsylvania Public Utility Commission (Docket R-2009—2149884);
- Aided in the issuance of RFPs and selection of candidates for over \$40 million in contracts;

- Major contributor to PGW's ongoing formal reporting and evaluation process, including the issuance of five implementation plans, three annual reports, and two impact evaluations.

DSM Potential Studies in New York, New Jersey, and Pennsylvania

Optimal Energy, Inc. - Vermont (December 2018 – December 2019)

- Assisted Optimal Energy, Inc. with the development of measure assumptions and characterizations for statewide, electric and gas DSM potential studies.

Natural Gas Efficiency Options and EE&C Plan for Peoples Natural Gas

Peoples Natural Gas, Inc. – Pennsylvania (September 2017 – February 2019)

- Prepared report on program, sector, and portfolio-level cost and savings for 29 natural gas administrators in 11 States, and provided recommendations for potential natural gas DSM opportunities for Peoples Natural Gas
- Assist with stakeholder review process
- Developed five year \$42 million Energy Efficiency and Conservation (EE&C) Plan, and provided testimony to support the adoption of the Plan (ongoing).

Research on Leading Energy Efficiency Portfolios

Green Energy Economics Group - Vermont (November 2007 – Present)

- Maintain research and proprietary analysis on actual and projected results from over a dozen electric and natural gas demand side management (DSM) portfolios throughout North America;

Analytic and Technical Support for DSM Tracking Systems

PECO Energy Company – Pennsylvania (September 2016 – December 2017)

Commonwealth Edison Company – Illinois (August 2017 – August 2018)

Companywide (September 2020 – present)

- Subcontractor to ANB Systems Inc. to provide domain expertise and analytic support to rollout of enhanced tracking system.
- Developed dashboards and internal reports used by PECO's EM&V team, business planning, and various program and portfolio managers.
- Guided automation of PECO's six-month and annual reporting process.
- Provided expert guidance on the development of cost effectiveness calculation modules for clients in Pennsylvania and New Jersey

Technical Assistance for Energy Efficiency Program Planning

Green Mountain Power - Vermont (August 2012 – July 2017)

- Developed multivariable regression model and framework to estimate the cost per kW to address a reliability gap in the St. Albans region with targeted energy efficiency.

- Reviewed and analyzed program proposals for the \$20 million Community Energy & Efficiency Development Fund (CEED Fund), including the development of scoring and rebalancing mechanisms;
- Analyzed dataset of 5,000 custom business projects to establish models used for future planning exercises.
- Prepared report on uncounted benefits of renewable generation sources for Vermont.

Analysis of Energy Efficiency in British Columbia

BC Sustainable Energy Association & Sierra Club BC, *British Columbia (May 2011 – June 2014)*

- Provided comments and energy efficiency opportunities report for proceedings on FortisBC Gas and Electric's long-term DSM plans in December of 2013.
- Assisted on research for direct testimony on reasonableness of gas DSM Plan by Fortis Energy Utilities before the British Columbia Utilities Commission, BCUC Project No. 3698627;
- Technical support on assessment of FortisBC Electric's long-term DSM plan and corresponding expert testimony;
- Assistance with direct testimony and technical support on assessment of BC Hydro's long-term DSM plan, before the BCUC.

Energy Efficiency Potential in Oklahoma

Sierra Club, *Oklahoma (April 2011 – November 2011, December 2013 – January 2014)*

- Provided updated report for energy efficiency in Oklahoma and additional comments on PUC rulemaking for electric and gas utility programs.
- Preparation of report on energy efficiency potential for Oklahoma;
- Assistance with research and drafting comments on the US regional haze Federal Implementation Plan for the State of Oklahoma;
- Research and formulation of energy efficiency potential projections provided as part of expert testimony for Oklahoma Gas & Electric's rate case before the Corporation Commission of Oklahoma, Cause No. PUD 201100087.

Technical Assistance for Energy Efficiency Programs

Focus on Energy - *Wisconsin*

(June 2011 – August 2013)

- Developed and customized cost-effectiveness calculators for Wisconsin's Focus on Energy portfolio of energy efficiency programs;
- Trained staff and other consultants on usage of tools and general economic analysis of energy efficiency programs;
- Provided QA/QC on cost-effectiveness analysis of 14 programs spending over \$160 million in two years.

Chicagoland Energy Efficiency Portfolio

People's Gas - *Chicago, Illinois*

(September 2008 – January 2013)

- Providing ongoing regulatory support;

- Provided cost-benefit analysis of various program scenarios and aided in the analysis of contractor bids;
- Customized excel-based portfolio and project cost-effectiveness tools to client's specifications.

Testimony Support for Expanding Gas Energy Efficiency in Pennsylvania

Citizens for Pennsylvania's Future, *Pennsylvania* (July 2013 – September 2013)

- Provided support on preparation of testimony regarding Peoples Gas of Pennsylvania's DSM plans, including preparation of benchmarking report and alternative scenario projections.

Energy Efficiency Potential in Texas

Sierra Club, *Texas* (May 2012 – August 2012)

- Research and development of alternative energy efficiency potential scenarios for the ten investor owned utilities (IOUs) in Texas;
- Development of comments for the Public Utility Commission of Texas;
- Development of presentation before the Energy Efficiency Incentive Program Committee.

Austin Energy's Energy Efficiency Potential

Austin City Council Consumer Advocate, *Austin, Texas* (April 2012)

- Research and development of alternative energy efficiency potential scenarios for Austin Energy.

Nevada Power's Energy Efficiency Potential

Sierra Club, *Nevada* (November 2011 – June 2012)

- Research on Nevada Power's Integrated Resource Plan (IRP) and development of alternative energy efficiency potential projections.

Comments on EmPower Maryland Programs

Sierra Club, *Maryland* (September 2011 – October 2011)

- Research for and development of comments on EmPower Maryland's energy efficiency programs, including the development of alternative energy efficiency potential projections.

Ontario Power Authority Field Audit Support Tool

Green Communities Canada - *Ontario, Canada* (January 2011 – May 2011)

- Collected and implemented specifications for updating the tool used by Ontario Power Authority's low-income program field agents to collect data and determine project net present values;
- Added custom features including customer input forms, saving and closing routines, and database file importing.

Energy Efficiency Potential in Arkansas

Sierra Club/Audubon Society, *Arkansas*

(September 2009 – March 2010)

- Research and drafting assistance for expert testimony on energy efficiency' as an alternative to the White Bluff Steam Electric Station before the Public Service Commission of Arkansas, Docket No. 09-024-U.

Training for NGOs Working on Energy Efficiency Projects in China

ISC and NRDC – United States and China

(August 2008 – September 2010)

- Developed training materials and provided remote and in-person training sessions on the economic and financial analysis of industrial retrofit projects for structuring and negotiating financial incentive offers to customers;
 - o Worked with the Institute for Sustainable Communities (ISC) to aid its efforts to promote energy efficiency in the Guangdong and Jiangsu Provinces (February 2009 – September 2010);
 - o Worked with the National Resource Defense Council (NRDC) to aid in its efforts in China, especially in conjunction with a \$100 million revolving loan fund from the Asia Development Bank (August 2008-January 2009).

Incentive Calculations for the Project Cost-effectiveness Analysis Tool (CAT)

Efficiency Vermont – Burlington, Vermont

(November 2008 – June 2010)

- Aided in the design of a new approach to calculating incentives for custom energy efficiency projects based on financing and reaching a desired rate of return;
- Modified CAT's cash-flow projection engine, an Excel VBA system, to accommodate the new approach to incentives.

Vermont's 20-year Forecast of Electricity Savings from Sustained Investment

Efficiency Vermont – Burlington, Vermont

(December 2008 – October 2009)

- Provided components of final report relating to long-term trends for the environment (climate change, land-use, and water-use), population growth, and governmental regulation;
- Provided additional technical support on electric demand-side savings potential.

Connecticut's Long Term Acquisition Plan

Connecticut Office of the Consumer Council – Connecticut

(August – October 2008)

- Provided research and support for expert testimony regarding long-range energy-efficiency procurement plan of the Energy Conservation Management Board, on behalf of the Connecticut Office of Consumer Counsel.

Energy Efficiency Plans of BC Hydro and Terasen Gas

BC Sustainable Energy Association and

The Sierra Club - British Columbia, Canada

(October 2008 – March 2009)

- Provided research and support for expert testimony and technical support on assessment of BC Hydro's long-term DSM plan, before the BCUC, on behalf of the

BC Sustainable Energy Association and Sierra Club Canada (November 2008 – March 2009);

- Provided research and support for expert testimony on assessment of Terasen Gas conservation plans before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada (October 2008).

Testimony

1. **Pennsylvania Public Utility Commission (PUC)** P-2014-2459362, Petition of Philadelphia Gas Works for Approval of Demand-Side Management Plan for FY 2016-2020; Philadelphia Gas Works. May 2020.

Review and benchmarking of historical performance and review of planned program changes.

2. **Nova Scotia Utility and Review Board** Matter No. M09096, Efficiency 1 (E1) Application for Approval of 2020 – 2022 Demand Side Management (DSM) Resource Plan; The Consumer Advocate. May 28, 2019.

DSM Investment Levels and Affordability, Usage of Unspent Ratepayer Funding, Rate and Bill Impacts, Target Setting.

3. **Pennsylvania PUC** R-2018-3006814, UGI Gas Utilities Inc. – Gas Division, Rate Case; UGI Utilities Inc. – Gas Division. January 28, 2019.

Energy Efficiency & Conservation Plan and Total Resource Cost Implementation.

4. **Pennsylvania PUC** M-2018-3004144, Petition of UGI Utilities, Inc. – Electric Division for Approval of Phase III of Its Energy Efficiency and Conservation Plan; UGI Utilities, Inc. – Electric Division. August 21, 2018.

Electric energy efficiency and conservation plan development, projections, implementation, and EM&V.

5. **Pennsylvania PUC** M-2017-2640306, Petition of Peoples Natural Gas Company LLC for Approval of its Energy Efficiency and Conservation Plan; Peoples Natural Gas – Peoples Division, Peoples Natural Gas – Equitable Division; January 31, 2018.

Energy efficiency study, energy efficiency & conservation plan, and total resource cost implementation.

6. **Pennsylvania PUC** P-2016-2580030, UGI Penn Natural Gas, Inc. Rate Case; UGI Penn Natural Gas, Inc. January 2017.

Energy efficiency & conservation plan and total resource cost implementation.

7. **Pennsylvania PUC** P-2015-2518438, UGI Utilities, Inc.- Gas Division Rate Case; UGI Utilities, Inc. January 2016.

Energy efficiency & conservation plan and total resource cost implementation.

8. **Pennsylvania Public Utility Commission (PUC)** P-2014-2459362, Philadelphia Gas Works Demand-Side Management Plan for FY 2016-202; Philadelphia Gas Works. May 2015.

Analysis of Phase I DSM Plan and design of Phase II DSM Plan.

Publications

Love, Theodore. J. Nunley. "Using Smart Thermostats to Engage Residential Customers and Drive Comprehensive Retrofit Projects" In *Proceedings of the ACEEE 2020 Summer Study on Energy Efficiency in Buildings*, Washington, D.C.: American Council for an Energy Efficient Economy.

Love, Theodore. "The Future for Residential Gas Efficiency is Combined". *Strategies*. Association of Energy Service Professionals. January 11, 2019.

Love, Theodore. "Using Open Data to Predict Energy Usage: What tax lot data can tell us about energy usage intensity in New York City". *Behavior Energy, and Climate Change Conference 2015*. Sacramento, CA

Plunkett, John, Theodore Love, Francis Wyatt. "An Empirical Model for Predicting Electric Energy Efficiency Acquisition Costs in North America: Analysis and Application". In *Proceedings of the ACEEE 2012 Summer Study on Energy Efficiency in Buildings*, #906, Washington, D.C.: American Council for an Energy Efficient Economy.

Gold, Elliott, Marie-Claire Munnelly, Theodore Love, John Plunkett, Francis Wyatt. "Comprehensive and Cost-Effective: A Natural Gas Utility's Approach to Deep Natural Gas Retrofits for Low Income Customers." In *Proceedings of the ACEEE 2012 Summer Study on Energy Efficiency in Buildings*, #442, Washington, D.C.: American Council for an Energy Efficient Economy.