BEFORE THE NOVA SCOTIA UTILITY AND REVIEW BOARD

In the Matter of an Application by EfficiencyOne for Approval of a 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 2019 Demand Side Management (DSM) Resource Plan

(NSUARB M08604)

Evidence of
Alice Napoleon

On Behalf of
Counsel to Nova Scotia Utility and Review Board

On the Topic of
EfficiencyOne's 2019 DSM Plan

June 13, 2018

Table of Contents

1. INTRODUCTION AND QUALIFICATIONS

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

A. My name is Alice Napoleon. I am a Senior Associate at Synapse Energy Economics ("Synapse"), located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse is a research and consulting firm specializing in electricity and gas industry regulation, planning, and analysis. Our work covers a range of issues including integrated resource planning; economic and technical assessments of energy resources; electricity market modeling and assessment; energy efficiency policies and programs; renewable resource technologies and policies; and climate change strategies. Synapse works for a wide range of clients including attorneys general, offices of consumer advocates, public utility commissions, environmental groups, and federal clients such as the U.S. Environmental Protection Agency and the Department of Justice. Synapse has a professional staff of 30 with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. Since joining Synapse in 2005, I have provided economic and policy analysis of electric systems and emissions regulations, with a focus on energy efficiency policies and programs, on behalf of a diverse set of clients throughout the United States and in Canada.

Before joining Synapse, I worked at Resource Insight, Inc., where I supported investigations of electric, gas, steam, and water resource issues, primarily in the context of reviews by state utility regulatory commissions.

I hold a Master's in Public Administration from the University of Massachusetts at Amherst and a Bachelor's in Economics from Rutgers University. My resume is attached as Appendix A.

1	**Q.**	**Please describe your professional experience as it relates to energy efficiency.**
2	A.	I have significant experience with energy efficiency programs review and
3		analysis. In Colorado, Maryland, and South Carolina, I facilitated and provided
4		expert analysis on program costs and benefits for demand-side resource policy
5		working groups. On the national level, I led the team that developed a cost
6		effectiveness calculator, provided guidance on program design, and developed
7		communications materials and case studies to help state and utility energy
8		efficiency program administrators with implementing offerings to support
9		participation in the U.S. Department of Energy's Superior Energy Performance
10		program.

11 Since 2009, I have provided extensive and ongoing expert analysis and support

12 for the State of New Jersey regarding its state- and utility-administered energy

13 efficiency and combined heat and power programs. In over a dozen dockets

14 regarding utility-administered efficiency programs, I have conducted expert

15 analysis, provided litigation support, and drafted testimony when appropriate on

16 behalf of the State with respect to a number of issues, including energy efficiency

17 program implementation, cost effectiveness, design, and overlap between utility-

18 and state-administered programs.

19 I have also provided expert advice on DSM programs in Nova Scotia, regarding a

20 range of issues including incentive setting methodologies, cost benefit analysis,

21 load forecasting, and locational DSM.

22 **Q.** **Have you previously testified before the Nova Scotia Utility and Review**
23 **Board?**

24 A. Yes, I provided evidence in Case No. M06247 on behalf of the Nova Scotia

25 Utility and Review Board, regarding the 2015 Demand-Side Management Plan,

26 and in Advanced Meter Infrastructure cases (Matter Nos. M07767 and M08349).

27 Further, I supported Tim Woolf in Matter No. M06733 regarding EfficiencyOne's

28 2016 to 2018 demand-side management plan.

1	Q.	On whose behalf are you providing evidence in this case?
2	A.	I am providing evidence on behalf of Counsel to the Nova Scotia Utility and
3		Review Board ("Board").

4	Q.	What is the purpose of this evidence?
5	A.	The purpose of this evidence is to assess EfficiencyOne's (E1) proposed 2019
6		Demand Side Management (DSM) Resource Plan (2019 Plan), describe and
7		present my concerns with it, and to provide recommendations to E1 and to the
8		Board.

9   **2.**   **SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS**

10	Q.	Please describe your conclusions.
11	A.	I find that the 2019 DSM Resource Plan secures highly cost-effective DSM
12		resources within the budget available, which is based upon the 2016-2018 DSM
13		Resource Plan annual spending levels. Given this construct of an effective cap on
14		DSM resource spending, the plan is reasonable.

15		As I note in this evidence, and as illustrated in E1's filing,[1] the cost effectiveness
16		of the total DSM resource portfolio anticipated for 2019 equals or exceeds a
17		benefit/cost ratio of 2.3 for the total resource cost test, and 3.9 for the program
18		administrator cost test. In addition, continued tightening of emissions caps in
19		Nova Scotia will lead to relative increases in the avoided costs of energy,
20		provided by DSM resources. Both of these points imply a significant level of
21		headroom available for procurement of additional DSM resources in the next
22		DSM Resource Plan.

23		Critically, E1 indicates that during 2018 and continuing into 2019, E1 will work
24		with NS Power to negotiate a contract for the 2020-2022 DSM Resource Plan.[2] It
25		is imperative that the starting point of such negotiations is an understanding of the
26		overall quantities of cost-effective DSM resources—informed by the most up-to-

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[1] DSM Plan, Appendix B, page 15.
[2] DSM Plan, Appendix A, p. 2.

| 1 | date information available on such avoided costs and on the level of cost-effective |
| 2 | DSM available to Nova Scotia's ratepayers. |

| 3 | Further, I make the following additional conclusions: |

4	1. Increased emphasis on capacity savings (e.g., through the demand reduction
5	pilots proposed by E1) is likely to yield benefits, given peak demand growth
6	in the province.

| 7 | 2. Reducing the emphasis on lighting measures will diversify the DSM portfolio |
| 8 | but could lead to lost opportunities for cost-effective savings. |

9	3. Transparency in the DSM decision-making process could be improved,
10	specifically with respect to assessing market transformation and the Technical
11	Reference Manual (TRM).

| 12 | 4. Research, such as potential studies, has not been aligned well with resource |
| 13 | decision making. |

| 14 | |

| 15 | **Q.** | **What are your recommendations?** |
| 16 | A. | I make the following recommendations for E1: |

17	1. E1 should increase focus on capacity savings by implementing demand
18	reduction pilots as soon as feasible, subject to review by stakeholders and the
19	Board.

20	2. E1 should continue a gradual shift towards a more diversified portfolio (i.e.,
21	less emphasis on lighting measures). However, E1 should continue to obtain
22	near-term lighting savings that, but for E1's efforts, might be delayed or lost.

| 23 | 3. E1 should make the Technical Reference Manual (TRM) accessible to |
| 24 | stakeholders and make the TRM update process transparent. |

| 25 | 4. E1 should develop specific metrics and a defined process for assessing market |
| 26 | transformation. |

5. E1 should develop a research plan. Future research, such as potential studies, should be better aligned to inform decision making in the Integrated Resource Plan (IRP) and the DSM planning process.

6. All activities E1 undertakes during 2018 and 2019 in advance of, and as part of, the development of a 2020-2022 DSM Resource Plan should explicitly recognize the high cost-effectiveness of the DSM resource and anticipate a more aggressive plan than that represented by the 2019 DSM Resource Plan.

7. For the 2020-2022 DSM Resource plan, E1 should incorporate long-term goals into plans more strategically and explicitly than is provided for in the 2019 DSM Resource plan. These include carbon reduction targets and avoiding capacity investment. The plan should recognize the full quantity of cost-effective DSM resource available and recognize the high level of cost effectiveness exhibited by the planned 2019 DSM resources.

8. E1, on its own or in conjunction with NS Power, should update the avoided cost information prior to developing a 2020-2022 resource plan. E1 could use the most up-to-date modeling conducted by Synapse in the Generation Utilization and Optimization case (M08059) to inform such an exercise, and/or work with NS Power to develop a reasonable estimate for avoided cost metric components including energy, capacity, transmission and distribution savings, and any emissions avoidance effect not already captured in the avoided energy estimate.

9. Discussions about the 2020-2022 DSM Resource Plan should start with findings about the full quantity of available, cost-effective DSM resources.

I make the following recommendation to the Board:

- For all future DSM plans, the Board should require E1 (or the holder of the Efficiency Nova Scotia franchise) to use the Standard DSM Template (or update to the Standard DSM Template in effect at the future date).

1	**3.**	**OVERVIEW OF THE 2019 DSM PLAN**

2 **Q.** **Please provide a high-level overview of the 2019 DSM Plan.**

3 A. E1 filed its proposal for the 2019 DSM plan on April 6, 2018. Generally, this plan
4 proposes to continue the budget and savings levels of the previous three years, as
5 well as introduce new demand reduction pilots and shift the measure mix to
6 reduce the share of savings from lighting measures. To minimize cost of the DSM
7 Plan proceeding, E1 used the modeling for the previously approved three-year
8 plan for 2016-2018.[3]

9 **Q.** **Did E1 use the Standardized Filing Framework for this DSM Plan?**

10 A. No. E1 indicated that it did not develop this DSM Resource Plan based on the
11 Standardized Filing Framework. E1's reason for not using the Standardized Filing
12 Framework is to be consistent with the continuation year approach set forth in the
13 Electricity Plan Implementation Act of 2015.[4] As a result, E1's 2019 DSM Plan
14 lacked sufficient detail and data to enable review by stakeholders. For example,
15 key metrics such as cost effectiveness test results were omitted from data tables.
16 Description and data to clarify and support the magnitude of the shift from
17 lighting to non-lighting measures was missing. Synapse asked numerous
18 discovery questions to fill in missing details and address data gaps in the plan.
19 While E1 was largely responsive to information requests, these data should be
20 provided in the initial filing so that stakeholders have the opportunity to review
21 and ask further questions on it.

22 **Q.** **Do you have any recommendations for future DSM plans?**

23 A. Yes. The Standard Filing Framework should be the minimum standard for all
24 future plans. In addition, I recommend the following:

25 • Key metrics such as cost effectiveness results (in addition to savings and
26 costs) should be provided at the sub-program level, or the finest level of detail
27 possible;

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[3] DSM Plan, p. 17.
[4] DSM Plan, p. 5-6.

1   • Data tables should be provided in their original, native format; and

2   • Data should be provided for each year (i.e., not averaged) and historical data
3   should be provided in a consistent format with data for the plan year(s).

4   Below, I compile, describe, and discuss available evidence from E1's DSM Plan
5   filing, Annual Progress Report, and responses to Information Requests on energy
6   savings, targets, budget, cost effectiveness, and program designs.

7   *Energy savings and targets*

8   **Q.**   **What level of energy savings is proposed in the 2019 plan?**
9   A.   The 2019 DSM Plan includes incremental annual savings of 51.2 gigawatt hours
10   (GWh) for residential programs and 76.1 GWh for the business, non-profit, and
11   institutional sector (BNI), for a portfolio total of 127.2 GWh. Incremental lifetime
12   savings of the proposed portfolio are 1,638.4 GWh.

13   **Q.**   **What is the proposed level of peak demand savings?**
14   A.   E1's 2019 Plan includes incremental demand savings of 10 megawatts (MW) for
15   the residential sector and 10.2 for BNI. Total peak demand savings for the
16   portfolio are 20.2 MW. Incremental annual, incremental lifetime, and peak
17   demand savings are shown in Table 1.

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2 **Table 1. 2019 Annual, Lifetime, and Demand Savings.**

Program	Incremental Annual Net Energy Savings (GWh)	Lifetime Net Energy Savings (GWh)	Incremental Annual Net Demand Savings (MW)
Residential DSM Programs			
Efficient Product Rebates	**14.9**	**132.9**	**1.5**
Instant Savings	12.6	115.9	1.2
Appliance Retirement	2.3	17.0	0.3
Existing Residential	**31.0**	**422.2**	**7.0**
Home Energy Assessment	9.4	187.0	2.4
Green Heat	4.8	86.9	2.7
Efficient Product Installation	16.9	148.3	2.0
New Residential	**5.3**	**157.5**	**1.6**
New Home Construction	5.3	157.5	1.6
Residential Total	**51.2**	**712.6**	**10.0**
Business, Nonprofit, and Institutional Programs			
Efficient Product Rebates	**32.5**	**380.3**	**5.1**
Business Energy Rebates	32.5	380.3	5.1
Custom Incentives	**34.3**	**427.2**	**3.6**
Custom	30.1	414.8	3.2
Energy Management Information Systems	1.8	5.1	0.2
Strategic Energy Management	2.5	7.3	0.3
Direct Installation	**9.3**	**118.4**	**1.5**
Small Business Energy Solutions	9.3	118.4	1.5
BNI Total	**76.1**	**925.8**	**10.2**
Enabling Strategies			
Education & Outreach	**n/a**	**n/a**	**n/a**
Development & Research	**n/a**	**n/a**	**n/a**
Other Enabling Strategies	**n/a**	**n/a**	**n/a**
Enabling Strategies Total	**n/a**	**n/a**	**n/a**
Total	**127.2**	**1,638.4**	**20.2**

3 *Source: 2019 DSM Resource Plan, Table 1 - 2019 DSM Resource Plan Savings and Investment*
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1 **Q.** **What performance targets has EfficiencyOne proposed?**

2 A. E1 proposed targets for first-year incremental energy savings and demand

3 savings. These are equal to 127.2 GWh and 20.2 MW, respectively.[5]

4 **Q.** **How do these targets compare with previous years' targets?**

5 A. E1's 2019 targets are slightly lower than the targets for the previous three years.

6 For example, 2017 targets for first-year energy savings equaled 136.5 GWh and

7 21 MW for peak demand savings.

8 **Q.** **Does E1 generally achieve its targets?**

9 A. Yes, E1 has exceeded its targets in recent years. Comparing E1's achievements

10 for 2015, 2016, and 2017 with its targets for the same years, it is evident that

11 actual energy and peak demand savings have exceeded planned targets by

12 significant margins. For example, 2016 energy savings exceeded E1's target by

13 about 4 GWh, or roughly 3 percent. Demand savings achieved in 2017 (23.7 MW)

14 exceeded E1's target for that year (21.0 MW) by 2.7 MW, or about 13 percent.[6]

15 The table below shows the differences between actual results and planned/as filed

16 targets for the past three years.

17 **Table 2. Historical DSM demand savings versus planned.**

Year	Results / Plan			
	Absolute Difference		Percent Difference	
	Energy Savings (GWh)	Demand Savings (MW)	Energy Savings	Demand Savings
2015	16.7	1.5	13.8%	7.1%
2016	3.8	5.6	2.9%	27.5%
2017	-5.8	2.7	-4.2%	12.9%
Average	4.9	3.3	4.1%	15.8%

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[5] DSM Plan, p. 19.
[6] ENS 2017 DSM Annual Progress Report, p. 2.

1   *Budget*

2   **Q.   Please describe E1's proposed budget for the 2019 programs.**

3   A.   As shown in Table 3, E1 proposes a total investment of $34.1 million for the

4   2019 programs, consistent with the level set forth in the Electricity Plan

5   Implementation Act of 2015.[7]

6   **Table 3. 2019 Investment.**

Program	Investment ($ million)
Residential DSM Programs	
Efficient Product Rebates	3.5
Existing Residential	8.6
New Residential	2.2
Residential Total	14.2
Business, Nonprofit, and Institutional Programs	
Efficient Product Rebates	5.2
Custom Incentives	6.1
Direct Installation	4.1
BNI Total	15.4
Enabling Strategies	
Education & Outreach	1.6
Development & Research	2.2
Other Enabling Strategies	0.7
Enabling Strategies Total	4.5
Total	34.1

7   *Source: 2019 DSM Plan, p. 18.*

8   *Cost of Saved Energy*

9   **Q.   Please describe the cost of saved energy for E1's proposed 2019 portfolio.**

10   A.   As shown in Table 4, the first-year cost of saved energy for the portfolio is $0.268

11   per kilowatt hour (kWh), and the lifetime cost of saved energy is just over 2 cents

12   per kWh. E1's projected 2019 portfolio-wide cost of saved energy is higher than

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[7] E1(SBA) IR-01.

1   the cost of saved energy of the 2016-2018 programs, ranging from $0.232 to

2     $0.268 per kWh on a first-year basis and from $0.019 to $0.021 per kWh on a

3   lifetime basis. E1's projected 2019 value is much lower than the lifetime, straight

4   average program administrator cost of saved energy, equal to $0.051 CAD per

5   kWh of savings,[8] that was found in Synapse's 2016 study based on U.S. Energy

6   Information Administration data for energy efficiency programs from 2010 and

7   2015.[9] The E1 value is also less than Synapse's finding for the utility cost of

8   providing energy efficiency when the average was weighted by saved energy,

9     $0.034 CAD per kWh.[10]

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[8] Assumes an exchange rate of $1 USD : $1.3 CAD.
[9] Synapse Energy Economics. 2016. Estimating the Cost of Saved Energy: The EIA 861 database.
[10] Ibid.

1 **Table 4. 2019 Investment, First-year Unit Cost, and Lifetime Unit Cost.**

Program	Investment ($ million)	First Year Unit Cost ($/kWh)	Lifetime Unit Cost ($/kWh)
Residential DSM Programs			
Efficient Product Rebates	**3.5**	**0.235**	**0.026**
Instant Savings	2.4	0.191	0.021
Appliance Retirement	1.1	0.478	0.065
Existing Residential	**8.6**	**0.276**	**0.020**
Home Energy Assessment	3.0	0.316	0.016
Green Heat	1.7	0.344	0.019
Efficient Product Installation	4.0	0.234	0.027
New Residential	**2.2**	**0.410**	**0.014**
New Home Construction	2.2	0.410	0.014
Residential Total	**14.2**	**0.278**	**0.020**
Business, Nonprofit, and Institutional Programs			
Efficient Product Rebates	**5.2**	**0.160**	**0.014**
Business Energy Rebates	5.2	0.160	0.014
Custom Incentives	**6.1**	**0.176**	**0.014**
Custom	5.3	0.176	0.013
Energy Management Information Systems	0.3	0.171	0.059
Strategic Energy Management	0.5	0.180	0.062
Direct Installation	**4.1**	**0.443**	**0.035**
Small Business Energy Solutions	4.1	0.443	0.035
BNI Total	**15.4**	**0.202**	**0.017**
Enabling Strategies			
Education & Outreach	**1.6**	**n/a**	**n/a**
Development & Research	**2.2**	**n/a**	**n/a**
Other Enabling Strategies	**0.7**	**n/a**	**n/a**
Enabling Strategies Total	**4.5**	**n/a**	**n/a**
Total	**34.1**	**0.268**	**0.021**

2 *Source: E1(Synapse) IR-10, Table 1: 2019 DSM Plan Savings and Investment - by Program*
3 *Component*
4

1   As noted by E1, the difference between this cost of saved energy and the 2016-

2   2018 average cost of saved energy is largely due to changes in the program

3   measure mixes; the impact of changes in program-level unit costs and avoided

4   costs generally balanced each other out.[11]

5   *Cost effectiveness*

6   **Q.   Has E1 provided cost effectiveness results for the proposed 2019 programs?**

7   A.   Yes, in response to information requests. E1's cost effectiveness results, in terms

8   of the Program Administrator Cost (PAC) test and the Total Resource Cost (TRC)

9   test, are shown in Table 5.

10   **Table 5. 2019 Program Cost Effectiveness.**

2019		
Program	**PAC Result**	**TRC Result**
Residential DSM Programs		
Efficient Product Rebates	2.9	1.8
Existing Residential	4.6	2.0
New Residential	5.5	3.5
Residential Total	4.3	2.2
Business, Nonprofit, and Institutional Programs		
Efficient Product Rebates	6.2	3.4
Custom Incentives	5.0	3.3
Direct Installation	2.4	1.4
BNI Total	4.7	2.8
Enabling Strategies		
Education & Outreach	n/a	n/a
Development & Research	n/a	n/a
Other Enabling Strategies	n/a	n/a
Enabling Strategies Total	n/a	n/a
Total	**3.9**	**2.3**

Source: Response IR-05, Table 1: 2019 DSM Resource Plan Cost-Effectiveness Test Results and Participation Estimates

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[11] E1(Synapse) IR-5, p. 2.

1 **Q.   How do you interpret the cost effectiveness results?**

2 A.   The PAC result for the portfolio means that for every dollar of investment in

3   DSM, the system realizes $3.90 in benefits. The high cost effectiveness of the

4   programs and the portfolio further suggests that there is headroom for increasing

5   DSM investment beyond current levels while maintaining a cost-effective

6   portfolio.

7 *Program design*

8 **Q.   Please describe changes in the program design from the 2016-2018 programs.**

9 A.   The 2019 DSM Plan reflects a shift from a large portion of savings coming from

10   lighting measures to a portfolio with less savings from that measure type.[12] In

11   terms of energy savings, lighting measures account for 81 GWh of projected 2018

12   savings, or roughly 58 percent of the portfolio. In 2019, lighting savings will

13   comprise about 49 percent of the portfolio, or a total of 62.4 GWh.

14 **Table 6. Lighting versus Non-lighting Energy Savings, 2018 and 2019.**

DSM Program	2018			2019		
	Lighting Measures	Non-Lighting Measures	Total	Lighting Measures	Non-Lighting Measures	Total
Efficient Product Rebates (Residential)	14.7	4.6	19.3	11.4	3.5	14.9
Existing Residential	11.7	16.8	28.5	11.6	19.4	31.0
New Residential	0.0	4.6	4.6	0.0	5.3	5.3
Efficient Product Rebates (BNI)	43.5	7.0	50.5	28.0	4.5	32.5
Custom Incentives	3.3	22.6	25.9	4.1	30.2	34.3
Direct Installation	7.6	2.0	9.6	7.4	1.9	9.3
Total (GWh)	80.8	57.5	138.3	62.4	64.8	127.2
Total (%)	58%	42%	100%	49%	51%	100%

15 *Source: E1(SBA)IR-07.*

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[12] DSM Plan, Appendix A, p. 3.

1   As shown in Table 7, this shift is also seen in demand savings. Savings from

2   lighting measures in 2018 is projected to be 13 MW, or roughly half of total

3   demand savings. Demand savings associated with lighting measures in the 2019

4   Plan is 9.1 MW, about 45 percent of the total.

5 **Table 7. Lighting versus Non-lighting Demand Savings, 2018 and 2019.**

DSM Program	2018			2019		
	Lighting Measures	Non-Lighting Measures	Total	Lighting Measures	Non-Lighting Measures	Total
Efficient Product Rebates (Residential)	2.3	0.3	2.6	1.3	0.2	1.5
Existing Residential	1.4	6.6	8.0	1.4	5.6	7.0
New Residential	0.0	1.3	1.3	0.0	1.6	1.6
Efficient Product Rebates (BNI)	7.1	0.8	7.9	4.6	0.5	5.1
Custom Incentives	0.9	3.6	4.5	0.7	2.9	3.6
Direct Installation	1.3	0.4	1.7	1.2	0.3	1.5
Total (MW)	13.0	12.9	25.9	9.1	11.1	20.2
Total (%)	50%	50%	100%	45%	55%	100%

6   *Source: E1(SBA) IR-07*

7 **4.   THE 2019 DSM PLAN SHOULD INCORPORATE STRATEGIES TO**

8 **ATTAIN LONGER TERM GOALS**

9 **Q.   Why do jurisdictions implement DSM?**

10 A.   In general, the reason for utility-sponsored DSM programs is the known and

11   demonstrated market failures that result in a less-than-economically-optimal

12   uptake of energy efficiency resources by consumers. Those failures include, for

13   example, imperfect information, split incentives (landlords vs. tenants),

14   externalities, and imperfect competition.[13] Different jurisdictions have different

15   objectives in implementing DSM, but several common ones include lowering

16   energy costs, reducing exposure to volatile fuel prices, avoiding infrastructure

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[13] For example, see ACEEE "Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency, March 2013, available at http://aceee.org/files/pdf/summary/e136-summary.pdf.

1		investments, reducing the energy burden for low-income households, and
2		reducing greenhouse gas emissions.
3	**Q.**	**Does the Plan clearly describe E1's goals and strategies for attaining those**
4		**goals?**
5	A.	No. The plan lacked description of E1's broader, longer-term strategic direction
6		for energy efficiency beyond 2019 and how E1's 2019 DSM Plan fits into and
7		helps E1 accomplish its longer-term strategy. E1 has the energy efficiency
8		franchise in Nova Scotia for at least two more planning periods (2020-2022,
9		2023-2025), and thus E1 should be anticipating a trajectory of DSM resource
10		planning that extends out more than seven years from now.
11	**Q.**	**Are there strategic objectives in Nova Scotia that call for a longer-term**
12		**perspective when considering DSM planning?**
13	A.	Two apparent objectives of DSM in Nova Scotia—addressing peak load growth
14		and reducing greenhouse gas emissions (GHG)—call for more strategic handling
15		in the DSM Plan. While DSM spending approval for this plan may be focused on
16		a one-year interval (2019), the planning for that year should consider expectations
17		about the role that DSM can continue to play in Nova Scotia planning for GHG
18		reduction and a transition to continuing use of clean energy.

19 *Reducing peak load growth in the province*

20	**Q.**	**What is the projected energy load growth in the province?**
21	A.	According to NSPI's Load Forecast Report, energy consumption is projected to
22		decline slightly over the next ten years, as shown in Table 8.

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1 **Table 8. Forecast Total System Energy, 2018-2028.**

Year	Total Energy	Growth
	GWh	%
2018	10,960	0.80%
2019	11,000	0.40%
2020	11,003	0.00%
2021	10,916	-0.80%
2022	10,881	-0.30%
2023	10,835	-0.40%
2024	10,802	-0.30%
2025	10,740	-0.60%
2026	10,705	-0.30%
2027	10,670	-0.30%
2028	10,659	-0.10%
Compound Annual Growth		-0.28%
10-year Growth		-2.75%

2 *Source: 2018 Load Forecast Report, Table A1*
3 **Includes municipal load and losses.*
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5 **Unlike energy, demand is projected to grow over the next six years. As shown in**

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7 Table 9, peak demand is expected to increase through 2024, then slowly decline
8 in the following years. Peak demand in 2028 is projected to be 1.5 percent higher
9 than projected 2018 demand.

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1   **Table 9. Forecast Total System Demand, 2018-2028.**

Year	Net System Peak (MW)	Growth (%)
2018	2,139	6.00%
2019	2,157	0.86%
2020	2,172	0.71%
2021	2,174	0.05%
2022	2,178	0.20%
2023	2,184	0.29%
2024	2,191	0.28%
2025	2,187	-0.18%
2026	2,183	-0.17%
2027	2,177	-0.25%
2028	2,172	-0.23%
Compound Annual Growth		0.15%
10-year Growth		1.54%

2   *Source: 2018 Load Forecast Report, Table A3*
3

4   **Q.   What do these forecasts suggest for DSM planning?**

5   A.   Targeting demand growth with DSM is appropriate in light of peak load growth

6   trends.

7   **Q.   How do demand savings proposed in the 2019 Plan compare with previous**
8   **years?**

9   A.   In absolute terms, the planned demand savings for 2019 are less than demand

10   savings achievements in recent years, from an average of 25 MW in the years

11   2016 through 2017, compared to the target of 20.2 MW in the 2019 plan.[14] E1 has

12   noted that the change in 2019 targets and 2016-2018 approved annual averages

13   reflects the allocation of $1 million in budget for the demand reduction initiatives,

14   as well as 2017 evaluation results.[15]

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[14] 2019 DSM Resource Plan, Table 1 - 2019 DSM Resource Plan Savings and Investment; E1(Synapse) IR-10, Tables 2 and 3.
[15] E1(SBA) IR-02.

1	Q.	**Does E1 plan to address peak demand growth during 2019?**
2	A.	Yes. E1 proposes to design and implement demand reduction pilots during 2019.
3		E1 proposes a $1 million budget for these pilots, equivalent to about 3 percent of
4		the total proposed investment.
5	Q.	**Has E1 presented program designs for the proposed demand reduction**
6		**pilots?**
7	A.	No. E1's proposed demand reduction pilots have yet to be defined.[16] Given the
8		lack of information on the pilots, it is difficult to comment on them at this point.
9	Q.	**Is it likely that E1 will see peak savings from the proposed demand reduction**
10		**pilots during 2019?**
11	A.	No, and E1 does not include any savings for the demand reduction pilots in its
12		performance targets.[17]
13	Q.	**Do you have any recommendations?**
14	A.	Given the peak load growth trend, E1 should develop plans to implement the
15		demand reduction pilots. I recommend that E1 consult best practices in other
16		jurisdictions and present draft plans to the DSMAG as soon as feasible.

17 *Carbon targets*

18	Q.	**Does E1's 2019 Plan consider potential carbon dioxide (CO2) savings**
19		**through E1's proposed 2019 DSM Plan?**
20	A.	Yes. As part of the potential benefits of the 2019 plan, E1 estimated that the 2019
21		plan "will avoid the release of approximately 850,000 tonnes of CO2e over 2019-
22		2032, roughly equivalent to the annual emissions from the Tufts Cove generation
23		station."[18]
24	Q.	**How did E1 estimate the avoided CO2 emissions?**
25	A.	The 2019 Plan is not clear about how E1 estimated the avoided emissions or what
26		avoided emission factors E1 used to estimate the total avoided emissions from the

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[16] E1(UARB) IR-15.
[17] E1(SBA) IR-20.
[18] DSM plan, p. 3.

1	expected lifetime energy savings from 2019 to 2032. The only relevant
2	information I am aware of is Econoler's recent evaluation report on E1's 2017
3	DSM programs in which Econoler used the annual weighted average emission
4	rate by dividing Nova Scotia Power's total system emissions of 7,079,268 CO2
5	equivalent (CO2e) tonnes in 2016 by its total electricity generation of 10,839
6	GWh.[19] This results in an emission factor of 0.6531 kg of avoided CO2e per
7	annual kWh saved at the generator. On the other hand, this factor is different from
8	the factor I derived from the 2019 DSM Plan, which reported 850,000 tonnes of
9	CO2e avoided (as mentioned above) and 1,640 GWh of lifetime energy savings.[20]
10	These data yield an average avoided emission rate of about 0.520 kg per kWh
11	saved.

| 12 | **Q.** | **What methodology should be used to estimate avoided emissions from DSM** |
| 13 | | **programs?** |

14	A.	Emission rates from power plants change by hour, in particular by peak and off
15		peak hours and by season. The types of power plants that often change their
16		output depending on hourly demand are called marginal power plant units. E1
17		should be using emission factors from marginal units that would change their
18		outputs by the demand, ideally by peak and off-peak and by season. Many
19		jurisdictions in the United States now use time of use and seasonable profiles for
20		savings and avoided costs.[21] If such data are not readily available, or not readily
21		usable because energy efficiency load shapes for such time periods are not
22		available at this point, E1 should at least use average emission rates from
23		marginal power plants and exclude any emissions from baseload power plants that
24		do not change their outputs substantially over the course of a year.

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[19] Econolar. 2018. 2017 DSM Evaluation Reports – Efficiency Nova Scotia, P. 13.
[20] DSM Plan, Appendix B, Table 1.
[21] For example, the New England states use the Avoided Energy Supply Costs study, available here: http://www.synapse-energy.com/project/avoided-energy-supply-costs-new-england. Wisconsin, California, and the Northwest Power and Conservation Council use or are developing seasonal or more granular (i.e. hourly) data.

1 2	Q.	**Does E1 take into account avoided costs of CO2 when evaluating its program cost effectiveness?**
3	A.	No.

4	Q.	**Should E1 incorporate the value of avoiding CO2 from its DSM programs?**
5 6	A.	Yes. E1 should incorporate the value of avoiding CO2 in its DSM cost effectiveness analysis for a variety of reasons.

7 First, Nova Scotia now has regulations (Bill No. 15 – an amendment to
8 Environment Act) that set emission targets for the entire economy and require the
9 establishment of a cap and trade program for CO2. Nova Scotia recently joined
10 the Western Climate Initiative for implementing the trading program. While
11 energy efficiency resources cannot directly participate in the trading program, the
12 province's power plants are subject to the regulations. This means that reducing
13 load through energy efficiency programs could reduce the cost of complying with
14 the CO2 regulations.

15 Second, Nova Scotia's Equivalency Agreement enacted in 2010 set strict
16 emission limits on the entire power sector in the province, which has a steep
17 declining emission limit over time. The Equivalency Agreement will lead to
18 increasing avoided energy costs (reflecting the carbon targets). A recent study by
19 Synapse Energy Economics demonstrated that an increased level of energy
20 efficiency programs will save CO2 emissions from the system while reducing the
21 system wide cost for consumers.[22]

22 23	Q.	**What are major implications of including the value of avoided CO2 for E1's DSM program?**
24 25 26	A.	By incorporating the avoided cost of CO2, E1 could improve the cost effectiveness of its DSM programs for 2019 and future programs. This also means that E1 could implement a higher level of DSM programs while maintaining cost

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[22] Synapse Energy Economics. 2018. Nova Scotia Power Inc. Thermal Generation Utilization and Optimization: Economic Analysis of Retention of Fossil-Fueled Thermal Fleet To and Beyond 2030 – M08059.

1		effectiveness, producing more economic benefits to the province and reducing
2		emissions.
3	**Q.**	**What should E1 do now in the 2019 Plan and/or the next three-year plan?**
4	A.	First, as described above, E1 should investigate improving its CO_2 savings
5		accounting methodology. At minimum, it should use the average emission rates
6		from marginal power plants. It should also develop avoided emissions as well as
7		energy and demand savings load profile by time of use (i.e., peak and off-peak)
8		and seasonable time periods (i.e., summer and winter). E1 should take this action
9		for the 2019 DSM Plan.
10		Second, E1 should develop long-term avoided costs of CO_2 while anticipating the
11		tightening emission rates over time as promulgated in the Equivalency
12		Agreement. I recommend E1 start considering how to develop avoided CO_2 costs
13		now and develop the values in time for the next three-year plan.
14		Third, E1 should modify future DSM programs by taking into account potential
15		improvements to the program cost effectiveness due to the expected increasing
16		costs of avoided CO_2 emissions. This should be taken into account for the next
17		three-year plan.
18		Lastly, research and development activities should reflect anticipated ongoing
19		increases to avoided costs due to tightening carbon targets and should
20		acknowledge the continuing economic attractiveness of increasing participation
21		across all sectors.

| 22 | **5.** | **OTHER ISSUES WITH THE 2019 PLAN** |

23	*Transparency*	
24	**Q.**	**How transparent is E1's approach to its 2019 DSM Plan?**
25	A.	As noted previously, E1's 2019 DSM Plan lacked the appropriate level of detail
26		and data required for review by stakeholders. In addition to key metrics such as
27		cost effectiveness, the plan lacked description of E1's longer-term strategic
28		direction for energy efficiency.

1	Q.	**Do any transparency issues require further action?**
2	A.	Yes, E1's responses to our discovery questions revealed two areas where lack of
3		transparency requires further action. The first area concerns the lack of
4		transparency of E1's new, electronic Technical Reference Manual or eTRM. The
5		second area concerns the lack of transparency in the methodology used to adjust
6		the measure mix to account for the lighting market transformation.

7 *TRM*

8	Q.	**What is an eTRM?**
9	A.	TRMs provide documentation of (a) key inputs, methodologies, and formulas
10		used to calculate savings and (b) the sources of these key inputs, methodologies,
11		and formulas. One of the primary purposes of any TRM, electronic or otherwise,
12		is to provide regulators and other stakeholders with clarity, transparency, and the
13		opportunity to review and provide feedback on key assumptions, methodologies,
14		and formulas used to calculate energy efficiency savings.

15	Q.	**Does E1's eTRM currently provide this documentation in a clear,**
16		**transparent, and accessible way?**
17	A.	No. In E1's response to Synapse IR-09, E1 states,

18		"The eTRM is an embedded application that is integrated with ENS's
19		data management system and as a result, it cannot be practically
20		viewed or filed in isolation. ENS will make the eTRM available for the
21		Evaluation Consultant, Verification Consultant, Synapse and other
22		interested stakeholders to review at the ENS offices. ENS can also
23		provide a remote WebEx demonstration of the eTRM."

24		In summary, E1's eTRM cannot be viewed currently except in person.

25	Q.	**Is it problematic that the eTRM cannot be reviewed remotely?**
26	A.	Yes. As they cover all measures included in a portfolio, TRMs are generally
27		voluminous and dense. A WebEx demonstration of the eTRM would be useful.
28		However, this may not provide the level of detail that stakeholders require, nor
29		will it allow stakeholders to continue their review on their own after the WebEx
30		demonstration. Given the length and complexity of TRMs, it is not reasonable to

1   require stakeholders to travel to E1's offices to review and provide feedback on

2   the eTRM.

3   **Q.**   **Should the transparency of the eTRM be improved?**

4   A.   Yes. I recommend that E1 investigate and report on the feasibility and cost of

5   expanding the functionality of the eTRM to enable electronic outputs to be

6   emailed or printed to stakeholders for review.

7   *Lighting Market Transformation and Portfolio Shifts*

8   **Q.**   **Is the lighting market transformation accounted for in E1's 2019 DSM Plan?**

9   A.   Yes. In E1's response to Synapse IR-06, E1 states,

10   "EfficiencyOne is seeking to diversify its energy savings. As such,
11   relative to evaluated results from recent years, the 2019 DSM
12   Resource Plan places more emphasis (budget and energy savings) on
13   program components that will help diversify ENS's portfolio.
14   Lighting plays an important role in achieving energy savings and will
15   continue to play an important and effective role in the future however,
16   increasing the focus on programs that are less reliant on savings from
17   lighting will enable ENS to diversify its portfolio. Although the 2019
18   DSM Resource Plan did not include bottom-up modelling, this high-
19   level direction helps ENS adjust its program components in a manner
20   that supports diversification while still achieving targets and
21   maintaining overall consistency with the 2016-2018 DSM Resource
22   Plan."

23 **Q.**   **How is lighting market transformation accounted for in E1's 2019 DSM**

24   **Plan?**

25 A.   In E1's response to Synapse IR-06, E1 describes shifting budgets from lighting to

26   non-lighting measures, which also drove changes to the proportion of energy

27   savings from lighting versus non-lighting measures. However, it is unclear

28   whether and how the lighting penetration and saturation data from recent market

29   studies was used to adjust the budget and associated savings for lighting versus

30   non-lighting measures. Further, E1's response to Synapse IR-07, E1 states,

31   "EfficiencyOne does not have lighting saturation information by
32   measure. EfficiencyOne has completed two socket studies for the
33   Residential sector, which indicate the level of efficient lighting in

1		homes; a similar study does not exist for the Business, Non-profit and
2		Institutional (BNI) sector. The 2017 Evaluation Reports included an
3		analysis of the level of LED market transformation for both the
4		Residential and BNI sectors. EfficiencyOne considers this information
5		when making decisions on measures and incentive levels."

6

7   E1 provides no description of how data from lighting penetration and saturation

8   studies were used to adjust budgets and savings for lighting and non-lighting

9   measures.

10 **Q.**   **Should the transparency of the application of lighting penetration and**

11   **saturation studies be improved?**

12 A.   Yes. In E1's response to Synapse IR-13, E1 states,

13   "EfficiencyOne monitors market trends to understand when a measure
14   may be approaching transformation. This includes considering product
15   price changes and free-ridership levels. The Evaluation Reports also
16   provide market transformation information, as appropriate. For
17   example, in 2017, a 'Market Evolution' section was provided for
18   residential and commercial LED lighting, and residential mini-split
19   heat pumps. These sections provided additional context surrounding
20   the potential level of transformation for these measures. To date,
21   EfficiencyOne has not established criteria for determining when the
22   market for a measure has transformed, nor has it established pre-and
23   post-transformation activities that may be appropriate to ensure and
24   maintain market transformation. As more knowledge is gained on
25   measures in transforming markets, and on experiences with market
26   transformation in other jurisdictions, EfficiencyOne will endeavour to
27   develop appropriate methodologies for adoption."

28   E1 should develop a more robust and transparent mechanism for applying market

29   transformation study results. Specific metrics (e.g., measure saturation) can be

30   readily applied in energy efficiency plan development. Mechanisms for applying

31   these metrics should be advanced and used to allow more consistent and

32   systematic consideration across programs.

33 **Q.**   **Do you have any comments on the proposed shift in the 2019 DSM portfolio?**

34 A.   I find that reducing the emphasis on lighting measures will diversify the DSM

35   portfolio. However, it is not clear that the market for lighting has transformed. E1

| 1 | | should continue to achieve cost-effective savings in lighting, while gradually |
| 2 | | diversifying its portfolio. |

| 3 | | *Research for DSM planning* |

| 4 | Q. | **Do you have any concerns about the assumptions and inputs underlying E1's** |
| 5 | | **DSM Plan?** |

6	A.	Yes. The avoided costs and potential study are both outdated. The avoided costs
7		are from NS Power's 2014 IRP. The most recent potential study was completed in
8		2013.

9		Significantly, E1 does not plan to update either of these in time for 2020-2022
10		Plan.[23] E1 should work with NS Power, or use information from the recent
11		Synapse Generation Optimization study, to update avoided costs for the 2020-
12		2022 Plan. On the other hand, the decision about the update of the potential study
13		is largely within E1's sphere of responsibility.

| 14 | Q. | **How should energy efficiency research be integrated into DSM planning?** |

15	A.	Planning efforts should be continually evolving as markets and products evolve
16		and should reflect the most up-to-date research and information available. Further,
17		E1 should purposefully plan its research so that outputs are available when they
18		are most helpful.

| 19 | Q. | **Can E1 improve the timing of research for DSM planning?** |

20	A.	Yes. At a minimum, E1 should develop a research plan that provides a high-level
21		description of planned research efforts, the schedule for completing these efforts,
22		who will complete them, how the results will be used, and critical dates for having
23		results in time to inform other decision-making processes. This research plan
24		should be reviewed with and subject to feedback by stakeholders.

| 25 | Q. | **Which research efforts should be included in the research plan?** |

| 26 | A. | All planned efforts or identified research needs should be addressed, including |
| 27 | | (but not limited to) potential studies, non-energy benefits research, incentive |

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[23] E1(Synapse) IR-08.

1   setting investigations, rate and bill impact analyses, and locational DSM

2   valuations. The plan should prioritize and align each research effort so that results

3   are available to inform critical processes, including but not limited to the IRP and

4   the DSM planning process. Decision making for capital investments, to the extent

5   they are anticipated, should also be included as critical processes in the plan.

6   **Q.**   **Does this conclude your evidence at this time?**

7   A.   Yes, it does.

1   **APPENDIX A: RESUME**