BEFORE THE
NOVA SCOTIA UTILITY AND REVIEW BOARD

An Application by EfficiencyOne for Approval of Supply Agreement for Electricity Efficiency and Conservation Activities between EfficiencyOne and Nova Scotia Power Inc., the establishment of a final agreement between the parties, and approval of a 2023 – 2025 Demand Side Management ("DSM") Resource Plan	Matter No. M10473

DIRECT TESTIMONY

OF

THEODORE M. LOVE
GREEN ENERGY ECONOMICS GROUP, INC.

On Behalf of
The Consumer Advocate

May 20, 2022

TABLE OF CONTENTS

I. INTRODUCTION AND SUMMARY

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS?

A. My name is Theodore M. Love, and I am a partner at Green Energy Economics Group, Inc. ("GEEG"), an energy consulting firm founded in 2005. My office address is 2534 Downingsville Rd, Lincoln, Vermont.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. My testimony is submitted on behalf of the Consumer Advocate ("CA").

Q. PLEASE BRIEFLY DESCRIBE YOUR QUALIFICATIONS?

A. I have been involved in the review and preparation of natural gas and electric energy efficiency plans, as well as potential studies and cost-effectiveness analyses, in nearly a dozen states, three Canadian Provinces, and China, since I began working with GEEG in 2007. My educational background and relevant experience are set forth in my resume attached as Exhibit TML-1 to my testimony.

Q. PLEASE DESCRIBE YOUR WORK WITH ENERGY EFFICIENCY AND CONSERVATION PLANS IN CANADA.

A. I have represented the Consumer Advocate on the Demand Side Management Advisory Group ("DSMAG") and reviewed EfficiencyOne's ("E1") DSM plans and reports since 2019. I have also recently presented evidence before the Ontario Energy Board on Enbridge Gas' Energy Efficiency Plan (EB-2021-0002) on behalf of the Small Business Utility Alliance.

Previously I have reviewed and analyzed a number of plans for electric and gas efficiency programs in British Columbia since 2007. I supported preparation of testimony regarding BC Hydro's 2006, 2008, and 2012 Integrated Electricity Plan and Long-Term Acquisition Plans; demand-side management ("DSM") plans by Terasen Gas in October

2008, and in November 2011, by its successor, Fortis Energy Utilities BC Gas. I also worked on testimony regarding FortisBC Electric's DSM Plan in March 2012.

In 2013, GEEG prepared a report benchmarking BC Hydro's 2012 efficiency investment plans based on updated industry experience and plans. I helped file evidence in two separate proceedings regarding gas and electric energy efficiency plans for 2014-15 submitted by both Fortis companies. All this work was done on behalf of the BC Sustainable Energy Association.

I have also assisted Green Communities Canada in Ontario, with the development and update of an energy efficiency savings calculation tool used by field staff in Ontario Power Authority's low-income program.

Q. HAVE YOU PRESENTED TESTIMONY IN PROCEEDINGS BEFORE THIS OR OTHER REGULATORY BOARDS?

A. Yes, I have previously provided evidence on EfficiencyOne's 2020 through 2022 DSM Plan (Matter No. M09096). I have also provided expert evidence in Ontario, California, and Pennsylvania.

Q. ARE YOU SPONSORING ANY EXHIBITS?

A. Yes, I am sponsoring the following exhibits:

1. Exhibit TML-1 –Resume of Theodore M. Love
2. Exhibit TML-2 – E1 response to CA IR-1
3. Exhibit TML-3 – E1 response to CA IR-2
4. Exhibit TML 4 – E1 response to NSUARB-22

Q. PLEASE PROVIDE A SUMMARY OF YOUR TESTIMONY AND FINDINGS.

A. I provide a review of the historical performance of EfficiencyOne's DSM portfolio, followed by a summary of the proposed scenarios for 2023 through 2025 along with my recommendations on the scenario that should be adopted. I then discuss affordability and related low-income targets, other program design concerns, avoided costs, and finish with a summary of my recommendations.

II. HISTORICAL PERFORMANCE

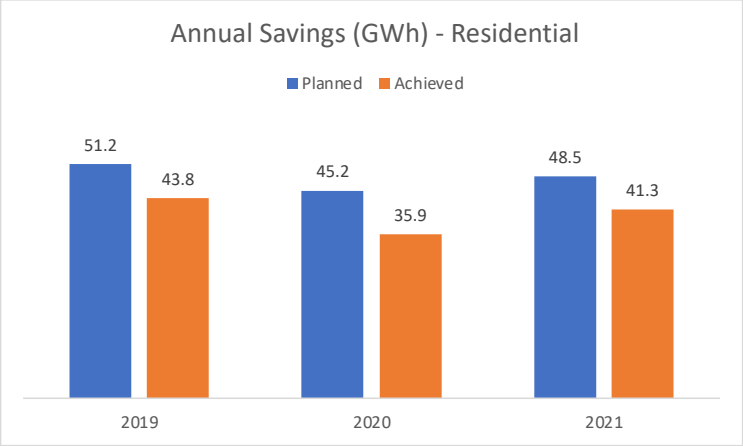
Q. WHAT IS AN APPROPRIATE TIME FRAME OVER WHICH TO EXAMINE THE CURRENT E1 PORTFOLIO?

A. I believe that looking back three years to performance from 2019 represents an appropriate time frame to analyze E1's historical performance. While the current portfolio of programs was designed and approved for 2020 through 2022, there has been significant challenges in market conditions with the outbreak of COVID-19 in mid-2020 affecting program performance in Nova Scotia and across North America and the world. By going back to 2019, we can get a clearer picture of how E1 has performed in more normal market conditions.

Q. HOW HAVE THE RESIDENTIAL PROGRAMS PERFORMED IN THE PAST THREE YEARS?

A. The following graph shows the projected savings for 2019 through 2021 against the achieved savings for the residential sector.

Figure 1. Plan vs. Achieved Annual Savings - Residential

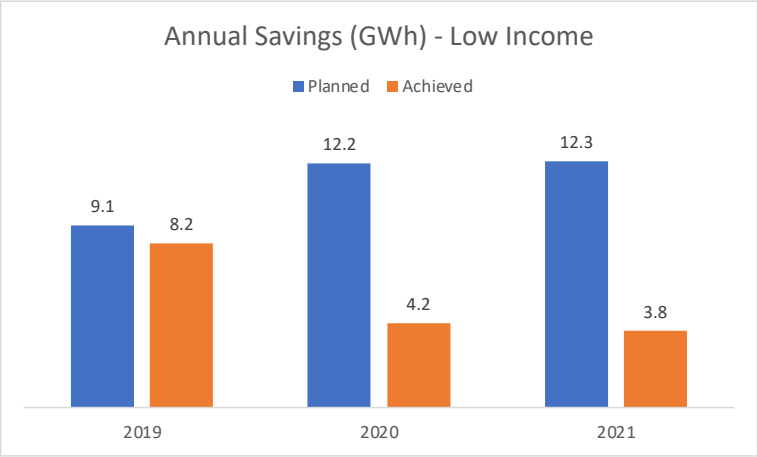


Since 2019, E1's savings goals have declined slightly. Despite the COVID-19 pandemic, E1 has been able to keep achieved savings relatively in line with projections for the residential sector as a whole, with a cumulative gap over the three years of 23.9 GWh, or about 16% of the overall savings targets for the years. However, the gap is much larger for the low-income sector.

Q. HOW HAVE THE LOW-INCOME PROGRAMS PERFORMED IN THE LAST THREE YEARS?

A. The following graph shows the projected savings for 2019 through 2021 against the achieved savings for the low-income portion of E1's portfolio, both residential and business sectors.

Figure 2. Plan vs. Achieved Annual Savings – Low-income

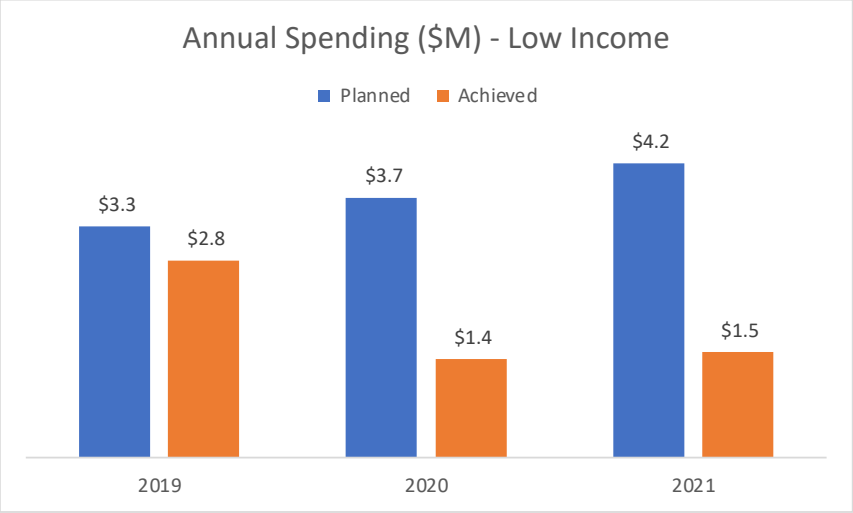


E1 has struggled to reach low-income savings targets in 2020 and 2021, and fallen significantly behind as shown in Figure 2. While savings were close to projections in 2019, the onset of the COVID-19 pandemic dropped savings in half for 2020 and 2021, while targets had gone up 33%. By the end of 2021, the gap between cumulative savings targets had grown to 17.2 GWh, or 52% of the cumulative savings goals.

Q. HAS SPENDING ON LOW-INCOME ACTIVITY ALSO LAGGED IN THE PAST THREE YEARS?

A. Yes, As the following figure shows, spending has lagged in a similar fashion to savings for the low-income sector.

Figure 3. Plan vs. Achieved Spending – Low-income



Since both savings and spending lagged in a similar manner, the cost to acquire low-income savings increased only modestly from projections. The cumulative cost of first year savings was $0.39 per kWh, compared to a projected cost of $0.34 per kWh.

III. PROPOSED SCENARIOS

Q. WHAT SCENARIOS HAS EFFICINECYONE PROPOSED?

A. E1 has developed two scenarios. The first, the Settlement Plan, will deliver approximately 413 GWh of incremental annual electric savings and 78.8 MW of demand savings at a cost

of $173 million over three years. The Settlement Plan has a Total Resource Cost Test (TRC) benefit-cost ratio (BCR) of 2.0 when including carbon costs.

The Alternate Plan is projected to deliver 377 GWh of incremental annual electric savings and 84.7 MW of demand savings at a cost of $160 million over three years. The Alternate Plan also has a TRC BCR of 2.0 when including carbon costs.

Q. HOW WERE THESE SCENARIOS DEVELOPED?

A. E1 developed these scenarios through a comprehensive process that included an extensive stakeholder engagement through the DSMAG at multiple stages over the past year. The stakeholder process provided an excellent way to understand and provide feedback on the initial framework, base assumptions, multiple rounds of scenario, and ultimately gain consensus on an acceptable scenario.

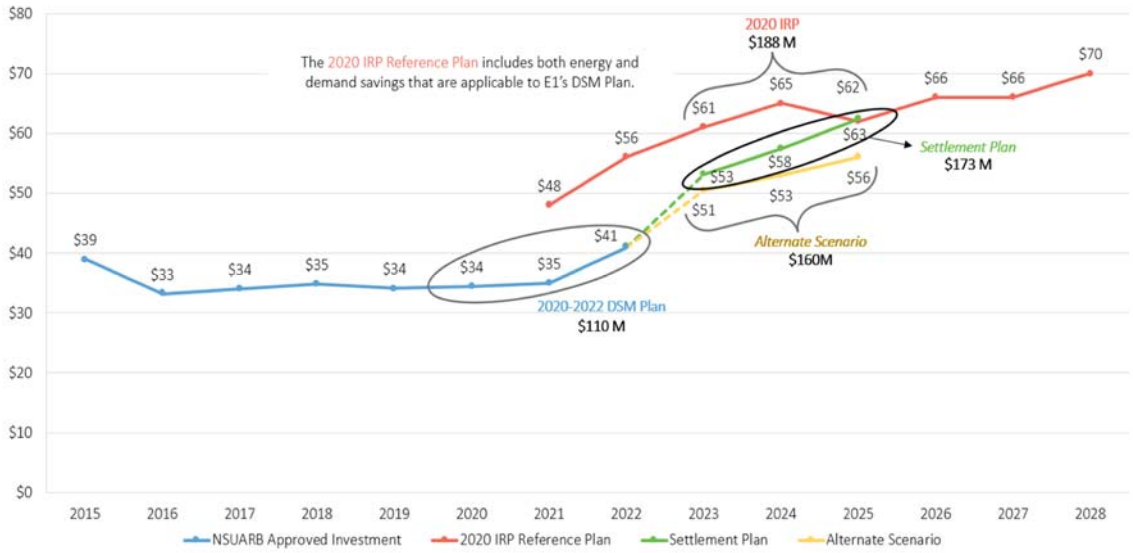
Q. WHAT SCENARIO DO YOU RECOMMEND AND WHY?

A. I recommend that the Board adopt the Settlement Plan since it represents a significant step in the right direction for efficiency saving and investment levels that have lagged those considered optimal for Nova Scotia under the IRP process. The Alternate Scenario does not provide a large enough step in this direction, and for that reason should be rejected.

The lower levels of DSM that E1 has pursued in the past has led to a significant gap in investment against the level of identified as "optimal" in both the 2014 IRP and the 2020 IRP. This gap continues to widen for every year that the portfolio provides lower savings than optimal, and these effects stack up as Nova Scotians continue to miss out on the long-term savings that continue from previous years. The Settlement Plan provides a path to bridge this investment gap as shown in the following figure from page 41 of E1'S 2023-2025 DSM Resource Plan. While the Settlement Plan does not make up for lost investment

yet, it puts the portfolio in a position to do so in the future. The Alternate Scenario does not.

Figure 4. Comparison of Settlement Plan & Alternate Scenario to the 2020 IRP



Q. ARE THERE OTHER REASONS YOU SUPPORT THE SETTLMENT PLAN?

A. Yes. The Settlement Plan provides a significant increase in investment and savings for Nova Scotia's low-income residents. As discussed earlier in this testimony, savings and investment have dragged even more for this sector than for the residential sector in general. The low-income population faces the highest energy burden and has been the most impacted by the COVID-19 pandemic. The projected spending level of $35.8 million, 21% of total investment, for low-income customers is much higher than the previous average of 8% for the 2015 to 2020. This increased goal is a very important step in making the plan more equitable and helping address broader issues in Nova Scotia.

Q. WILL E1 BE ABLE TO RAMP UP ACTIVITY TO MEET THE RECOMMENDED SETTLEMENT PLAN?

A. Yes, I believe that the currently projected activity is achievable. However, I do have some concerns regarding the ability to meet low-income saving and investment levels given recent historical performance in this sector as I discuss further in this testimony.

IV. AFFORDABILITY

Q. HOW HAS THE BOARD ADDRESSED AFFORDABILITY CONCERNS RELATED TO DSM INVESTMENT IN THE PAST?

A. The Board has clearly recognized that there are two perspectives to take on affordability: a short-term perspective and a long-term one. The Board has determined that it is not in the best interest of Nova Scotia to weigh only short-term costs, without considering the long-term benefits of energy efficiency, as reflected in the following statement:

> "The Board does not believe that ratepayers are well-served, or that it is in their best interests to focus only on short-term costs and thereby deny customers the real long-term cost savings that are possible from a balanced and properly implemented DSM program." (2016-18 Plan Decision. Page 29 para 82)

This implies that, while important, short-term impacts should not be the sole driver of decision-making regarding investments in DSM. A balance must be found, and it is possible for modest short-term impacts to be offset by greater long-term benefits.

Q. HOW WILL THE INCREASED DSM SPENDING FROM THE SETTLEMENT PLAN AFFECT AFFORDABILITY?

A. The Rate and Bill Impact Analysis (RBIA) provided by EfficiencyOne shows that short term rate impacts for residential customers are on the order of 3.5% to 4.5% for 2023 to 2025. However, the benefits from energy efficiency run deep, and the types of measures that E1 invests in last for an average 11.1 years, as shown by their weighted average measure lifetime. These long-lasting benefits also protect customers against future rate

increases. Looking at a longer-term perspective, the rate impact for residential customers through 2039 from the Settlement Plan is a relatively small average annual impact of 0.78%, which is slightly below the long-term average rate impact from the 2020 to 2022 plan for residential customers of 0.80%. These small rate impacts are more than made up for by customer savings, and average bill impacts for residential customers at negative 1% averaged across both participants and non-participants. In addition, the increased scope and spending of the Settlement Plan allows E1 to reach more customers and lower bills for a broader range of customers.

Q. ARE THERE OTHER ASPECTS OF AFFORDIBILITY THAT SHOULD BE CONSIDERED?

A. Yes. One of the most important aspects of affordability is the effect of DSM investments on classes of customers who are most acutely affected by changes in energy costs. This includes low-income customers and those groups of customers who may have additional barriers to participation in energy efficiency programs, such as tenants and First Nations customers.

V. ADDRESSING UNDERSERVED COMMUNITIES

Q. HOW IS E1 ADDRESSING UNDERSERVED COMMUNITIES?

A. E1, with feedback from the DSMAG, has worked to make equity and diversity a central aspect of its balanced plan approach, as highlighted in Section 4 of their DSM Resource Plan Filing. Specifically, they have identified the following design objectives related to diversity and access for underserved communities:

1. Low-income investment is 17-22% of total energy efficiency investment. This aligns with 2016 Census data for low-income prevalence in Nova Scotia.
2. Expansion of education and outreach for diverse and underserved communities.
3. Increased diversity of energy and demand savings to further help customers achieve cost-effective energy solutions.

4. Expanded accessibility for a wider variety of market sectors and customer segments.

Q. HAVE THESE DESIGN OBJECTIVES BEEN INTERPRETTED IN THE SETTLEMENT PLAN?

A. Yes. The Settlement Plan provides significantly expanded investment for underserved communities, mainly through the addition of the Affordable Single-Family Homes Program and the expansion of the Mi'kmaw and Diverse Community initiatives.

Q. WHAT LEVEL OF SAVINGS AND INVESTMENT IS E1 PROPOSING FOR THESE INITIATIVES?

A. E1 is proposing an investment in residential low-income efficiency of $35.2 million resulting in first year savings of 36.5 GWh over the three years of the plan, with around two-thirds of the investment in the new Affordable Single-Family Homes program. This represents approximately 43% of all residential energy efficiency spending and 19% of first year residential energy savings. E1 also projects about $0.6 million will be spent on low-income customers from the business, non-profit, and industrial ("BNI") sector, with first year savings of approximately 2.9 GWh. Overall spending is projected at $35.8 million, 21% of the DSM portfolio, and first year savings of 39.4. GWh, 10% of the DSM portfolio.

Q. HOW DOES THIS COMPARE TO THE CURRENT PHASE?

A. The following tables compares the proposed low-income spending for the Settlement Scenario Plan to the compliance plan filing for the 2020 through 2022 DSM portfolio.

Table 1. Comparison of Low-Income investment Dollars for the Settlement Plan vs. 2020 to 2022 Plan ($ Million)

Sector	'20-'22 Compliance Plan	'23-'25 Settlement Plan	Difference ($M)	Difference (%)
Residential	11.2	35.2	24.0	214%
BNI	1.7	0.6	(1.1)	-65%
Total	12.9	35.8	22.9	178%

The Settlement plan represents more than a tripling of investment dollars for residential customers, and near tripling of overall investment. This increase in spending can be primarily linked to the new Affordable Single-Family and Multifamily programs.

The following tables compares the proposed low-income savings for the Settlement Scenario Plan to the compliance plan filing for the 2020 through 2022 DSM portfolio.

Table 2. Comparison of Low-Income First Year Savings for the Settlement Plan vs. 2020 to 2022 Plan (GWh)

Sector	'20-'22 Compliance Plan	'23-'25 Settlement Plan	Difference (GWh)	Difference (%)
Residential	22.9	36.5	13.6	59%
BNI	14.6	2.9	(11.7)	-80%
Total	37.5	39.4	1.9	5%

Savings projections for low-income customers have not increased significantly between the two plans, due to an 80% drop in savings from the BNI sector offsetting much of the nearly 60% growth in savings projections for the residential sector. It is unclear to me why savings from activity in the BNI sector shows such a significant drop in projected savings. E1's response to CA IR-2 (Exh. TML-3) provided a document titled "Estimation of DSM Low-Income Impacts for the 2023-2025 DSM Resource Plan" which provides an outline of the methodologies used to allocate low-income savings. This document and E1's

response did not indicate any change in the methodology of savings allocations that would explain this drop.

Q. DO YOU BELIEVE THE SETTLEMENT PLAN WILL RESULT IN INCREASED ENERGY SAVINGS FOR UNDERSERVED COMMUNITIES?

A. Yes. The Settlement Plan includes a very substantial increase in funding for programs that provide direct benefits for underserved communities, as opposed to the ex-post attribution for the BNI sector from the current phase. In addition, E1 has only achieved 8 GWh of first year savings two-thirds of the way through its current phase, or only 21% of its three-year goal. I am primarily concerned that E1 will continue to fall further behind if they are unable to ramp up activity successfully to reach these higher savings and spending targets.

Q. HOW WILL EFFICIENCYONE RAMP UP TO MEET THESE TARGETS?

A. E1 directly addresses this question in their response to CA IR-01 (Exh. TML-2), where they describe how projections assume no periods of isolation, as during the COVID-19 pandemic, that could disrupt in-home service delivery. They also mention "robust marketing and customer outreach efforts", as well as expanded measure offerings and updated incentives. While all off these are extremely important, I am concerned it may take substantial effort to almost immediately more than triple investment in this area. In my experience, retrofit programs, such as the Affordable Single-Family Homes Program, are some of the most difficult to ramp up, especially as the home performance industry faces workforce shortages. It is my understanding that E1 will be utilizing their experience running the HomeWarming program to get to investment levels of $8 million per year starting immediately in 2022 for the Single-Family Homes Program. I hope that E1 can accomplish this goal, but still have some reservations regarding E1's ability to achieve it.

Q. HOW DO YOU RECOMMEND THE BOARD ADDRESS YOUR CONCERNS REGARDING LOW-INCOME RAMP UP?

A. I recommend that the Board specifically establish cumulative first year low-income savings of 39.4 GWh. as a performance target, and not just a performance threshold or metric. By stating that E1 must meet 90% of this low-income savings target in order to be in substantial compliance with the overall plan's Performance Targets, E1 will have a clear incentive to make sure that investment in energy efficiency in underserved communities will not fall behind and be covered up by savings from other residential or BNI programs.

VI. PROGRAM DESIGN

Q. IS E1 PLANNING ON ANY COORDINATION OF ITS BEHAVIOUR PROGRAM WITH NS POWER'S CUSTOMER ENERGY MANAGEMENT (CEM) SYSTEM?

A. It is not clear. E1's response to NSUARB IR-22 (Exh. TML-4) stated:

> *"E1 understands through NS Power's Customer Energy Management (CEM) matter that the CEM system is not considered to be a DSM program but rather an engagement tool that can direct customers to E1's energy efficiency programs."*

This implies that they may not think that there needs to be coordination between the programs.

Q. DO YOU BELIEVE E1'S BEHAVIOUR PROGRAM SHOULD BE COORDINATED WITH NS POWER'S CEM?

A. Yes. This would help lower costs and time for both setting up and running the behavior program and help E1 and Nova Scotia Power avoid double counting savings from the two similar efforts.

Q. DO YOU HAVE ANY COMMENTS ON MEASURES OFFERED IN THE GREEN HEAT PROGRAM?

A. Yes. I was pleased to see that the minimum efficiency levels required for space heating heat pumps were sufficiently high and in line with other leading jurisdictions. However, I am not sure why the domestic hot water heating minimum only requires 3 element water

heaters. While these may be better than 2 element water heaters, a heat pump water heater would provide more savings. There may be some situations where heat pump water heaters are not feasible due to space limitations, in which case a 3-element water heater might be the best option available, but otherwise a heat pump water heater should be the minimum offered by the program.

Q. DO YOU HAVE ANY COMMENTS REGARDING THE NEW HOME CONSTRUCTION PROGRAM?

A. Yes. E1 is phasing out the residential new home construction program and only providing support for residential new construction through enabling strategies. While I support the Settlement Plan as a whole, I think it is a mistake to drop financial incentives for new home construction completely, particularly for building shell measures. The insulation, windows and doors will remain for many decades and will be much more expensive to come back later to upgrade. Contractors building new homes will not be the ones paying the electric bill, so may choose to cut costs on the building shell such as insulation, windows and doors. Providing incentives can encourage builders to make the upgrades at the time of initial construction if at least some of the incremental costs are offset. Returning later to make those upgrades would be far more expensive than the incremental costs of the upgrades at the time of the new home construction. Having a better insulated house also allows for easier adoption of heat pumps and permits downsizing of the HVAC equipment. I hope that a future portfolio will see a return to supporting further improvements in building shells for new home construction, and that a reexamination of avoided costs may help make such an effort worthwhile.

VII. AVOIDED COSTS

Q. DO THE AVOIDED COSTS USED BY E1 FOR CALCULATING TOTAL RESOURCE COST (TRC) BENEFITS REFLECT THE PRESENT CONDITIONS?

A. No. The avoided costs used by E1 in its Application are understated. There have been a few recent updates to policy in Nova Scotia that have made some of the current avoided costs assumptions used in the current plan no longer reflective of the future energy landscape in Nova Scotia. Specifically, the enaction of a 2030 Renewable Electricity Standard and the passing of Bill 57 (Environmental Goals and Climate Change Reduction Act), both of which may lead to significantly higher marginal electric avoided costs. In addition, EfficiencyOne's witness David Hill addresses many of the ways in which the values used in the application are too conservative and do not reflect the true avoided cost value.

Q. WHY DOES THIS MATTER?

A. While it may not affect the MWh savings projected in the Application, it will understate the value of those savings. This could lead to measures or programs appearing not cost effective and possibly being inappropriately dropped in the future. By understating the benefits of the electricity savings, the full value of the E1 DSM programs will not be appropriately reflected and could lead to non-economic choices in the future. E1 may also use these avoided costs to screen projects for cost effectiveness for its Custom Program offerings and make a decision on whether or not to pursue a project based on flawed assumptions.

Q. HOW SHOULD THIS UNDERCOUNTING OF BENEFITS BE ADDRESSED?

A. I support the recommendations of David Hill and further recommend that, if the Board approves a plan, E1 should work with Nova Scotia Power to develop an updated set of

avoided costs that aligns with current legislation and any Integrated Resource Plan ("IRP") assumptions. These avoided costs should be subjected to the same stakeholder process undertaken for the development of the plan, with the goal of including updated cost-effectiveness results as part of E1's next annual report.

VIII. CONCLUSION

Q. PLEASE SUMMARIZE YOUR KEY FINDINGS AND OBSERVATIONS

A. In summary, I respectfully recommend that the Board should:

1) Adopt the proposed Settlement Plan and reject the Alternate Plan.
2) Adopt cumulative first year low-income savings of 39.4 GWh as a performance target, and not just a performance metric.
3) Coordinate the management of the Behavior program with Nova Scotia Power's CEM.
4) Include heat pump water heaters as a measure in the Green Heat Program.
5) Examine ways to return to providing incentives for shell measures in the New Home Construction Program.
6) Recalculate avoided costs to align with current legislation and IRP assumptions, with the goal of providing updated cost-effectiveness results in the next annual report.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

THEODORE M. LOVE

2534 Downingsville Rd. | Lincoln, VT 05443
(919) 949 – 5906
tlove@greenenergyeconomics.com

Professional Experience

Green Energy Economics Group, Inc. – Cuttingsville, VT
Partner 2017 to Present
Senior Associate and Data Scientist 2013 to 2017
Associate 2010 to 2013
Analyst 2007 to 2010

For over 15 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
Consultant
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
Client Reporting Analyst
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)

Economic and Policy Analysis
Small Business Utility Alliance – Ontario, CA *(June 2021 – Present)*

- Provided analysis and evidence on Enbridge Gas of Ontario's 2023 through 2027 DSM Plan.

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.

Program Management and Benefit Cost Analysis Expert
Public Service Enterprise Group (PSEG) – New Jersey *(October 2021 – Present)*

- Consulted on forecasting and management of PSEG's internally run commercial Engineered Solutions and Direct Install programs.
- Assisted with rollout of tracking system for PSEG DSM portfolio.
- 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.
- 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 Regulatory Support for DSM Portfolio
Columbia Gas of Pennsylvania - Pittsburgh, Pennsylvania (February 2022 – Present)

- Developed a three-year voluntary gas energy efficiency plan and provided supporting testimony under Docket No. P-2014-2459362.

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;
    - 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);
    - 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 PUC** R-2022-3031211. Columbia Gas of Pennsylvania – Rate Case. March 2022.

   Three-year energy efficiency plan proposal.

2. **Ontario Energy Board (OEB),** EB-2021-0002. Enbridge Gas Inc. – Multi Year Demand Side Management Plan (2022 – 2027); Small Business Utility Alliance. December 2021.

   Analysis of commercial program goals and program design.

3. **California Public Utility Commission (CPUC)**, R. 21-02-014. Rulemaking to Address Energy Utility Customer Bill Debt Accumulated During the COVID-19 Pandemic. Small Business Utility Advocate, April 2021.

   Report on Analysis of Small Business Utility Bill Arrearages in California during COVID-19

4. **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.

5. **Nova Scotia Utility and Review Board (NSURB)** 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.

6. **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.

7. **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.

8. **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.

9. **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.

10. **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.

11. **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.

M10473 – EfficiencyOne (E1) Application for Approval of a Supply Agreement for Electricity Efficiency and Conservation Activities between E1 and NS Power (2023-2025 DSM Plan)

E1 Responses to Consumer Advocate (CA) Information Requests
NON-CONFIDENTIAL

Request IR-01:

In the past, E1 has underperformed in meeting its planned low-income spending and savings amounts. How will E1 ensure that it meets its low-income projected spending and savings amounts in 2023-2025?

Response IR-01:

The low-income impacts estimated for EfficiencyOne's (E1) 2023-2025 DSM Plan period includes low-income impacts from programs specifically targeted to low-income customers, as well as low-income impacts from other E1 programs, referred to as 'incidental' low-income programming. E1 has identified a number of barriers to participation in low-income programming, including affordability, awareness, resources, trust, and split incentives for rentals. The Settlement Plan includes new program components, and enhancements to existing program components, that provide broader access to low-income programming and address participation barriers. For example, the Affordable Multi-family Housing and Non-Profit Organization program component includes new ways to access rebates for heat pumps and heat pump water heater measures that address barriers to participation for property owners with smaller buildings requiring more efficient space or water heater measures. Similarly, the Efficient Product Installation program component includes new, electrician-installed measures like occupancy sensors and smart thermostats that address barriers of affordability, and information and resources to organize and install such measures.

Participation in low-income programming is supported by robust marketing and customer outreach efforts, which are strengthened by advancements in energy analytics that enable E1 to effectively identify and target low-income customers with personalized messaging and offers. For example, E1's data-based outreach and marketing plan includes a targeted email journey that

offers one-on-one appointment booking and application assistance with members of E1's outreach team. E1 is committed to meeting its low-income projected spending and savings amounts in 2023-2025 and has assumed no further periods of isolation due to the COVID-19 pandemic during this period which could lead to suspension of in-home and in-business activities.

M10473 – EfficiencyOne (E1) Application for Approval of a Supply Agreement for Electricity Efficiency and Conservation Activities between E1 and NS Power (2023-2025 DSM Plan)

E1 Responses to Consumer Advocate (CA) Information Requests
NON-CONFIDENTIAL

Request IR-02:

How will E1 accurately attribute DSM savings for low-income customers in each of its programs? Of particular interest are the prescriptive programs.

Response IR-02:

Please refer to Attachment 1 of this IR response for a description of how low-income (LI) savings were estimated for all DSM programs in the 2023-2025 DSM Resource Plan. Low-income savings for existing program components relied on the current methodology in use by EfficiencyOne (E1). E1 intends to review and update the methodology as required, pending the release of 2021 Census data.

In cases where the DSM Plan model outputs did not provide the necessary information for E1 to calculate LI impacts in the manner it reports on historical LI impacts, the ratios of reported 2020 LI impacts to total LI impacts within each program component were used as scaling factors to estimate the 2023-2025 LI impacts.

EfficiencyOne

Estimation of DSM Low-Income Impacts for the 2023-2025 DSM Resource Plan

Last Updated:
November 15, 2021

1. OBJECTIVE AND BACKGROUND

EfficiencyOne (E1) has included programs that are considered to be dedicated low-income programming in the DSM Plan scenarios explored in round 1 and round 2 modelling for the 2023-2025 DSM Plan. It has also assumed that low-income Nova Scotians participate in other E1 programs in varying proportions; this is "incidental" low-income programming. This document describes how low-income impacts were estimated for the 2023-2025 DSM Plan. For most programs with incidental low-income participation, E1's historical low-income reporting relies on information about actual projects (e.g. building type, income level) which is not available through DSM Plan modeling. For this reason, most estimates were scaled based on the reported 2020 incidental low-income impacts.

2. KEY ASSUMPTIONS

County Prevalence (CP) of Low-Income Nova Scotians

Census data for Nova Scotia provides the population and percentage of low-income residents by county. The percentage of low-income Nova Scotians in a certain county, using Low-Income Cut-off Before Tax (LICO-BT) is the County Prevalence (CP) for that county, as shown in Table 1.

Table 1: LICO-BT Thresholds by Nova Scotia County

Counties	LICO-BT	Population
Annapolis	11.4%	20,591
Antigonish	7.5%	19,301
Cape Breton	12.5%	98,722
Colchester	9.9%	50,585
Cumberland	11.5%	30,005
Digby	9.8%	17,323
Guysborough	7.3%	7,625
Halifax	12.7%	403,390
Hants	7.7%	42,558
Inverness	7.3%	17,235
Kings	10.0%	60,600
Lunenburg	8.6%	47,126
Pictou	10.0%	43,748
Queens	11.6%	10,351
Richmond	6.9%	8,964

Counties	LICO-BT	Population
Shelburne	7.6%	13,966
Victoria	5.2%	7,089
Yarmouth	9.6%	24,419
	11.1%	**923,598**

Overall Prevalence (OP) of Low-Income Nova Scotians

The percentage of low-income residents for Nova Scotia is reported as 11.1% for Nova Scotia from the 2016 Census data using Low-Income Cut-off Before Tax (LICO-BT). This is the Overall Prevalence (OP).

Apartment Prevalence (AP) of Low Income Nova Scotians

Research commissioned by E1 in 2015 reported on the incidence of low income Nova Scotians in apartment buildings. The conclusion was that 53% of 1-unit apartment residents are low income, and 57% of 2-4 unit apartment residents are low income. E1 currently uses the average, 55%, as the Apartment Prevalence (AP).

Energy, Demand, Expenditures, and Participants

The calculations used in this document use the general term "savings". The same calculations are applied to energy savings, peak demand savings, and program expenditures.

3. PROGRAM CALCULATIONS

Table 2: Residential Sector Programs: Low-Income Assumptions and Calculations

Program	Program Component	Assumptions	Calculation for 2023-2025 DSM Plan
Residential Efficient Product Rebates	Instant Savings	Low-income Nova Scotians are assumed to be 10% as likely to participate as the general population (as estimated by a local low-income expert).	Low-income IS savings = (total IS savings) x (OP) x (10%) Energy savings, demand savings, and expenditures are each estimated with the formula above.
	Appliance Retirement	DSM Plan scenarios include retirements, and full-service market rate replacements, under the ARET program. Low Income Nova Scotians are assumed to be 10% as likely to participate as the general population (as estimated by a local low-income expert).	Low-income ARET savings = (total ARET savings) x (OP) x (10%) Energy savings, demand savings, and expenditures are each estimated with the formula above.
Existing Residential	Home Energy Assessment	No low-income participation.	No low-income participation.
	Green Heat	No low-income participation.	No low-income participation.
	Efficient Product Installation	Homes: Income disclosure is optional for this program component. Low-income participants are tracked where income information is available; otherwise low-income Nova Scotians are assumed to participate in proportion to the general population, within each county. Apartments: Income disclosure is optional for this program component. Low-income participants are tracked where income information is available; otherwise the proportion of low income tenants in participating apartments is assumed to be the	Low-income EPI energy savings = (total EPI savings) * (35%) Low-income EPI demand savings = (total EPI savings) * (36%) Low-income EPI expenditures = (total EPI expenditures) * (19%)

Program	Program Component	Assumptions	Calculation for 2023-2025 DSM Plan
		same as the proportion of low-income tenants in Nova Scotia apartments overall. Total low-income savings for EPI = (Homes tracked low-income savings) + (Homes low-income savings from undisclosed income groups in all counties) + (Apartments tracked low-income savings) + (Apartments low-income savings from undisclosed income group) In 2020, low-income participation in EPI represented: - 35% of energy savings - 36% of demand savings - 19% of expenditures	
	Affordable Multi-Family Housing (AMF)	Exclusively low income. Focus on helping low-income renters and non-profits that provide shelter.	Low-income AMF savings = total AMF savings
	Mi'kmaw Home Energy Efficiency Project	Exclusively low income. Focus on community members who have greatest need.	Low-income MHEEP savings = total MHEEP savings
	Affordable Single-Family Housing (ASF)	Exclusively low income.	Low-income ASF savings = total ASF savings
	Residential Solar PV	No low-income participation.	No low-income participation.
	Residential Behaviour	Low-income Nova Scotians are assumed to participate in proportion with the general population.	Low-income RB savings = (total RB savings) * (OP) Energy savings, demand savings, and expenditures are each estimated with the formula above.
New Residential	New Home Construction	No low-income participation.	No low-income participation.

Table 3: BNI Sector Programs: Low-Income Assumptions and Calculations

Program	Program Component	Assumptions	Calculation for 2023-2025 DSM Plan
BNI Efficient Product Rebates	Business Energy Rebates – Mail-In (BER-MI) and Instant Rebates (BER-IR)	Actual program participants are apartment building owners. Avoided energy benefits are assumed to flow-through to tenants either a) directly, where tenants pay power bills, or b) indirectly, by means of deferred increases in rent. Upgrades done in apartment buildings are assumed to benefit low-Income Nova Scotians in proportion with the Apartment Prevalence factor, except for upgrades at Housing NS facilities, which exclusively benefit low-income Nova Scotians. *BER-MI:* Low-income savings = (total savings from Housing NS projects) + (Total Residential Savings [Excluding Housing NS]) X (Low Income Apartment Prevalence Factor) *BER-IR:* BER-IR low income savings = [(BER-Ml low-income savings)/ (BER-Ml total savings)] x BER-IR total savings In 2020, low-income participation in BER represented: - 1% of energy savings - 2% of demand savings - 1% of expenditures	Low-income BER energy savings = (total BER energy savings) * (1%) Low-income BER demand savings = (total BER demand savings) * (2%) Low-income BER expenditures = (total BER expenditures) * (1%)

Program	Program Component	Assumptions	Calculation for 2023-2025 DSM Plan
Custom Incentives	Custom	Actual program participants are apartment building owners. Avoided energy benefits are assumed to flow-through to tenants either a) directly, where tenants pay power bills, or b) indirectly, by means of deferred increases in rent. Upgrades done in apartment buildings are assumed to benefit low-Income Nova Scotians in proportion with the Apartment Prevalence factor, except for upgrades at Housing NS facilities, which exclusively benefit low-income Nova Scotians. Low-income savings = (total savings from Housing NS projects) + (Total Residential Savings [Excluding Housing NS]) X (Low Income Apartment Prevalence Factor) In 2020, low-income participation in Custom represented: - 0% of energy savings - 0% of demand savings - 0% of expenditures	Low-income Custom energy savings = (total Custom energy savings) * (0%) Low-income Custom demand savings = (total Custom demand savings) * (0%) Low-income Custom expenditures = (total Custom expenditures) * (0%)
	Energy Management Information Systems (EMIS)	No low-income participation.	No low-income participation.
	Strategic Energy Management (SEM)	No low-income participation.	No low-income participation.
Direct Installation	Small Business Energy Solutions	Actual program participants are apartment building owners. Avoided energy benefits are assumed to flow-through to tenants either a) directly, where tenants pay power bills, or b) indirectly, by means of deferred increases in	Low-income SBES energy savings = (total SBES energy savings) * (4%) Low-income SBES demand savings = (total SBES demand savings) * (6%)

Program	Program Component	Assumptions	Calculation for 2023-2025 DSM Plan
		rent. Upgrades done in apartment buildings are assumed to benefit low-Income Nova Scotians in proportion with the Apartment Prevalence factor, except for upgrades at Housing NS facilities, which exclusively benefit low-income Nova Scotians. Low-income savings = (total savings from Housing NS projects) + (Total Residential Savings [Excluding Housing NS]) X (Low Income Apartment Prevalence Factor) In 2020, low-income participation in SBES represented: - 4% of energy savings - 6% of demand savings - 2% of expenditures	Low-income SBES expenditures = (total SBES expenditures) * (2%)

M10473 – EfficiencyOne (E1) Application for Approval of a Supply Agreement for Electricity Efficiency and Conservation Activities between E1 and NS Power (2023-2025 DSM Plan)

E1 Responses to Nova Scotia Utility and Review Board (NSUARB) Information Requests
NON-CONFIDENTIAL

[Evidence]

Request IR-22:

On p. 42 of 65, Figure 6 notes proposed 2023 spending of $1.1 million for "Re-introduction of Behaviour". Tables 11 and 12 in Appendix A show a further spending of $2.2 million in each of years 2024 and 2025.

(a) Given that this is labelled as a "re-introduction", please explain how this proposed program aligns or differs from the any previous "behaviour" program.

(b) How will success be measured?

Response IR-22:

(a) Behaviour change programs are an essential component of demand side management portfolios to realize energy savings. Effective behaviour change programs achieve energy savings through changes in individual or organizational behaviour. Typically, behaviour energy efficiency programs are one of the most cost-effective ways for DSM administrators to achieve energy savings. Through the provision of insights, tips, and consumption information, participants are given the tools and motivation to make informed choices about their energy usage. Customers also benefit from these programs by recognizing bill savings immediately without incurring any incremental costs. This program complements other marketing strategies and outreach activities and allows EfficiencyOne (E1) to reach more Nova Scotians. Customers are introduced to other E1 efficiency programs resulting in even more bill savings.

E1, as the DSM administrator in Nova Scotia, has included a residential behaviour program component in the 2023-2025 DSM Plan. E1 understands through NS Power's Customer Energy Management (CEM) matter that the CEM system is not considered to be a DSM program but rather an engagement tool that can direct customers to E1's energy efficiency programs. Previously, E1 delivered the Home Energy Report, a behaviour energy efficiency program component, to Nova Scotia residents as part of its DSM portfolio. The reports provided residents with insights into their home's electricity use, including how their usage changed over time and how it compared to similar homes in their area. They also included practical energy saving tips and other tools and resources to help residents manage their electricity use. Re-introducing a behaviour change offer is important for E1 to reach more customers, round out its DSM portfolio, and deliver cost-effective savings in the future.

As part of the 2023-2025 DSM Plan, the design and delivery of the Residential Behaviour program will build upon the success of E1's former Home Energy Report program, which resulted in residents implementing more than 82,000 energy saving tips, without incurring any incremental costs. The 2023-2025 DSM Plan behavioural offer will be strengthened by E1's access to Advanced Metering Infrastructure (AMI) data and other advances in energy analytics, which will allow E1 to offer more personalized, actionable energy savings tips and recommendations, and increase participation in other residential programs.

(b) In the 2023-2025 DSM Plan, the energy savings assumptions for Residential Behaviour relied on an energy savings assumption of 2 percent savings per home, relative to a typical Nova Scotia home consumption. The percentage savings assumption was informed by Guidehouse, and an analysis of average consumption by home was performed by Guidehouse using 2021 NS data (10,362 kWh per home). These assumptions informed an annual energy savings estimate of 207 kWh per year per home.

Consistent with all DSM program components, the Residential Behaviour program component included in E1's 2023-2025 DSM Plan will be subject to annual independent third-party evaluation. Similar to the previously delivered Home Energy Report, it is expected that the evaluation will include usage comparisons before and after intervention and data from "treated" groups will be measured against a control group. E1 has initiated discussions with its independent evaluation consultant on the evaluation plan for 2023-2025, inclusive of the Residential Behaviour component.