
NOVA SCOTIA UTILITY AND REVIEW BOARD

In the Matter of Energy Efficiency Nova Scotia Corporation -
Application for Approval of its Electricity Demand Side Management Plan for 2013-2015
E-ENSC-R-12 / Matter No. M04819

**Direct Testimony of
Tim Woolf**

**On Behalf of
Counsel to Nova Scotia Utility and Review Board**

**On the Topics of
Rate Impacts, Bill Impacts, Participation Rates
and Multi-Year Planning Cycles**

May 22, 2012

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1 **1. INTRODUCTION AND QUALIFICATIONS**

2 **Q. Please state your name, title and employer.**

3 A. My name is Tim Woolf. I am a Vice-President at Synapse Energy Economics,
4 located at 485 Massachusetts Avenue, Cambridge, MA 02139.

5 **Q. Please describe Synapse Energy Economics.**

6 A. Synapse Energy Economics is a research and consulting firm specializing in
7 electricity and gas industry regulation, planning and analysis. Our work covers a
8 range of issues including integrated resource planning; economic and technical
9 assessments of energy resources; electricity market modeling and assessment;
10 energy efficiency policies and programs; renewable resource technologies and
11 policies; and climate change strategies. Synapse works for a variety of clients,
12 with an emphasis on consumer advocates, regulatory commissions, and
13 environmental advocates.

14 **Q. Please summarize your professional and educational experience.**

15 A. Before joining Synapse Energy Economics, I was a commissioner at the
16 Massachusetts Department of Public Utilities (DPU). In that capacity I was
17 responsible for overseeing a significant expansion of clean energy policies,
18 including an aggressive increase in ratepayer-funded energy efficiency programs;
19 the implementation of decoupled rates for electric and gas companies; an update
20 of the DPU energy efficiency guidelines; the promulgation of net metering
21 regulations; review of smart grid pilot programs; and review of long-term
22 contracts for renewable power.

23 Prior to being a commissioner at the Massachusetts DPU, I was employed as the
24 Vice President at Synapse Energy Economics; a Manager at Tellus Institute; the
25 Research Director of the Association for the Conservation of Energy; a Staff
26 Economist at the Massachusetts Department of Public Utilities; and a Policy
27 Analyst at the Massachusetts Executive Office of Energy Resources.

1 I hold a Masters in Business Administration from Boston University, a Diploma
2 in Economics from the London School of Economics, a BS in Mechanical
3 Engineering and a BA in English from Tufts University.

4 **Q. Please describe your professional experience as it relates to energy efficiency**
5 **policies and programs.**

6 A. Energy efficiency policies and programs have been at the core of my professional
7 career. While at the Massachusetts DPU I played a leading role in updating the
8 Department's energy efficiency guidelines, in reviewing and approving the recent
9 three-year energy efficiency plans, in reviewing and approving energy efficiency
10 annual reports, in leading a working group on rate and bill impacts, and
11 advocating for allowing energy efficiency to participate in the New England
12 wholesale electricity market. I served as a co-chair of the Working Group on
13 Utility Motivation as part of the State Energy Efficiency Action Network
14 sponsored by the US Department of Energy and the US Environmental Protection
15 Agency.

16 As a consultant I have reviewed and critiqued utility energy efficiency policies
17 and programs throughout the US, and I have testified on these issues in British
18 Columbia, Colorado, Delaware, Massachusetts, Minnesota, Nevada, Nova Scotia,
19 Québec, and Rhode Island. My work has encompassed all aspects of energy
20 efficiency program design and implementation, including efficiency measure
21 assessment, program delivery options, program budgeting, cost-benefit analyses,
22 avoided costs, utility performance incentives and other relevant regulatory
23 policies. I have represented clients on several energy efficiency collaboratives,
24 where policies and programs were discussed among a variety of stakeholders. In
25 2006 and 2007 I worked for the Nova Scotia Utility and Review Board (the
26 Board), along with other Synapse staff, assisting with the review of the 2007
27 Integrated Resource Plan (IRP).

28 **Q. On whose behalf are you testifying in this case?**

29 A. I am testifying on behalf of counsel to the Nova Scotia Utility and Review Board.

1 **Q. Have you testified previously before the Nova Scotia Utility and Review**
2 **Board (Board)?**

3 A. Yes. I presented testimony to the Board regarding the Energy Efficiency Nova
4 Scotia Corporation's (ENSC) Electricity Demand Side Management Plan for
5 2012, in Docket E-ENSC-R-10, Matter No. MO3669. My testimony in that
6 docket was also on behalf of counsel to the Board.

7 **Q. What is the purpose of your testimony?**

8 A. The purpose of my testimony is two-fold. First, I provide an overview of how
9 ENSC should be considering the rate impacts, bill impacts and participation rates
10 associated with its DSM Plans. Assessing these impacts is a critical aspect of
11 understanding the full implications of the proposed DSM programs, and should
12 become a routine component of every DSM plan filed with the Board. My
13 testimony on this subject is a follow-up to my testimony presented to the Board
14 regarding the ENSC Electricity Demand Side Management Plan for 2012, in
15 Docket E-ENSC-R-10, Matter No. MO3669. Second, I provide some comments
16 on the ENSC proposal to move to a multi-year planning cycle.

17 **Q. How is your testimony organized?**

18 A. My testimony is organized as follows:

- 19 1. Introduction and Qualifications.
- 20 2. Summary of Conclusions and Recommendations.
- 21 3. Rate Impacts, Bill Impacts and Participation Rates.
- 22 4. Multi-Year Planning Cycle

23 2. SUMMARY OF RECOMMENDATIONS

24 **Q. Please summarize your primary recommendations regarding rate impacts,**
25 **bill impacts and participation rates.**

26 A. I offer the following recommendations with regard rate impacts, bill impacts and
27 participation rates:

- 28 • ENSC should fully comply with the Board's order in last year's 2012 DSM
29 Plan docket to develop better information on rate and bill impacts for future
30 DSM proceedings.

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- 1 • ENSC should develop a methodology for analyzing rate and bill impacts with
2 input from the DSM Advisory Group. The DSM Advisory Group offers a
3 great opportunity for providing directional advice and stakeholder
4 perspectives on this important emerging issue.
- 5 • ENSC should complete its methodology, and develop rate and bill impact
6 estimates for its DSM Plan in time to be included in the first DSM Annual
7 Progress Report filing, expected in the first quarter of 2013.
- 8 • ENSC's methodology for analyzing rate and bill impacts should build upon
9 the methodology illustrated below in my testimony. In particular,
- 10 ♦ Rate and bill impact analyses should account for impacts over the long-
11 term in order to capture the full effect of energy efficiency savings.
- 12 ♦ Rate and bill impacts should separately identify the impacts on
13 (a) program participants, (b) program non-participants, and (c) all
14 customers on average.
- 15 ♦ Rate and bill impact analyses should estimate the number of program
16 participants, in order to provide an indication of the portion of
17 customers that experience bill reductions.
- 18 • ENSC should take steps to improve its methods for tracking customer
19 participation, including tracking by customer for each program and in each
20 year, in order to keep track of customers that may be double-counted.

21 **Q. Please summarize your primary recommendations regarding a multi-year**
22 **planning cycle for energy efficiency programs.**

23 A. I fully support the proposal to move to a multi-year planning cycle for energy
24 efficiency programs. However, I recommend that if ENSC proposes to make any
25 significant changes to the three-year plans then it should notify the Board of its
26 proposal in the relevant Annual Progress Report.

27 ENSC would only be required to notify the Board of significant proposed
28 changes, where significant changes would be defined as any of the following:

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- 1 • adding a new program that is not in the three-year plan;
 - 2 • terminating an existing program that is in the three-year plan;
 - 3 • increasing or decreasing three-year plan budgets for the total residential
 - 4 sector programs or the total business, non-profit and institutional (BNI) sector
 - 5 programs by more than 25 percent;
 - 6 • increasing or decreasing the three-year plan savings estimates of the total
 - 7 residential sector programs or the total BNI sector programs by more than 25
 - 8 percent.

9 If ENSC proposes to make any such significant change to its three-year plan, then
10 the Board will decide at that time whether to investigate the proposal in a formal
11 docket. In the meantime, ENSC would be able to continue to operate under the
12 presumption that it has on-going approval from the Board to continue to
13 implement its three-year plan as modified.

14 **3. RATE IMPACTS, BILL IMPACTS AND PARTICIPATION RATES**

15 **Q. Please summarize the recommendations you made to the Board regarding**
16 **rate impacts, bill impacts and participation rates in your testimony**
17 **regarding the 2012 DSM Plan.**

18 A. During the Board's review of the 2012 DSM plan, I testified on the importance of
19 properly accounting for rate and bill impacts associated with energy efficiency
20 programs. In my testimony, I recommended that the Board establish several key
21 principles regarding how to quantify and assess rate impacts. The specific
22 principles that I recommended be applied when quantifying rate impacts of
23 energy efficiency programs are as follows:

- 24 • Rate impact analyses should estimate the impacts of energy efficiency on
- 25 customer bills, as well as customer rates, because the primary direct benefits
- 26 of efficiency measures are reflected in the customer bills.
- 27 • Rate and bill impacts should separately identify the impacts on (a) program
- 28 participants, (b) program non-participants, and (c) all customers on average.

-
- 1 • Rate and bill impact analyses should estimate the number of program
2 participants, in order to provide an indication of the portion of customers that
3 experience bill reductions.
- 4 • Rate and bill impact analyses should account for impacts over the long-term
5 (e.g., using a study period that includes at least the average life of energy
6 efficiency measures), in order to capture the full effect of energy efficiency
7 savings.
- 8 • Rate and bill impact analyses should compare (a) the estimated rates and bills
9 resulting from the energy efficiency programs associated with IRP targets to
10 (b) the estimated rates and bills resulting from different levels of efficiency
11 programs.
- 12 • Rate and bill impact analyses should account for all the costs of energy
13 efficiency that are expected to affect rates.
- 14 • Rate and bill impact analyses should account for all the benefits of energy
15 efficiency that are expected to affect rates, including avoided generation costs,
16 avoided transmission costs, and avoided distribution costs.
- 17 I also recommended that the level of program participation, program design
18 issues, and overall benefits of the efficiency programs be considered in deciding
19 whether specific rate impacts are acceptable.

20 **Q. What did the Board find with regard to your recommendation?**

21 In its Order on ENSC's 2012 DSM Plan, the Board accepted my recommendation,
22 stating that there is a need to have better information on rate and bill impacts in
23 future proceedings, and directing ENSC to undertake the necessary consultation
24 with a view to providing enhanced information as suggested by me in connection
25 with the 2013 DSM Plan. (NSUARB-E-ENSC-R-10, 2011 NSUARB 99, page
26 29.)

1 **Q. How has ENSC complied with the Board's order regarding the 2012 DSM**
2 **Plan?**

3 A. In response to the Board's Order, ENSC retained Elenchus Research Associates
4 (Elenchus) to conduct an analysis of the projected rate and bill impacts of ENSC's
5 DSM programs for NSPI's ratepayers based on the cost projections contained in
6 the 2013-2015 DSM Plan. Elenchus was also charged with developing and
7 reviewing a cost allocation model to fully allocate costs to taxpayer-funded
8 programs and ratepayer-funded programs.

9 **Q. Please describe ENSC's proposed rate and bill impact analysis.**

10 A. The rate and bill impacts provided by Elenchus highlight the year-to-year change
11 in rates and bills resulting from the proposed DSM programs. Elenchus also
12 provided the total change in rates and bills by the end of 2015, as compared to the
13 rates and bills from 2012. Table 1, below, summarizes the rate and bill impacts
14 for each customer class, as presented in the Elenchus report.

15 Elenchus states that the bill and rate impacts provided in its report should be
16 viewed as indicative only. Actual impacts will vary for a number of reasons,
17 including when the cost allocation model is used to allocate ENSC's actual costs,
18 variations in actual program costs from preliminary budgets, as well as variations
19 in rates and load forecasts in future years (Appendix C, 13).

20 **Table 1: Summary of ENSC's Proposed Rate and Bill Impacts**

Rate Class	Bill Impacts			
	2013	2014	2015	Total
Residential	(0.5%)	0.3%	0.4%	0.2%
Small General	(1.7%)	(0.3%)	(0.0%)	(2.0%)
General Demand	1.0%	(0.2%)	(0.0%)	0.8%
Large General	4.4%	(0.0%)	0.1%	4.5%
Small Industrial	(1.3%)	(0.2%)	(0.1%)	(1.7%)
Medium Industrial	(2.2%)	(0.0%)	0.1%	(2.1%)
Large Industrial	(0.4%)	0.0%	0.1%	(0.3%)
ELI 2P-RTP	(0.8%)	0.0%	0.0%	(0.8%)
Municipal	0.3%	0.1%	0.3%	0.6%
Unmetered	12.1%	(0.1%)	(0.2%)	11.8%
Bowater Mersey (AE only)	0.3%	0.0%	0.1%	0.4%
Gen. Repl. / Load Foll.	1.3%	0.1%	0.1%	1.4%

1 **Q. In your opinion, has ENSC adequately complied with the Board's order and**
2 **your principles regarding the proper assessment of rate and bill impacts**
3 **resulting from energy efficiency programs?**

4 A. No, not entirely. While ENSC has considered the impact on rates and bills from
5 its DSM programs, it has done so in only a limited fashion.

6 **Q. Please explain how ENSC has not fully addressed your recommendations.**

7 A. ENSC's rate and bill impact analysis ignores three of the principles that I
8 presented in my previous testimony, and that the Board supported in its order.
9 First, ENSC has not provided rate and bill impact analyses that account for
10 impacts over the long-term (e.g., using a study period that includes at least the
11 average life of energy efficiency measures). The ENSC analysis therefore does
12 not account for the full effect of energy efficiency savings on rates and bills.
13 Second, ENSC has failed to present rate and bill impact analyses that account for
14 all the benefits of energy efficiency that are expected to affect rates (i.e.,
15 including avoided generation costs, avoided transmission costs, avoided
16 distribution costs, and avoided environmental compliance costs.) Finally, ENSC
17 has not presented rate and bill impacts that separately identify the impacts on
18 program participants, program non-participants, and all customers on average.
19 Without these important aspects of the rate and bill impact analysis, it is not
20 possible for ENSC, the Board, or other stakeholders to obtain a complete picture
21 of the impact of the energy efficiency programs on customers' rates and bills.

22 **Q. Please provide an example of how ENSC should more fully address your**
23 **recommendations.**

24 A. To illustrate how my recommended principles should be applied, I will use the
25 Residential rate class and the Existing Residential DSM program as an example of
26 the type of analysis that could be conducted. The Residential rate class accounts
27 for approximately 58 percent of the energy requirements and 45 percent of the
28 demand requirements over the three years of the DSM plan, and approximately 51
29 percent of DSM costs are allocated to this rate class.

30 The Existing Residential program makes for a good program illustration as it is
31 designed to promote cost-effective energy efficiency improvements to Nova

1 Scotia's housing stock of single detached houses, duplexes, rental housing,
2 mobile/mini homes and multi-family buildings, and includes small community
3 buildings such as fire halls and churches. Incentives are available for lighting
4 upgrades, measures to reduce electric water heating energy use, appliance
5 upgrades and other items. Incentives for homes with electric space heating may
6 include a full range of envelope measures, such as air-sealing and insulation, and
7 green heating system measures.

8 **Q. What is ENSC proposing for the Residential rate class and the Existing**
9 **Residential program?**

10 A. ENSC proposes to recover through the Residential rate class an average of
11 \$24 million each year of its three year plan (Appendix C). This rate class uses
12 approximately 750 kWh a month on average (Appendix C).

13 Over the three year period, the Existing Residential program is expected to
14 achieve approximately 50 GWh in annual energy savings, 766.5 GWh in lifetime
15 energy savings with a measure life of about 15 years, save 12.5 MW on-peak,
16 enroll approximately 33,000 participants out of 415,000 eligible participants at a
17 cost of approximately \$30.6 million (Appendix C; Evidence, 19-21; Avon IR-3).

18 **Q. How would you apply your rate and bill impact principles to the Residential**
19 **rate class and Existing Residential program?**

20 A. I would start by analyzing the residential rate and bill impacts from the DSM
21 Plan, as compared to rates and bills that would occur in a scenario where no DSM
22 programs were implemented. Such an approach isolates the impact of efficiency
23 on customers' rates and bills.

24 When conducting such an analysis, it is important to take a "snapshot" of the
25 program planning assumptions that are under review by the Board. In this case,
26 ENSC is proposing efficiency investments for 2013 through 2015, and expects
27 savings over the average life of the measures installed, which is through 2029 (15
28 years). The analysis I present below considers only the costs in the three years of
29 the plan, and the benefits over the life of the measures installed.

1 While ENSC will certainly file a new plan for the Board's review at the
2 conclusion of the currently proposed three-year plan with budgets and rate
3 adjustments beginning in 2016, I choose not to include the impacts of those
4 programs in the rate and bill impact analysis for the 2013 through 2015 programs.
5 This approach is a useful way of isolating the rate and bill impacts of just the
6 three years of programs in question. If I were to include the rate and bill impacts
7 of energy efficiency programs beyond 2015, then in order to be internally
8 consistent it would be necessary to expand the study period to include the full life
9 of the energy efficiency measures installed in those years.

10 I recognize that the analysis presented below appears to be truncated or
11 incomplete, because there is no analysis of the rate and bill impacts of the energy
12 efficiency programs implemented after 2015. Nonetheless, I believe that the
13 snapshot approach is very useful for the purpose of both isolating and fully
14 capturing the rate and bill impacts of the three-years of efficiency program
15 currently at issue before the Board.

16 **Q. Please provide a summary of your residential rate impact analysis.**

17 A. Figures 1 and 2 below present a summary of my rate and bill impacts analysis for
18 residential customers. These analyses were conducted using the information
19 provided by ENSC in its Evidence and in response to information requests.
20 Exhibit TW-2 includes the input assumptions that I used for this analysis, and
21 Exhibit TW-3 includes the results of this analysis in tabular form.

22 This analysis compares two scenarios: one with the DSM programs at the levels
23 proposed by ENSC in this docket, and one with no DSM programs at all. The
24 scenario with no DSM programs at all is purely a hypothetical case in order to put
25 the DSM rate and bill impacts into context. As I discuss below, a better approach
26 would be to compare two scenarios with two different levels of DSM investment.

27 The DSM costs include all of the costs that will be passed on to residential
28 customers. For the program savings and participation information below, I
29 assume a typical residential customer who uses 750 MWh per month, participates

1 in the Existing Residential program and reduces electricity consumption by
2 roughly 16 percent through that program.

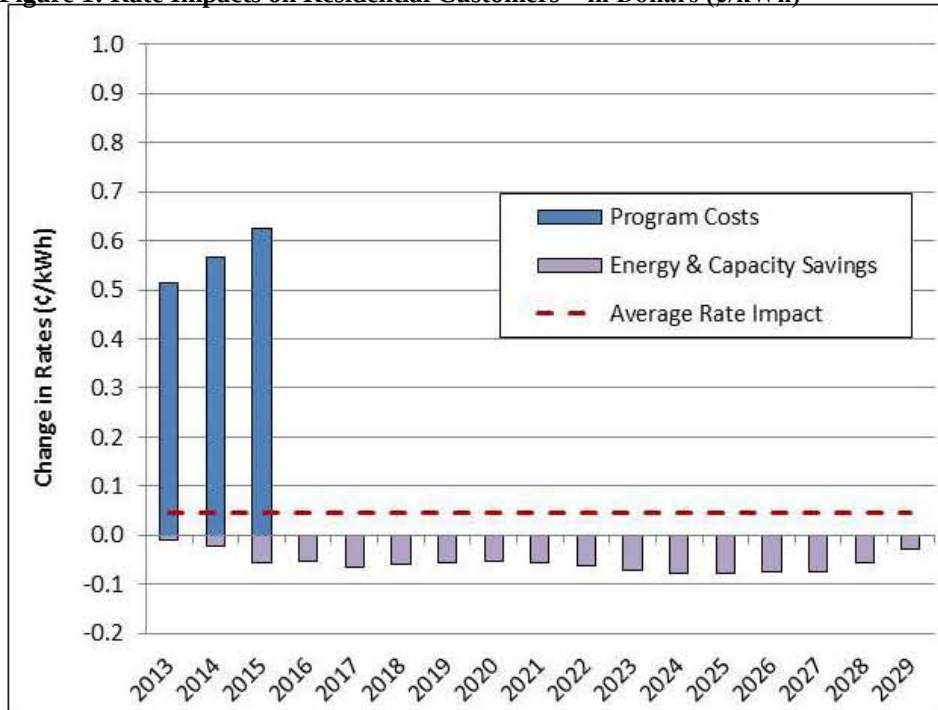
3 Figure 1 indicates the changes in a typical customer's rates (in ¢/kWh), and
4 Figure 2 presents the percent change in a typical customer's rates. Note that in
5 the first three years rates are expected to increase in order to collect sufficient
6 funds to pay for the DSM programs, while there will be energy and capacity
7 savings over the life of the efficiency measures that will lead to reductions in
8 rates. Also note that I have calculated an average rate impact across the entire
9 study period to indicate how the customers will be affected on average over all the
10 relevant years.

11 As shown in Figure 1, the rate impact to the Residential customer class from the
12 DSM programs is likely to be on the order of 0.5 to 0.6 ¢/kWh in the first three
13 years, and then there is likely to be rate reductions of less than 0.1 ¢/kWh as a
14 result of the efficiency savings over time. The average rate impact across the
15 entire study period is likely to be just under 0.05 ¢/kWh.

16 As shown in Figure 2, the rate impact to the Residential customer class from the
17 DSM programs is likely to be on the order of four percent of rates in the first three
18 years, and then there is likely to be rate reductions of roughly 0.5 percent as a
19 result of the efficiency savings over time. The average rate impacts across the
20 entire study period is likely to be under 0.5 percent.

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Figure 1: Rate Impacts on Residential Customers – in Dollars (¢/kWh)

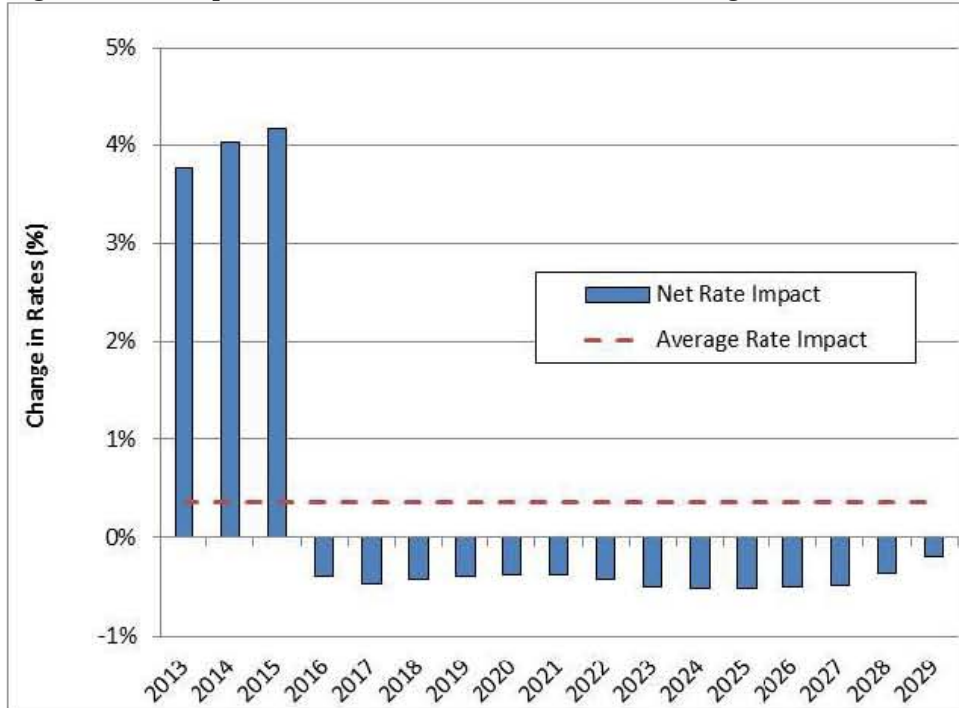


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Figure 2: Rate Impacts on Residential Customers – in Percentage Terms



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1 **Q. Please provide a summary of your residential bill impact analysis.**

2 A. The effect on a customers' bill depends on whether or not a customer participates
3 in the DSM programs. Through participation in efficiency programs, a customer
4 will decrease its monthly consumption, which mitigates the rate increase from the
5 DSM charge.

6 Figure 3 summarizes the bill impacts on three types of customers in the
7 Residential rate class. First, non-participants do not reduce their consumption
8 from the installation of efficiency measures, and, therefore, their bill impact
9 represents only the change in rates from the DSM charge and energy and capacity
10 savings.

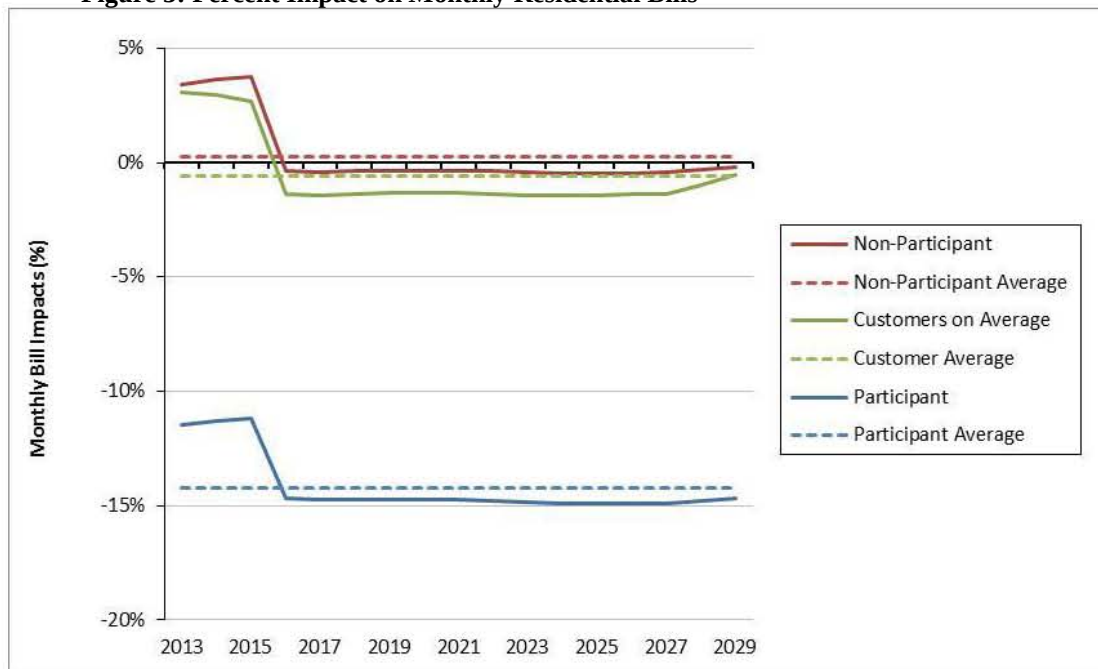
11 Second, participants in the Existing Residential program experience the same rate
12 impacts as the non-participant, yet their monthly consumption is reduced through
13 their participation in the efficiency program. For the Existing Residential program
14 in 2013, ENSC expects 14.3 GWh annual energy savings from 10,000
15 participants. Therefore, savings per participant are likely to be approximately
16 1,430 kWh a year, or 119 kWh a month.

17 Finally, I present the bill impacts for residential customers on average. This
18 information represents the average effect on customers' bills across both program
19 participants and non-participants. It is a hypothetical construct meant to indicate
20 how customers across the entire residential sector are affected by the efficiency
21 programs.

22 Figure 3 summarizes the bill impacts for each of the three customer types,
23 expressed as the percent change on monthly bills over the average life of
24 measures adopted through the Existing Residential program. For non-participants
25 and customers on average the bills are expected to be higher by three to four
26 percent in the first three years, and then lower by roughly one percent or less after
27 that. On average across the study period non-participants are expected to see a
28 roughly 0.3 percent increase in bills, while customers on average are expected to
29 see a 0.6 percent decrease in bills. Program participants fare the best, with bill

1 reductions of more than 10 percent in the first few years, nearly 15 percent in the
2 later years, and roughly 14 percent on average across the study period.

3 **Figure 3: Percent Impact on Monthly Residential Bills**



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6 **Q. What conclusions do you draw with regard to the magnitude of these rate**
7 **and bill impacts?**

8 A. I do not intend to draw any conclusions about the magnitude of these rate and bill
9 impacts at this point in time. Instead, I present the results here to illustrate how
10 the rate and bill impact analysis should be conducted, and the type of information
11 that it can provide. I recommend that ENSC provide this type of rate and bill
12 impact information in future DSM Plans, so that the Board and other stakeholders
13 can get a sense of the magnitude of rate and bill impacts associated with the
14 ENSC energy efficiency activities.

15 **Q. You mentioned that ENSC should look at program participation levels.**
16 **Why?**

17 A. After reviewing the rate and bill impact analysis, it is important to analyze
18 program participation to discern the extent of customers experiencing bill
19 increases or decreases. As observed in the above analysis, the electricity bills for
20 program participants and customers on average are reduced over the long-run,

1 despite the rate increase from DSM. As previously stated in my 2012 DSM Plan
2 testimony, the extent of customer participation in energy efficiency programs
3 should be a critical factor considered in assessing whether particular rate and bill
4 impacts are acceptable. Once energy efficiency programs reach a point where a large
5 portion of customers participate in the programs, then concerns about rate impacts
6 should be significantly mitigated.

7 **Q. Please summarize your analysis of program participation levels.**

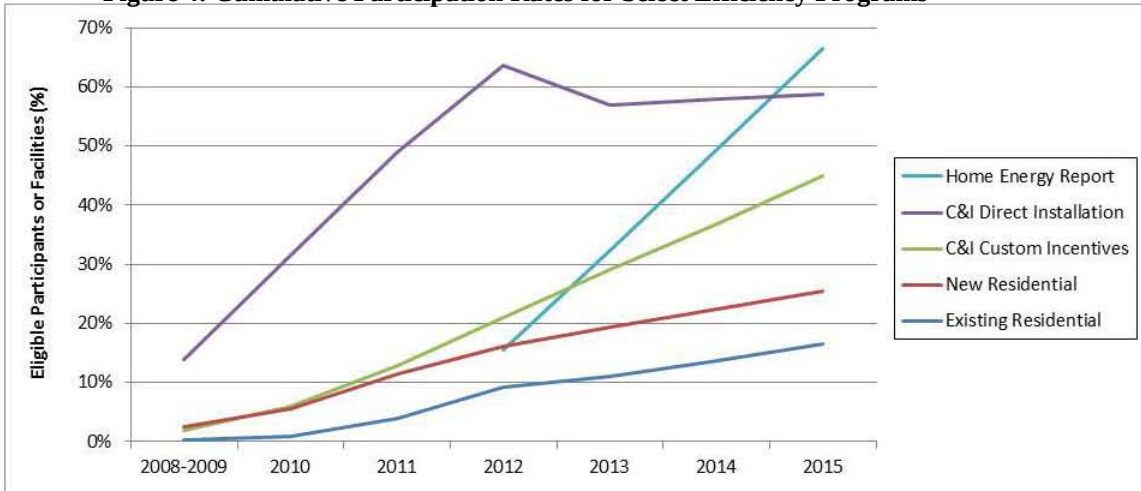
8 A. Figure 4 presents a summary of program participation rates for some of ENSC's
9 key DSM programs, based on information provided by ENSC in response to
10 information requests. For each of these programs I have taken the ratio of the
11 number of participants in each year to eligible customers in each year, to estimate
12 a participation rate. I then calculate a cumulative participation rate for each of
13 these programs, including the historic years of 2008 through 2011, as well as the
14 current and future years of 2012 through 2015. Exhibit TW-4 presents the
15 numbers behind my analysis of participation rates.

16 It is very important to note that there are several challenges to estimating
17 participation and participation rates in energy efficiency programs. One of the
18 most significant challenges is to properly identify a participant. For the programs
19 presented in Figure 4, ENSC identifies a participant as either a housing unit (for
20 residential customers) or a facility (for business customers). For other programs
21 (e.g. the Efficient Products Rebate program) participants are sometimes defined as
22 an efficiency measure. Another significant challenge is to avoid double-counting
23 of participants. For example, some residential customers may participate in both
24 the Existing Residential program and in the Efficient Products Rebate program in
25 any one year. Similarly, a business customer may participate in the BNI Custom
26 Incentives program in more than one year during the timeline presented below.

27 I have not attempted to address all these issues in the participation rates presented
28 below. Instead, I have taken the simplest approach of taking the ratio of eligible
29 customers to participants. Therefore, the participation rates presented below
30 should be seen as an illustrative example of how participation rates should be

analyzed and presented. Over time, ENSC should collect sufficient data to be able to sort out some of the challenges about defining participants and avoiding double-counting.

Figure 4: Cumulative Participation Rates for Select Efficiency Programs



Q. Why have you not included all of ENSC's DSM programs in Figure 4?

A. I did not include the Efficient Product Rebate programs for Residential and BNI customers in Figure 4 because participation for these programs is measured in units, or the number of financial incentives (rebates or financing) offered to customers (2013-2015 DSM Filing, App. A, 16). When reviewing program participation for these programs, cumulative participation rates quickly exceed 100 percent of eligible participants. This indicates that participants receive more than one financial incentive or participate multiple times. I have not included these two programs in my analysis because to do so would not provide a meaningful indication of the number of customers that have participated in efficiency programs. However, I recommend that ENSC should track the number of rebates or units provided to each participant or facility, so that program participation from these two programs could be better analyzed, and the impact on customer's rates and bills from these programs would be better understood.

1 **Q. What is the value of investigating the participation rates?**

2 A. Any analysis of rate and bill impacts should include some investigation of
3 participation rates, in order to indicate the extent of customers that are likely to
4 see lower bills as a result of the programs. The information presented above
5 illustrates the type of participation rate analysis that ENSC should conduct in
6 future DSM filings, in order to provide the Board and other stakeholders with
7 information that will be useful in evaluating future rate and bill impacts. If, in
8 future DSM proceedings, ENSC or the Board are in the position of balancing
9 higher rates and lower bills, it will be useful to consider participation rates in
10 achieving the proper balance.

11 Furthermore, this type of participation information can be very important in
12 reviewing and assessing ENSC's DSM programs in general. It provides an
13 indication of how successfully each program is pursuing customers, as well as an
14 indication of how many more customers could benefit from future efficiency
15 programs.

16 **Q. What conclusions do you draw from the information presented in Figure 4?**

17 A. I do not intend to draw specific conclusions from the participation rates in
18 Figure 4 as part of my testimony, because I see these participation rates as
19 preliminary estimates and I expect they include some double-counting of
20 customers.

21 Nonetheless, we can draw some general conclusions from this information. It is
22 clear that by the end of the three-year plan a large portion of Nova Scotia
23 electricity customers will have been served by the DSM programs in one way or
24 another, and will thereby experience lower bills. The Existing Residential
25 Program is likely to reach over 15 percent of residential customers, and the Home
26 Energy Report Program is expected to reach well over 50 percent of residential
27 customers. When we add to this the many customers that purchase efficient
28 equipment through the Efficient Product Rebate Program it is clear that many
29 residential customers will participate in the efficiency programs and will thereby
30 experience lower bills. The same conclusion can be drawn about the BNI sector.

1 Between the Custom Program, the Direct Install Program and the Efficient
2 Product Rebate Program, many BNI customers will participate in the efficiency
3 programs and thereby experience lower bills.

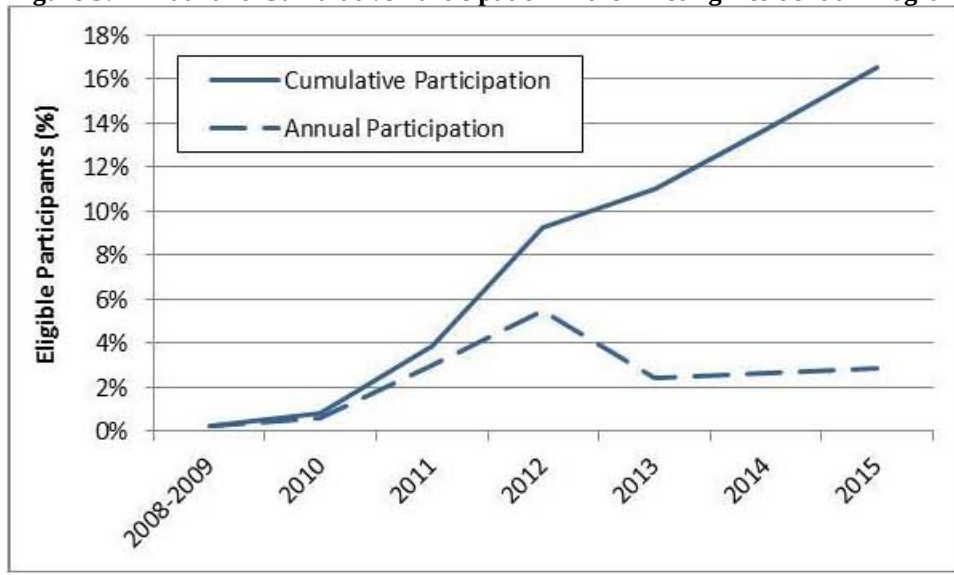
4 These are very important conclusions in the context of the rate and bill impact
5 analysis. They indicate that the majority of customers are likely to see lower bills
6 as a result of the energy efficiency programs, because the bill savings from the
7 efficiency measures outweigh rate impact of the DSM rider. I recommend that
8 ENSC be encouraged to maximize customer participation rates over time, so as to
9 ensure the greatest amount equity among customers and to mitigate concerns
10 about rate impacts.¹ Indeed, ENSC should pursue the ultimate goal of reaching
11 all electricity customers in one way or another over time.

12 **Q. Please summarize your analysis of the participation rates for the Existing**
13 **Residential Program.**

14 A. Figure 5, below, presents the annual and cumulative participation rates of
15 customers in the Existing Residential program since 2008 (Avon IR-3). As the
16 figure demonstrates, ENSC proposes to engage over 16 percent of eligible
17 participants by the end of 2015. The figure also indicates that ENSC has
18 proposed a significant reduction in annual participation rates in this program after
19 2012. ENSC explains that this is because the 2012 program includes a direct
20 install pilot component that is not factored into the 2013 DSM Plan (Synapse IR-
21 16).

¹ It is important to note that this goal must be balanced with other important goals, such as avoiding cream-skimming and lost opportunities.

Figure 5: Annual and Cumulative Participation in the Existing Residential Program



Q. You have analyzed rate and bill impacts by comparing the proposed 2013-2015 DSM initiatives to a scenario where no DSM occurs. Is this the most appropriate use of rate and bill impact analyses?

A. No, it is not. The hypothetical scenario where no DSM occurs is not meaningful because it is very unlikely to happen. I present that analysis above to demonstrate conceptually how rate and bill impacts can be analyzed from this most simple comparison.

Q. Is there a better way to apply the rate and bill impact analyses?

A. Yes. Energy efficiency program administrators and regulators frequently wrestle with the question of how much ratepayer money should be invested in energy efficiency programs. One of the key concerns is that too much funding of energy efficiency programs will lead to unacceptable rate impacts. In these decisions, there are often two or more scenarios for how much to invest in energy efficiency programs. For example, regulators may be faced with one proposal to maintain constant efficiency budgets from one year to the next and a second proposal to increase efficiency budgets by a certain amount in order to obtain additional efficiency savings. In this context, the rate and bill impact analysis should consider the same two scenarios: constant efficiency budgets compared to increased efficiency budgets. In this way, the program administrators, the

1 regulators and other stakeholders will be able to assess the likely rate and bill
2 impacts associated with the decision that is at issue. I refer to this approach as an
3 “incremental” rate and bill impact analysis, because it captures the effects of
4 incremental changes to energy efficiency budgets.

5 **Q. Please provide an example of what you mean by an incremental rate and bill**
6 **analysis.**

7 A. Using the same information discussed in my analysis above, I have conducted a
8 second analysis that considers the impacts on residential rates and bills assuming
9 that ENSC increased its proposed 2013 through 2015 residential DSM budgets by
10 20 percent.

11 **Q. Why did you choose to increase ENSC’s 2013 through 2015 residential**
12 **budgets by 20 percent?**

13 A. I chose this budget increase merely to provide an illustration of an incremental
14 rates and bill analysis. An increase of 20 percent in program budgets would bring
15 ENSC’s three-year cumulative residential program budget from \$74 million to
16 \$89 million. I assume for simplicity that this increased budget would be used to
17 provide the same type of energy efficiency services to additional program
18 participants, i.e., the increased budget would lead to a 20 percent increase in
19 program participants.

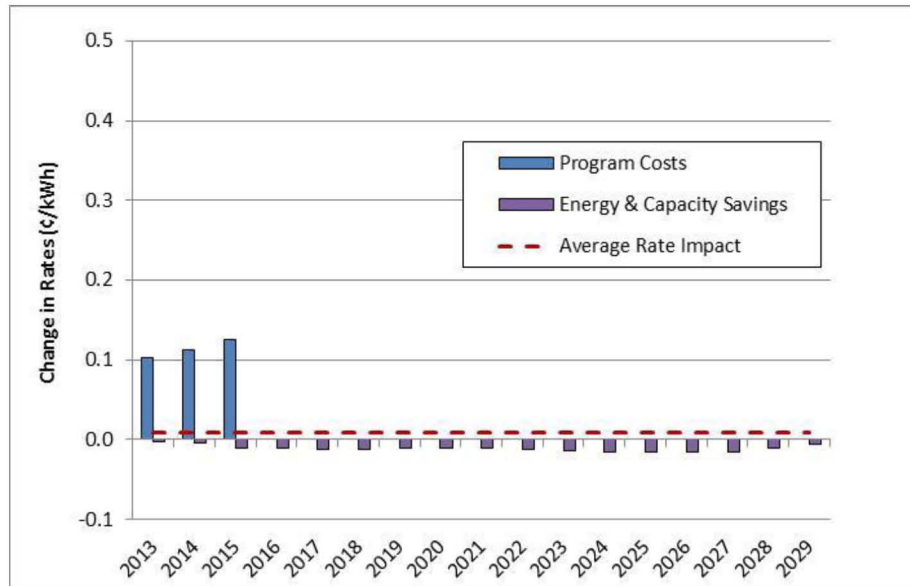
20 **Q. What is the impact on Residential rates from the proposed 20 percent**
21 **increase in the residential program budget?**

22 A. The impact on residential rates from this incremental increase in program budgets
23 are presented in Figures 6 and 7 below. These figures mirror the information
24 presented in Figures 1 and 2 above. Exhibit TW-5 presents the results of my
25 analysis in tabular form.

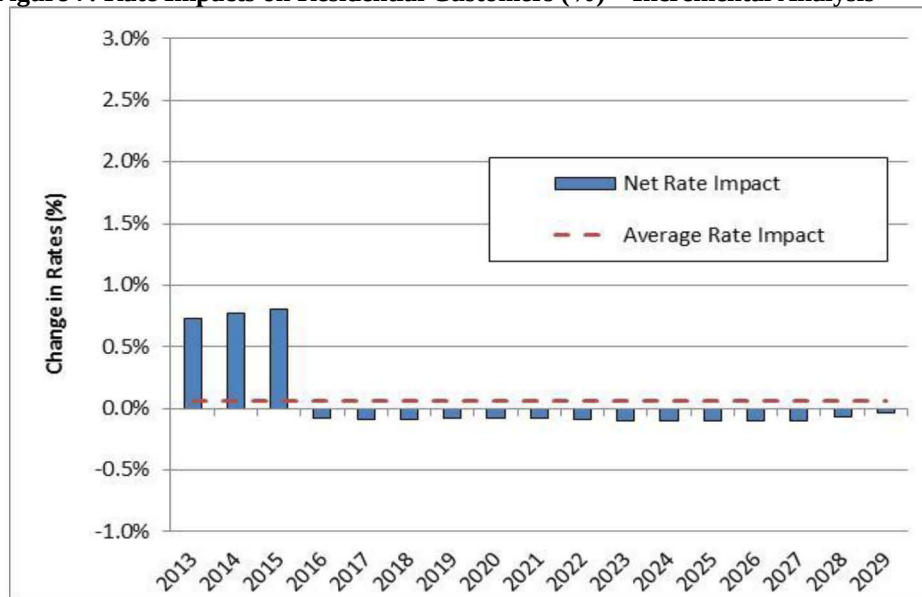
26 As shown in Figure 6, the rate impact to the Residential customer class from the
27 DSM programs is likely to be on the order of 0.1 ¢/kWh in the first three years,
28 and then there is likely to be small rate reductions as a result of the efficiency
29 savings over time. The average rate impact across the entire study period is likely
30 to be less than 0.01 ¢/kWh.

1 As shown in Figure 7, the rate impact to the Residential customer class from the
2 DSM programs is likely to be between 0.5 and 1.0 percent in the first three years,
3 and then there will be small rate reductions as a result of the efficiency savings
4 over time. The average rate impact across the entire study period is likely to be
5 less than 0.1 percent.

6 **Figure 6: Rate Impacts on Residential Customers (¢/kWh) – Incremental Analysis**



9 **Figure 7: Rate Impacts on Residential Customers (%) – Incremental Analysis**

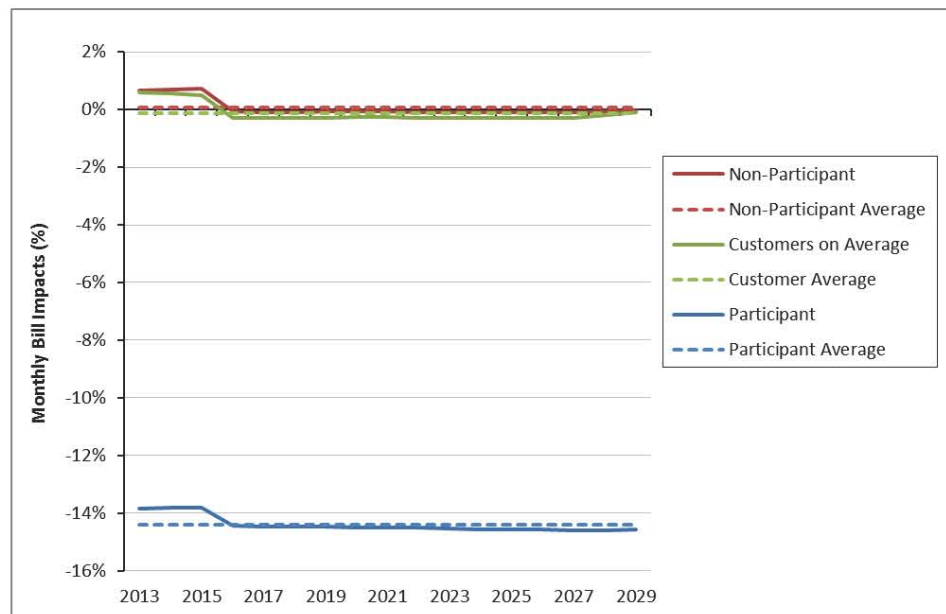


1 **Q. What is the impact on Residential bills from the 20 percent increase in**
2 **program budgets?**

3 A. The impact on bills from this incremental increase in program budgets are
4 presented in Figure 8. This figure mirrors the information presented in Figure 3
5 above. Exhibit TW-5 presents my estimates

6 For non-participants and customers on average the bills are expected to be higher
7 by 0.5 to 1.0 percent in the first three years, and then lower by roughly 0.1 to 0.3
8 percent after that. On average across the study period non-participants are
9 expected to see a roughly 0.06 percent increase in bills, while customers on
10 average are expected to see a 0.12 percent decrease in bills. Program participants
11 are expected to see bill reductions comparable to those in the previous case, on
12 the order of 14 percent on average. (Again, for this analysis we have defined
13 program participants as those that would not have participated under the current
14 budget proposal but would participate as a result of the increased funding.)

15 **Figure 8: Percent Impact on Residential Monthly Bills – Incremental Analysis**

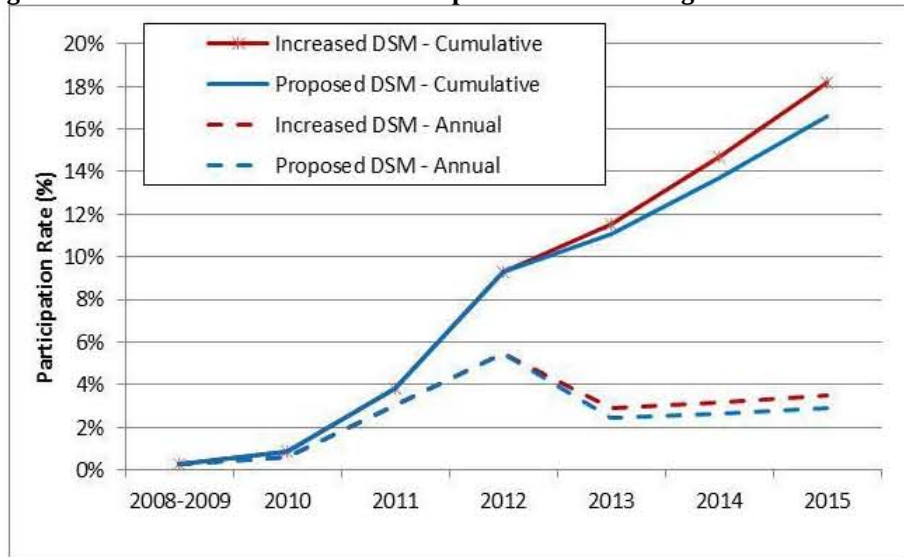


16
17
18 **Q. What is the impact on the participation levels of the Existing Residential**
19 **program from the 20 percent increase in program budgets?**

20 A. With a larger budget available for efficiency programs, ENSC could enroll more
21 participants than currently proposed. Under the Existing Residential program for

1 2013, ENSC expects 10,000 participants resulting in annual savings of 14.3 GWh
2 for the year (Evidence, 19; Avon IR-3). Assuming that the savings-per-participant
3 remains constant at 1,430 kWh, a 20 percent increase in budget would allow
4 ENSC to reach a corresponding 20 percent increase in participants, for a total of
5 12,000 participants. This would result in annual savings of 17.2 GWh in 2013 for
6 the program. Figure 9, below, provides the annual and cumulative participation
7 levels for both budget scenarios, presented as a percent of total eligible
8 participants.

9 **Figure 9: Annual and Cumulative Participation Rates Existing Residential - Incremental**



10

11

12 **Q. Please summarize the results of your incremental analysis.**

13 **A.** The incremental analysis can be summarized as follows:

- 14
- Increased budget: \$15 million, over three years.
 - 15 • Increased savings: 2.9 to 3.8 GWh per year.
 - 16 • Increased participants: 6,600 households, over three years.
 - 17 • Average rate impact over study period: less than 0.1 percent.
 - 18 • Average bill impact over study period (dollars):
 - 19 ♦ non-participants: \$0.07 per month (0.06 percent).

1 ♦ customers on average: -\$0.12 per month (-0.12 percent).

2 ♦ participants: -\$17.20 per month (-14.4 percent).

3 **Q. How do you recommend the results of your incremental analysis be used?**

4 A. Again, I present the incremental rate and bill impact analysis to illustrate how
5 such an analysis could be used in the future to assist with a decision about DSM
6 program funding. I recommend that ENSC develop rate and bill impact analyses
7 along the lines of what I have outlined above. This sort of information should be
8 provided with each proposal for a new DSM Plan. If in the future ENSC and the
9 Board are faced with a decision as to whether to increase or decrease DSM
10 program budgets relative to current levels, this information will be useful in
11 drawing the appropriate balance between reducing average costs to all customers
12 and increasing electricity rates.

13 **Q. What else do you recommend about ENSC's program participation going**
14 **forward?**

15 A. I recommend that ENSC take steps to improve its methods for tracking customer
16 participation. This includes defining participation better, including participation in
17 the Efficient Products Rebate programs. It also includes tracking customers by
18 account number for each program that they participate in each year, in order to
19 keep track of customers that may be double-counted. Better participation
20 information will be useful over time in order to provide meaningful information
21 regarding the magnitude of customers that experience bill savings from the DSM
22 programs. It will also be useful in assessing program performance as the ENSC
23 programs gain more experience and reach a greater level of maturity.
24 Furthermore, more detailed information on participation rates will help ENSC
25 identify those customers that may not have participated yet in the efficiency
26 programs, so that it can target the efficiency programs to those customers in order
27 to maximize customer participation rates.

1 **Q. You have provided an illustration of the rate impacts and bill impacts of the**
2 **residential DSM programs, with a focus on the participants in the Existing**
3 **Residential program. What do you recommend with regard to the business,**
4 **non-profit and institutional sector?**

5 A. I recommend that ENSC conduct parallel analyses of the rate and bill impacts of
6 the BNI sector energy efficiency programs. In this case, it may be appropriate to
7 investigate the impacts on participants in the Custom Incentives Program
8 separately from the impacts on participants in the Direct Installation program,
9 given that the amount of savings per participant and the number of participants
10 are likely to be considerably different across the programs.

11 **4. MULTI-YEAR PLANNING CYCLE**

12 **Q. Please describe ENSC's proposed multi-year planning cycle.**

13 A. In its 2012 DSM Plan filing, ENSC indicated its intent to engage stakeholders in
14 consultation and dialogue to further assess the available options for the
15 implementation of a future multi-year regulatory model. Such a model would
16 allow greater flexibility and capacity in the delivery of DSM programming.

17 ENSC engaged Dunskey Energy Consulting (Dunskey) to review the current
18 regulatory oversight model and propose changes to improve ENSC's ability to
19 assist Nova Scotians in saving energy as efficiently and effectively as possible.
20 Dunskey's review noted that the limited (twelve month) approval period of
21 ENSC's plans creates uncertainty in the market. ENSC is unable to make a
22 commitment longer than one year to its contractors (who must decide whether,
23 and to what extent, to invest in building capacity in Nova Scotia), to critical
24 market players (including those who are being asked to provide new products and
25 services to Nova Scotians), to its current and prospective staff, and to its larger
26 customers (who often plan important investments in equipment and buildings over
27 several years). The one-year approval period can further lead to missed savings,
28 as well as diverted organizational time and focus.

29 Consistent with Dunskey's report, ENSC has prepared a three-year DSM plan that
30 includes the following:

-
- 1 • the approach it intends to take to achieve savings within its target markets
 - 2 • a forecast of annual costs (budgets) and energy savings for each of the three
 - 3 years
 - 4 • a high-level evaluation plan indicating when and how evaluation activities
 - 5 would be conducted, and a timetable for reporting the results.

6 In addition, the multi-year filing includes two additional years of DSM outlook,
7 intended for directional information purposes, not for Board approval. This rolling
8 approach is designed to keep the period between formal plan approvals relatively
9 short for the Board and stakeholders, while allowing ENSC, its delivery agents,
10 and trade allies to operate with a multi-year view that enables capacity building
11 for continued future success.

12 Beginning in 2013, and in each intervening year between multi-year filings,
13 ENSC will file an annual progress report in the first quarter of the calendar year,
14 intended to be a paper filing and consisting of:

- 15 • a summary of the context, activities and milestones achieved in the prior year
- 16 • a management discussion and analysis of any major discrepancies relative to
- 17 the original plan's intent and forecasts
- 18 • a summary of costs and savings for each program or target market area

19 Dunsky recommends, and ENSC concurs, that the Board consider adopting a
20 trigger mechanism whereby, if reported results fall below 75 percent of the
21 original plan's forecast savings up to that point, ENSC would be required to file a
22 corrective action plan designed to achieve the total approved energy savings
23 target, within the approved multi-year budget.

24 Revisions to the schedule and approach for evaluating DSM program savings are
25 also proposed, changing from an all-in-one annual process to an ongoing multi-
26 year process.

1 ENSC recommends that it continue to meet quarterly with the Board. Regular
2 meetings with the DSM Advisory Group will provide ongoing opportunities to
3 update stakeholders and discuss issues and concerns. The meetings and reports
4 will provide quarterly status updates and highlights, as well as communicate
5 course changes within the approved DSM Plan.

6 **Q. Is ENSC's proposal to move from an annual planning cycle to a multi-year**
7 **planning cycle appropriate?**

8 A. Yes. For all the reasons discussed in Dunsky's report, as briefly summarized
9 above, a multi-year planning cycle can be beneficial to program planning. Moving
10 from annual to multi-year planning cycles is becoming a trend in several
11 jurisdictions that I am aware of.

12 **Q. Do you have any recommendations regarding ENSC's multi-year planning**
13 **proposal?**

14 A. Yes. While I fully support ENSC's proposal to move to a multi-year planning
15 cycle, I have some recommendations about the trigger mechanism that requires
16 ENSC to file a Corrective Action Plan to adjust its original plan. This trigger is of
17 utmost importance as it serves to weigh the balance between ENSC's flexibility to
18 implement effective programs (indeed, the benefits of moving to multi-year
19 planning cycle), with the need for adequate oversight by the Board and
20 stakeholders. Such a balance can be challenging to achieve, and needs to be
21 clearly identified prior to the plan's implementation. As such, a trigger
22 mechanism must be carefully crafted and clearly understood by all parties
23 involved.

24 **Q. Why do you state that a balance between flexibility and oversight can be**
25 **difficult to achieve, and needs to be identified prior to the plan's**
26 **implementation?**

27 A. My recent experience in Massachusetts leads me to be circumspect about
28 establishing an appropriate trigger mechanism. After the three-year planning cycle
29 was adopted in Massachusetts, some efficiency program administrators submitted
30 to the Department of Public Utilities (DPU) the equivalent of corrective action
31 plans within six months of the three-year plans being approved. Additionally,
32 annual plan modifications became a customary filing in Massachusetts, essentially

1 maintaining the annual planning process that was expected to be overhauled by a
2 three-year planning cycle.

3 **Q. Why do you think these energy efficiency filings were submitted to the**
4 **Massachusetts DPU so shortly after the three-year plans were approved in**
5 **Massachusetts?**

6 A. The primary reason is that the conditions established requiring DPU review of
7 changes to the three-year plan were more detailed than what is proposed here, and
8 were much more stringent. In addition, there was some uncertainty among the
9 program administrators as to how the conditions should be applied.

10 **Q. Please explain how the conditions triggering a regulatory review in**
11 **Massachusetts were different from those that are proposed here.**

12 A. First, I note that the DPU required energy efficiency program administrators to
13 file a request for mid-term modifications – i.e., modifications to the three-year
14 efficiency plans during the course of the three years – if the program
15 administrators anticipated significant changes to program designs. In this way,
16 the DPU would be able to review and decide upon anticipated changes to the
17 energy efficiency programs before they were implemented. This is different from
18 Nova Scotia, where corrective action plans are only required if reported results
19 fall below a trigger. In other words, the approach in Massachusetts is to anticipate
20 future changes in the plans, whereas the approach proposed in Nova Scotia is to
21 respond to historic experience relative to the efficiency plans.

22 Second, the conditions established in Massachusetts were more detailed and more
23 stringent than what is proposed in Nova Scotia. The Massachusetts DPU
24 established guidelines requiring that program administrators submit mid-term
25 modifications to their three-year plans if any of the following changes occurred:

- 26 • a new program is added to the portfolio of programs;
- 27 • an existing program is terminated;
- 28 • the budget for an energy efficiency program is changed by 20 percent;
- 29 • the savings of an efficiency program are changed by 20 percent; or

-
- 1 • the performance incentives resulting from an energy efficiency program are
2 changed by 20 percent.²

3 **Q. Why did these conditions lead to program administrators filings so shortly**
4 **after the commencement of the three-year plans.**

5 A. First, there was some uncertainty about how these conditions should be applied.
6 The program administrators assumed that they should be applied on an annual
7 basis, i.e., if an annual budget was expected to deviate by more that 20 percent of
8 an annual budget in the three-year plan, then it should be reviewed by the DPU.
9 The DPU has since clarified that these triggers should instead be applied over the
10 entire three-year plan, i.e., a 20 percent budget under-run in one year is acceptable
11 if the difference is made up in the following year.³

12 Second, the triggers are fairly broad and stringent, especially relative to the
13 conditions proposed in Nova Scotia. The Massachusetts triggers apply on a
14 program level, as opposed to the portfolio level. The Massachusetts triggers go
15 beyond energy savings to include budgets and program administrator performance
16 incentives. The Massachusetts triggers apply to savings results above and below
17 those of the three-year plan, as opposed to just savings results that are below the
18 plan. The Massachusetts triggers of 20 percent are slightly more stringent than the
19 25 percent proposed in Nova Scotia. Finally, the Massachusetts triggers include
20 additions of programs and terminations of programs, while the Nova Scotia
21 proposal does not.

22 **Q. What is the current status of these guidelines?**

23 A. The DPU has opened an investigation to determine whether its mid-term
24 modification guidelines should be modified to strike a better balance between

² Massachusetts Department of Public Utilities, *Investigation by the Department of Public Utilities on its Own Motion into Updating its Energy Efficiency Guidelines*, DPU 08-50-B, October 26, 2009.

³ Massachusetts Department of Public Utilities, *Petition of the Cape Light Compact for Approval of a Modification to its Three-Year Energy Efficiency Plan Budget for Program Year 2020*, DPU 10-106, January 10, 2011.

1 program administrator flexibility and regulatory review.⁴ That investigation has
2 not yet been completed.

3 **Q. What is your recommendation regarding ENSC's proposed trigger**
4 **mechanism for the three-year plan?**

5 A. I believe that there is value in providing the Board with proposals to make
6 significant changes to the energy efficiency programs *before* the changes are
7 implemented. In this way, the Board will be able to review any significant
8 changes prior to their implementation, as opposed to many months afterwards.

9 It is important to note that the electricity industry and the energy efficiency
10 market are constantly in flux, and there may be many good reasons for ENSC to
11 make significant modifications to its efficiency programs during the course of its
12 three-year plans. For example, once NSPI completes its forthcoming integrated
13 resource plan it may provide compelling evidence to make significant changes to
14 the current three-year DSM plan.

15 Nonetheless, in order to avoid the problems encountered in Massachusetts, these
16 prospective triggers should be clearly defined and should be relatively broad.

17 **Q. What do you recommend with regard to prospective triggers?**

18 A. I recommend that ENSC be required to notify the Board in its Annual Progress
19 Report if it plans to make any of the following changes to its three-year plan:

- 20 • add a new program;
- 21 • terminate an existing program;
- 22 • increase or decrease three-year budgets for the total residential sector
23 programs or the total BNI sector programs by more than 25 percent;
- 24 • increase or decrease the three-year savings estimates of the total residential
25 sector programs or the total BNI sector programs by more than 25 percent.

⁴ Massachusetts Department of Public Utilities, *Investigation by the Department of Public Utilities on its Own Motion into Updating its Energy Efficiency Guidelines*, DPU 11-120, November 29, 2011.

1 **Q. Please explain why you believe these prospective triggers are important.**

2 A. ENSC may want to add a new program or terminate an existing program during
3 the course of the three-year plan, and this is clearly a significant change that the
4 Board should be made aware of prior to it being implemented.

5 I recommend that there be a trigger for efficiency budgets, as well as efficiency
6 savings, because the budgets are an important indicator of the program priorities
7 and an important driver of the program impacts.

8 I recommend that the budget and savings triggers be applied at the sector level,
9 because there are important policy and equity considerations with regard to
10 providing energy efficiency opportunities to both sectors. If the trigger is for all
11 sectors combined, then ENSC could shift budgets, and therefore savings, from
12 one sector to another, which might lead to inequities that would be of concern to
13 the Board.

14 I recommend that the budget and savings triggers be applied both for increases
15 and decreases, as the Board may be interested in significant changes in either
16 direction.

17 I recommend the 25 percent level for the trigger, because this is consistent with
18 the current proposal and it strikes an appropriate balance between flexibility for
19 ENSC and regulatory oversight.

20 **Q. If one of these triggers is met, and ENSC were to notify the Board in an**
21 **Annual Progress Report, then how do you recommend the Board should**
22 **respond to this additional information.**

23 A. The Board should make it clear in approving these triggers that ENSC has on-
24 going approval from the Board to continue to implement its three-year plan as
25 modified, unless the Board makes a finding otherwise within a given timeframe.
26 If a trigger is met in any one of the Annual Progress Reports, then the Board
27 could decide how to address it on a case-by-case basis. For example, if ENSC
28 were to propose increasing savings to the residential sector by 30 percent due to
29 increased adoption of highly cost-effective residential efficiency measures, then
30 the Board may see no need for any formal review of such a proposal. If on the

1 other hand, ENSC were to propose terminating a cost-effective program that was
2 serving hard-to-reach small business customers, then the Board may want to
3 investigate that proposal. At that time, the Board would establish a streamlined
4 process for conducting its review and making its findings on the ENSC proposal.

5 **Q. Does this conclude your pre-filed testimony?**

6 A. Yes, it does.

Tim Woolf
Vice President
Synapse Energy Economics, Inc.
485 Massachusetts Avenue, Suite 2, Cambridge, MA 02139
(617) 453-7031 • fax: (617)-661-0599
twoolf@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. Vice President, 2011 to present.
Provides expert consulting on the economic, regulatory, consumer, environmental, and public policy implications of the electricity and gas industries. The primary focus of work includes technical and economic analyses, electric power system planning, climate change strategies, energy efficiency programs and policies, renewable resources and related policies, power plant performance and economics, air quality, and many related aspects of consumer and environmental protection.

Massachusetts Department of Public Utilities, Boston, MA. Commissioner, 2007- 2011.
Oversaw a significant expansion of clean energy policies as a consequence of the Massachusetts Green Communities Act, including an aggressive expansion of ratepayer-funded energy efficiency programs; the implementation of decoupled rates for electric and gas companies; an update of the DPU energy efficiency guidelines; the promulgation of net metering regulations; review of smart grid pilot programs; and review of long-term contracts for renewable power. Oversaw six rate case proceedings for Massachusetts electric and gas companies. Played an influential role in the development of price responsive demand proposals for the New England wholesale energy market. Served as President of the New England Conference of Public Utility Commissioners from 2009-2010. Served as board member on the Energy Facilities Siting Board from 2007-2010. Served as co-chair of the State Energy Efficiency Action Working Group on Utility Motivation. Served as co-chair of the Steering Committee for the Northeast Energy Efficiency Partnership's Regional Evaluation, Measurement and Verification Forum.

Synapse Energy Economics Inc., Cambridge, MA. Vice President, 1997-2007.

Tellus Institute, Boston, MA. Senior Scientist, Manager of Electricity Program, 1992-1997.

Association for the Conservation of Energy, London, England. Research Director, 1991-1992.

Massachusetts Department of Public Utilities, Boston, MA. Staff Economist, 1989-1990.

Massachusetts Office of Energy Resources, Boston, MA. Policy Analyst, 1987-1989.

Energy Systems Research Group, Boston, MA. Research Associate, 1983-1987.

Union of Concerned Scientists, Cambridge, MA. Energy Analyst, 1982-1983.

EDUCATION

Masters, Business Administration. Boston University, Boston, MA, 1993.

Diploma, Economics. London School of Economics, London, England, 1991.

B.S., Mechanical Engineering. Tufts University, Medford, MA, 1982.

B.A., English. Tufts University, Medford, MA, 1982.

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Testimony of Tim Woolf					
Exhibit TW-2					
Page 1 of 1					
Information	2013	2014	2015	Units	Source
Customer Class Information					
Utility	ENSC / NPSI				
Sector	Residential				
Base Year	2013			year	
Customers	452,558	456,991	461,716	people	Synapse IR-3
Annual Sales	4,373	4,373	4,373	GWh	App. C, Att. 2-1 (Revised April 18, 2012)
Average Monthly Consumption	750	750	750	kWh/Mo/Cust	App. C, Att. 3-5 (Revised April 18, 2012)
Customer Growth Rate	-0.3%			%	Synapse IR-3
Sales Growth Rate	1.00%			%	Synapse IR-4
All Customer Classes Annual Sales	9,829	9,829	9,829	GWh	App. C, Att. 2-1 (Revised April 18, 2012)
Rate Class Information					
Rate Class	Residential (Domestic)				
Customer Charge	10.83			\$/month	App. C, Att. 3-1 (Revised April 18, 2012)
Energy Charge					
Block 1 Volume	750			kWh	App. C, Att. 3-1 (Revised April 18, 2012)
Block 1 Rate	0.12638			\$/kWh	App. C, Att. 3-1 (Revised April 18, 2012)
FAM Volume	750			kWh	App. C, Att. 3-1 (Revised April 18, 2012)
FAM Rate	0.00698			\$/kWh	App. C, Att. 3-1 (Revised April 18, 2012)
DSM Cost Recovery	0.00513	0.00565	0.00624	\$/kWh	App. C, Att. 3-1 (Revised April 18, 2012)
Energy Inflation	1.0%			%	General inflation
EE Program Costs and Impacts					
Cost in Rates	22,436,308	24,713,537	27,282,418	\$	App. C, Att. 1-5, Table 3; Att. 1-11, Table 3; Att. 1-15, Table 3 (Revised April 18, 2012)
Percent Increase in Budget	20%	20%	20%	%	analysis input
New Cost in Rates	26,923,570	29,656,244	32,738,902	\$	calculation: Cost in Rates * Percent Increase in Budget
Program	Existing Residential				
Annual Energy Savings	14.3	16.9	18.9	GWh	Evidence, 19-21 (Revised April 18, 2012)
Lifetime Energy Savings	219	259	289	GWh	calculation: Annual savings * Measure life
Demand Savings	3.5	4.2	4.8	MW Peak	Evidence, 19-21 (Revised April 18, 2012)
Measure Life	15.3	15.3	15.3	years	Synapse IR-5
Eligible Customers	415,000	415,000	415,000	Participants	Avon IR-3(b) (Revised April 18, 2012)
Participants	10,000	11,000	12,000	Participants	Avon IR-3(b) (Revised April 18, 2012)
Participant Monthly Savings	119	128	131	kWh	calculation: annual savings / participant / 12
Inflation Rate	2.00%			%	General inflation; Synapse IR-8
Real Discount Rate	6.81%			%	Synapse IR-8
Nominal Discount Rate	8.95%			%	calculation: (1 + Real Discount Rate) * (1 + Inflation Rate) - 1
Annual Cost of Saved Energy	1,568,973			\$/MWh	calculation: Cost in Rates / Annual Energy Savings
Lifetime Cost of Saved Energy	102,547			\$/MWh	calculation: Cost in Rates / Lifetime Energy Savings
Levelized Cost of Saved Energy	168,251			\$/MWh	calculation: Cost in Rates * Capital Recovery Factor / Annual Energy Savings
Capital Recovery Factor	11%			%	calculation: [discount rate * (1 + discount rate) ^ measure life] / [(1+ discount rate) ^ measure life - 1]
\$ spent = # Lifetime kWh Savings	102.5	95.6	94.3	kWh	calculation: Cost in Rates / Lifetime Energy Savings
Notes					
Red text = input					
Black text = calculation					

Testimony of Tim Woolf

Exhibit TW-3

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Rate Impacts of Energy Efficiency: Base DSM Rates

Year	Base Case (Without Efficiency)			Efficiency Case (Currently Proposed)			Difference Between Cases				Efficiency Rate Impacts		
	Supply Rate	Demand Rate	Total	Supply Rate	Demand Rate	Total	Supply Rate	Demand Rate	Total		Program Costs	T&D Savings	Energy & Capacity Savings
	(c/kWh)	(c/kW/Mo)	(c/kWh)	(c/kWh)	(c/kW/Mo)	(c/kWh)	(c/kWh)	(c/kW/Mo)	(c/kWh)	%	(c/kWh)	(c/kWh)	(c/kWh)
2013	13.336	0.0	13.34	13.839	0.0	13.84	0.503	0.0	0.503	3.77%	0.513	0.000	-0.010
2014	13.469	0.0	13.47	14.012	0.0	14.01	0.543	0.0	0.543	4.03%	0.565	0.000	-0.022
2015	13.604	0.0	13.60	14.171	0.0	14.17	0.567	0.0	0.567	4.17%	0.624	0.000	-0.057
2016	13.740	0.0	13.74	13.686	0.0	13.69	-0.054	0.0	-0.054	-0.39%	0.000	0.000	-0.054
2017	13.877	0.0	13.88	13.812	0.0	13.81	-0.065	0.0	-0.065	-0.47%	0.000	0.000	-0.065
2018	14.016	0.0	14.02	13.957	0.0	13.96	-0.059	0.0	-0.059	-0.42%	0.000	0.000	-0.059
2019	14.156	0.0	14.16	14.101	0.0	14.10	-0.056	0.0	-0.056	-0.39%	0.000	0.000	-0.056
2020	14.298	0.0	14.30	14.243	0.0	14.24	-0.055	0.0	-0.055	-0.38%	0.000	0.000	-0.055
2021	14.441	0.0	14.44	14.386	0.0	14.39	-0.055	0.0	-0.055	-0.38%	0.000	0.000	-0.055
2022	14.585	0.0	14.59	14.523	0.0	14.52	-0.062	0.0	-0.062	-0.42%	0.000	0.000	-0.062
2023	14.731	0.0	14.73	14.659	0.0	14.66	-0.073	0.0	-0.073	-0.49%	0.000	0.000	-0.073
2024	14.879	0.0	14.88	14.801	0.0	14.80	-0.077	0.0	-0.077	-0.52%	0.000	0.000	-0.077
2025	15.027	0.0	15.03	14.950	0.0	14.95	-0.077	0.0	-0.077	-0.51%	0.000	0.000	-0.077
2026	15.178	0.0	15.18	15.103	0.0	15.10	-0.075	0.0	-0.075	-0.49%	0.000	0.000	-0.075
2027	15.329	0.0	15.33	15.255	0.0	15.26	-0.074	0.0	-0.074	-0.48%	0.000	0.000	-0.074
2028	15.483	0.0	15.48	15.428	0.0	15.43	-0.055	0.0	-0.055	-0.35%	0.000	0.000	-0.055
2029	15.638	0.0	15.64	15.609	0.0	15.61	-0.029	0.0	-0.029	-0.19%	0.000	0.000	-0.029
Average			14.46			14.50			0.044	0.36%	0.100	0.000	0.000

Source: See Exhibit TW-2 for inputs.

Note: Demand rates do not apply to residential customers.

Year	Rates - All Customers		No DSM Case		Participant				Non-Participant				Customers on Average			
	No DSM	With DSM			DSM Case		Bill Impact		DSM Case		Bill Impact		DSM Case		Bill Impact	
	Average Rate	Average Rate	Usage	Average Monthly Bill	Usage	Average Monthly Bill	Dollars	Percent	Usage	Average Monthly Bill	Dollars	Percent	Usage	Average Monthly Bill	Dollars	Percent
Units ->	(c/kWh)	(c/kWh)	(kWh)	(\$)	(kWh)	(\$)	(\$)	(%)	(kWh)	(\$)	(\$)	(%)	(kWh)	(\$)	(\$)	(%)
2013	13.3	13.8	750	110.9	631	98.1	-12.72	-11.5%	750	114.6	3.77	3.4%	748	114.3	3.43	3.1%
2014	13.5	14.0	750	111.9	631	99.2	-12.62	-11.3%	750	115.9	4.07	3.6%	745	115.2	3.32	3.0%
2015	13.6	14.2	750	112.9	631	100.2	-12.63	-11.2%	750	117.1	4.25	3.8%	741	115.9	3.04	2.7%
2016	13.7	13.7	750	113.9	631	97.2	-16.71	-14.7%	750	113.5	-0.40	-0.4%	741	112.3	-1.57	-1.4%
2017	13.9	13.8	750	114.9	631	98.0	-16.95	-14.7%	750	114.4	-0.49	-0.4%	742	113.3	-1.65	-1.4%
2018	14.0	14.0	750	116.0	631	98.9	-17.08	-14.7%	750	115.5	-0.44	-0.4%	742	114.3	-1.61	-1.4%
2019	14.2	14.1	750	117.0	631	99.8	-17.22	-14.7%	750	116.6	-0.42	-0.4%	742	115.4	-1.58	-1.4%
2020	14.3	14.2	750	118.1	631	100.7	-17.38	-14.7%	750	117.7	-0.41	-0.3%	742	116.5	-1.57	-1.3%
2021	14.4	14.4	750	119.1	631	101.6	-17.56	-14.7%	750	118.7	-0.41	-0.3%	742	117.6	-1.58	-1.3%
2022	14.6	14.5	750	120.2	631	102.4	-17.77	-14.8%	750	119.8	-0.46	-0.4%	742	118.6	-1.63	-1.4%
2023	14.7	14.7	750	121.3	631	103.3	-18.01	-14.8%	750	120.8	-0.55	-0.4%	742	119.6	-1.71	-1.4%
2024	14.9	14.8	750	122.4	631	104.2	-18.22	-14.9%	750	121.8	-0.58	-0.5%	742	120.7	-1.74	-1.4%
2025	15.0	15.0	750	123.5	631	105.1	-18.39	-14.9%	750	123.0	-0.58	-0.5%	742	121.8	-1.74	-1.4%
2026	15.2	15.1	750	124.7	631	106.1	-18.56	-14.9%	750	124.1	-0.56	-0.4%	742	122.9	-1.72	-1.4%
2027	15.3	15.3	750	125.8	631	107.1	-18.74	-14.9%	750	125.2	-0.56	-0.4%	742	124.1	-1.72	-1.4%
2028	15.5	15.4	750	127.0	631	108.2	-18.80	-14.8%	750	126.5	-0.41	-0.3%	745	125.7	-1.24	-1.0%
2029	15.6	15.6	750	128.1	631	109.3	-18.82	-14.7%	750	127.9	-0.22	-0.2%	747	127.5	-0.66	-0.5%
Average:				119.3		102.3	-17.0	-14.2%		119.6	0.3	0.3%		118.6	-0.7	-0.6%
Cumulative Present Value:				1,163.4		1,001.7	-161.7	-13.9%		1,170.7	7.2	0.6%		1,160.6	-2.8	-0.2%
Levelized:				124.8		107.4	-17.3	-13.9%		125.5	0.8	0.6%		124.5	-0.3	-0.2%

Source: See Exhibit TW-2 for inputs.

Annual Participation (Units/ Participants/ Facilities)							
Program	Historical				Base Efficiency Case (Currently Proposed)		
	2008-2009	2010	2011	2012	2013	2014	2015
Existing Residential (P)	1,041	2,196	11,563	21,000	10,000	11,000	12,000
New Houses (P)	77	260	701	900	1,150	1,375	1,625
Custom Incentives (F)	49	102	172	200	205	195	200
Direct Installation (F)	4,830	6,248	6,063	5,144	500	375	325
Home Energy Report (P)				60,000	66,492	66,492	66,492
Efficient Products Rebate (Residential) (U)	93,324	205,916	341,237	300,000	100,070	161,514	198,864
Efficient Product Rebates (BNI) (U)	1,400	494,636	575,778	550,000	242,682	223,911	210,491

	Cumulative Participation (Units/ Participants/ Facilities)						
Program	Historical				Base Efficiency Case (Currently Proposed)		
	2008-2009	2010	2011	2012	2013	2014	2015
Existing Residential (P)	1,041	3,237	14,800	35,800	45,800	56,800	68,800
New Houses (P)	77	337	1,038	1,938	3,088	4,463	6,088
Custom Incentives (F)	49	151	323	523	728	923	1,123
Direct Installation (F)	4,830	11,078	17,141	22,285	22,785	23,160	23,485
Home Energy Report (P)	-	-	-	60,000	126,492	192,984	259,476
Efficient Products Rebate (Residential) (U)	93,324	299,240	640,477	940,477	1,040,547	1,202,061	1,400,925
Efficient Product Rebates (BNI) (U)	1,400	496,036	1,071,814	1,621,814	1,864,496	2,088,407	2,298,898

[illegible]

Percent of Eligible U/P/F Participating Cumulatively							
Program	Historical				Base Efficiency Case (Currently Proposed)		
	2008-2009	2010	2011	2012	2013	2014	2015
Existing Residential (P)	0%	1%	4%	9%	11%	14%	17%
New Residential (P) - Cumulative Eligible	3%	6%	12%	16%	19%	22%	25%
Custom Incentives (F)	2%	6%	13%	21%	29%	37%	45%
Direct Installation (F)	14%	32%	49%	64%	57%	58%	59%
Home Energy Report (P)				16%	32%	49%	67%

Source: Avon IR-3 (Revised April 18, 2012)

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Program Participation - Existing Residential								
Base DSM Case (Currently Proposed Budget)	Units	Historical				Base Efficiency Case (Currently Proposed)		
		2008-2009	2010	2011	2012	2013	2014	2015
Eligible Participants	(participants)	385,000	385,000	385,000	385,000	415,000	415,000	415,000
Annual Participants	(participants)	1,041	2,196	11,563	21,000	10,000	11,000	12,000
Participation Rate	(%)	0%	1%	3%	5%	2%	3%	3%
Cumulative Participation	(participants)	1,041	3,237	14,800	35,800	45,800	56,800	68,800
Percent Eligible Participating (Annual)	(%)	0%	1%	3%	5%	2%	3%	3%
Percent Eligible Participating (Cumulative)	(%)	0%	1%	4%	9%	11%	14%	17%
Increased DSM Case	Units	Historical				Increased DSM Case (20% Increase)		
		2008-2009	2010	2011	2012	2013	2014	2015
Proposed Budget	(\$)					22,436,308	24,713,537	27,282,418
Proposed Annual Savings	(kWh)					14,300,000	14,300,000	14,300,000
Savings per Participant	(kWh)					1,430	1,300	1,192
Participants per Dollar Spent	(participants)					0.00045	0.00045	0.00044
Increased Budget (20%)	(\$)					26,923,570	29,656,244	32,738,902
Increased Annual Participants	(participants)	1,041	2,196	11,563	21,000	12,000	13,200	14,400
Increased Cumulative Participants	(participants)	1,041	3,237	14,800	35,800	47,800	61,000	75,400
Percent Eligible Increased Participating (Annual)	(%)	0%	1%	3%	5%	3%	3%	3%
Percent Eligible Increased Participating (Cumulative)	(%)	0%	1%	4%	9%	12%	15%	18%
Source: Avon IR-3 (Revised April 18, 2012)								
Also see Exhibit TW-2.								

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Exhibit TW-5

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Rate Impacts of Energy Efficiency: Increased DSM

Year	Base DSM (Currently Proposed)			Increased DSM (20% Increase)			Difference Between Cases				Increased Efficiency Rate Impacts			
	Supply Rate	Demand Rate	Total	Supply Rate	Demand Rate	Total	Supply Rate	Demand Rate	Total		Efficiency Impacts			Incrmntl Impact
	(c/kWh)	(c/kWh)	(c/kWh)	(c/kWh)	(c/kWh)		(c/kWh)	(c/kWh)	(c/kWh)	%	(c/kWh)	(c/kWh)	(c/kWh)	(c/kWh)
2013	13.839	0.000	13.84	13.940	0.000	13.94	0.101	0.000	0.101	0.73%	0.616	0.000	-0.012	-0.002
2014	14.012	0.000	14.01	14.121	0.000	14.12	0.109	0.000	0.109	0.78%	0.678	0.000	-0.026	-0.004
2015	14.171	0.000	14.17	14.285	0.000	14.28	0.113	0.000	0.113	0.80%	0.749	0.000	-0.068	-0.011
2016	13.686	0.000	13.69	13.675	0.000	13.68	-0.011	0.000	-0.011	-0.08%	0.000	0.000	-0.065	-0.011
2017	13.812	0.000	13.81	13.799	0.000	13.80	-0.013	0.000	-0.013	-0.09%	0.000	0.000	-0.078	-0.013
2018	13.957	0.000	13.96	13.945	0.000	13.95	-0.012	0.000	-0.012	-0.08%	0.000	0.000	-0.071	-0.012
2019	14.101	0.000	14.10	14.090	0.000	14.09	-0.011	0.000	-0.011	-0.08%	0.000	0.000	-0.067	-0.011
2020	14.243	0.000	14.24	14.233	0.000	14.23	-0.011	0.000	-0.011	-0.08%	0.000	0.000	-0.065	-0.011
2021	14.386	0.000	14.39	14.375	0.000	14.38	-0.011	0.000	-0.011	-0.08%	0.000	0.000	-0.066	-0.011
2022	14.523	0.000	14.52	14.511	0.000	14.51	-0.012	0.000	-0.012	-0.09%	0.000	0.000	-0.074	-0.012
2023	14.659	0.000	14.66	14.644	0.000	14.64	-0.015	0.000	-0.015	-0.10%	0.000	0.000	-0.087	-0.015
2024	14.801	0.000	14.80	14.786	0.000	14.79	-0.015	0.000	-0.015	-0.10%	0.000	0.000	-0.093	-0.015
2025	14.950	0.000	14.95	14.935	0.000	14.93	-0.015	0.000	-0.015	-0.10%	0.000	0.000	-0.093	-0.015
2026	15.103	0.000	15.10	15.088	0.000	15.09	-0.015	0.000	-0.015	-0.10%	0.000	0.000	-0.090	-0.015
2027	15.255	0.000	15.26	15.240	0.000	15.24	-0.015	0.000	-0.015	-0.10%	0.000	0.000	-0.089	-0.015
2028	15.428	0.000	15.43	15.417	0.000	15.42	-0.011	0.000	-0.011	-0.07%	0.000	0.000	-0.066	-0.011
2029	15.609	0.000	15.61	15.603	0.000	15.60	-0.006	0.000	-0.006	-0.04%	0.000	0.000	-0.035	-0.006
Average			14.50			14.51			0.009	0.07%	0.120	0.000	-0.067	-0.011

Source: See Exhibit TW-2 for inputs.

Note: Demand rates do not apply to residential customers.

[illegible]

Year	Rates - All Customers		Base DSM Case		Participant				Non-Participant				Customers on Average			
	Base DSM	Increased DSM			Increased DSM		Incrmntl Bill Impact		Increased DSM		Incrmntl Bill Impact		Increased DSM		Incrmntl Bill Impact	
	Average Rate	Average Rate	Usage	Average Monthly Bill	Usage	Average Monthly Bill	Dollars	Percent	Usage	Average Monthly Bill	Dollars	Percent	Usage	Average Monthly Bill	Dollars	Percent
Units ->	(c/kWh)	(c/kWh)	(kWh)	(\$)	(kWh)	(\$)	(\$)	(%)	(kWh)	(\$)	(\$)	(%)	(kWh)	(\$)	(\$)	(%)
2013	13.8	13.9	750	114.6	631	98.8	-15.86	-13.8%	750	115.4	0.75	0.7%	747	115.0	0.68	0.6%
2014	14.0	14.1	750	115.9	631	99.9	-16.01	-13.8%	750	116.7	0.81	0.7%	744	115.8	0.66	0.6%
2015	14.2	14.3	750	117.1	631	100.9	-16.17	-13.8%	750	118.0	0.85	0.7%	740	116.5	0.60	0.5%
2016	13.7	13.7	750	113.5	631	97.1	-16.38	-14.4%	750	113.4	-0.08	-0.1%	740	112.0	-0.31	-0.3%
2017	13.8	13.8	750	114.4	631	97.9	-16.54	-14.5%	750	114.3	-0.10	-0.1%	740	112.9	-0.33	-0.3%
2018	14.0	13.9	750	115.5	631	98.8	-16.71	-14.5%	750	115.4	-0.09	-0.1%	740	114.0	-0.32	-0.3%
2019	14.1	14.1	750	116.6	631	99.7	-16.87	-14.5%	750	116.5	-0.08	-0.1%	740	115.1	-0.32	-0.3%
2020	14.2	14.2	750	117.7	631	100.6	-17.04	-14.5%	750	117.6	-0.08	-0.1%	740	116.2	-0.31	-0.3%
2021	14.4	14.4	750	118.7	631	101.5	-17.21	-14.5%	750	118.6	-0.08	-0.1%	740	117.2	-0.31	-0.3%
2022	14.5	14.5	750	119.8	631	102.4	-17.39	-14.5%	750	119.7	-0.09	-0.1%	740	118.3	-0.32	-0.3%
2023	14.7	14.6	750	120.8	631	103.2	-17.56	-14.5%	750	120.7	-0.11	-0.1%	740	119.3	-0.34	-0.3%
2024	14.8	14.8	750	121.8	631	104.1	-17.74	-14.6%	750	121.7	-0.12	-0.1%	741	120.3	-0.35	-0.3%
2025	15.0	14.9	750	123.0	631	105.0	-17.91	-14.6%	750	122.8	-0.12	-0.1%	741	121.4	-0.35	-0.3%
2026	15.1	15.1	750	124.1	631	106.0	-18.09	-14.6%	750	124.0	-0.11	-0.1%	741	122.6	-0.34	-0.3%
2027	15.3	15.2	750	125.2	631	107.0	-18.27	-14.6%	750	125.1	-0.11	-0.1%	741	123.7	-0.34	-0.3%
2028	15.4	15.4	750	126.5	631	108.1	-18.45	-14.6%	750	126.5	-0.08	-0.1%	744	125.5	-0.25	-0.2%
2029	15.6	15.6	750	127.9	631	109.3	-18.64	-14.6%	750	127.9	-0.04	0.0%	747	127.3	-0.13	-0.1%
Average:				119.6		102.4	-17.2	-14.4%		119.7	0.07	0.06%		118.4	-0.14	-0.12%
Cumulative Present Value:				1171		1,002.9	-167.8	-14.3%		1,172.1				1,160.0		
Levelized:				125.5		107.5	-18.0	-14.3%		125.7				124.4		

Source: See Exhibit TW-2 for inputs.