NAVIGANT

Kevin Cooney, Managing Director
1375 Walnut Street
Suite 200
Boulder, CO 80302
303.728.2500 phone
303.728.2501 fax

April 13, 2012

Mr. Allan Crandlemire
Chief Executive Officer
Efficiency Nova Scotia Corporation
230 Brownlow Avenue, Suite 300
Dartmouth, NS B3B 0G5

Dear Allan:

I wanted to follow up on Todd Williams' letter and error report provided to you earlier today. As head of Navigant's global work on energy efficiency and demand side management, I wanted to reinforce Todd's commitment to addressing the errors in the initial deliverables and to assure you Navigant will do whatever is needed to support you and your team in resolving any concerns created among stakeholders or regulators by the reporting error.

Our team has treated this issue as its highest priority. My understanding is that the error has been addressed, and that the team is working to provide updated DSM planning information to ENSC. The process has prompted us to initiate a review of our internal QC procedures.

Please accept our sincere apologies for the problems this error has caused. We value ENSC as a client I want to personally assure you that we are taking the necessary steps to ensure this will not happen again. If you have any question, please do not hesitate to contact me directly.

Sincerely,

Kevin Cooney
Managing Director

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Todd Williams, Managing Director
Navigant Consulting Ltd.
333 Bay Street, Suite 1250
Toronto ON M5H 2R2
Direct: (647) 288-5204
TWilliams@Navigant.com

April 13, 2012

Mr. Allan Crandlemire
Chief Executive Officer
Efficiency Nova Scotia Corporation
230 Brownlow Avenue, Suite 300
Dartmouth, NS B3B 0G5

Dear Allan:

Corrections to Navigant Information re: ENSC 2013 – 2015 DSM Plan

I would like to thank you and your staff for your patience as Navigant worked to address a systemic error in our Energy Efficiency Resource Assessment Model (RAM Tool) that was used in developing information for Efficiency Nova Scotia Corporation (ENSC) that was subsequently provided as evidence in NSUARB-E-ENSC-R-12.

I would also like to assure you that we are treating this issue very seriously. Our team has worked diligently to address the error in order to enable ENSC to update its evidence in the above proceeding.

I am pleased to confirm that the error has been completely addressed, the revised RAM Tool has been thoroughly tested and we are working to provide ENSC with the information required to revise ENSC's DSM evidence and affected IRs.

The attached report provides an explanation of the error, the impact of the error and the process undertaken to find and correct the issue. The report also outlines the scope of changes required to ENSC's DSM evidence and recent IRs.

Please accept my sincere apologies for the problems this error has caused. We appreciate that ENSC, the NSUARB and stakeholders have relied on Navigant over the past several years for accurate DSM analysis and want to assure you that we are taking the necessary steps to ensure this will not happen again.

Sincerely,

Todd Williams
Managing Director

NAVIGANT

ENERGY EFFICIENCY RESOURCE ASSESSMENT MODEL (RAM TOOL) UPDATE

Prepared for:

efficiency NOVA SCOTIA CORPORATION

Navigant Consulting Ltd.
333 Bay Street, Suite 1250
Toronto, ON M5H 2R2

416-927-1641
www.navigantconsulting.com

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1 Introduction

On March 30, 2012, Efficiency Nova Scotia Corporation (ENSC) identified an error in an IR prepared by Navigant on behalf of ENSC as evidence in NSUARB-E-ENSC-R-12 (the Proceeding). In addressing this error, Navigant subsequently confirmed that the Energy Efficiency Resource Assessment Model (the "RAM Tool") used by Navigant to support ENSC's 2013 – 2015 DSM Plan development contained a systemic error that had affected evidence provided by ENSC in the Proceeding.

The purpose of this report is to describe the:

- Nature of the error
- Changes to and testing of the revised RAM Tool
- Impact of the error
- Scope of changes required to ENSC's evidence, and
- Quality Assurance/Quality Control policies used by Navigant's Energy Practice.

Navigant appreciates that ENSC, the NSUARB and stakeholders rely on the accuracy of our analysis. Navigant has worked diligently to address this issue as quickly as possible and is taking steps to ensure that it will not happen again.

Additionally, at ENSC's direction, to be consistent with the model previously used for ENSC's TRC calculations, Navigant has also revised the Total Resource Cost (TRC) calculation within the RAM Tool which had recently been modified without notice to ENSC to reflect the approach to TRC as applied in California. The specific change to the TRC calculation introduced in California is to treat incentives paid to free riders as a "cost" in the TRC calculation. The rationale for and specifics of the change are described in a clarification memo issued by the California Public Utilities Commission[1]. The TRC calculation formerly used in California, and still in use in many North American jurisdictions, treats all incentives as transfer payments and therefore does not include them in the TRC calculation.

2 Nature of the Error

The systemic error relates to the erroneous application of the Net-to-Gross (NTG) factor, which is essentially equal to 1 - Free Rider %, in the determination of measure-specific incentive costs and energy savings. Essentially, what was assumed to be gross incentives and/or gross energy savings in measure-specific calculations and other specific model calculations was actually net incentives

[1] 2007 SPM Clarification Memo, (D.07-09-043, Mimeo pages 154-158)

and/or net energy savings. As a result, the NTG factor was applied twice in the determination of the following parameters for all measures in the model:

- Net Avoided Cost Benefits
- Technology Costs, and
- Portion of Incentive Costs paid to Free-Riders.

The NTG should only have been applied once in the determination of these parameters.

Similarly, the ENSC Investment and Program Administrator Cost (PAC) Test were erroneously based upon net incentives paid instead of gross incentives paid.

The relative impact of the error on these parameters for each measure and program was dependent on the NTG for the measure and the relativity between benefits, technology costs and incentive costs for the measure.

As an example, please consider the following table based on Multeese IR-5a, in which Navigant provided an illustrative example of the calculation of the Total Resource Cost Test (TRC) for one compact fluorescent measure in the Efficient Products program (with revisions made to the items highlighted in **BOLD**).

Note that given the changes to the measure-specific TRC, the RAM Tool incorporates a resource optimization module to place greater relative emphasis within a program on those measures with higher TRC benefit / cost ratios. Since the subject measure's TRC benefit / cost ratio increased as a result of the changes made in the RAM Tool, the expected number of participants purchasing this measure increased from 6,179 in the original example (left-hand column) to 7,537 in the revision (right-hand column).

Table 1: Parameters for Screw-In (<=15W) Efficient Products, Replace on Burnout, Retail Markdown

Parameter	Comment	Revision (BOLD)
TRC Test = (Energy Avoided Costs + Demand Avoided Costs) * Net-to-Gross / (Technology Cost * Net-to-Gross + Administrative Cost **+ (1 – Net-to-Gross) * Incentive Cost**)	Remove Incentives paid to Free Riders from TRC calculation.	TRC Test = (Energy Avoided Costs + Demand Avoided Costs) * Net-to-Gross / (Technology Cost * Net-to-Gross + Administrative Cost)
• Measure Life = 7 years • Net-to-Gross Factor (NTG) = 0.53 • 2013 Participants = **6,179** units • At Generator Impact/unit = 45.42 kWh and 5.61 watts • Installed Measure (Technology) Cost = $2.84/unit • ENSC Administrative Cost = $0.175/kWh • ENSC Measure Incentive = $1.02/unit • Net Present Value (NPV) of Energy Avoided Costs for Measure Life of 7 years = $0.555/kWh	The TRC increased for this measure and as a result, the resource optimization module placed greater emphasis on this measure, which increased the expected number of units.	• Measure Life = 7 years • Net-to-Gross Factor (NTG) = 0.53 • 2013 Participants = **7,537** units • At Generator Impact/unit = 45.42 kWh and 5.61 watts • Installed Measure (Technology) Cost = $2.84/unit • ENSC Administrative Cost = $0.175/kWh • ENSC Measure Incentive = $1.02/unit • Net Present Value (NPV) of Energy Avoided Costs for Measure Life of 7 years = $0.555/kWh

Parameter	Comment	Revision (BOLD)
NPV of Demand Avoided Costs for Measure Life of **19** years = $0.00/kW (Note: Capacity Avoided Costs are zero for 2013 through 2019 – 7 years)	Reference to measure life of 19 years should be changed to 7 years per above. Does not change result.	NPV of Demand Avoided Costs for Measure Life of **7** years = $0.00/kW (Note: Capacity Avoided Costs are zero for 2013 through 2019 – 7 years)
2013 Measure Energy Savings = **6179** units * 45.42 kWh * 0.53 (NTG) = **148,744.6** kWh	Should be clearly stated as **Net** Measure Energy Savings.	2013 **Net** Measure Energy Savings = **7537** units * 45.42 kWh * 0.53 (NTG) = **181,435.2** kWh
2013 Measure Demand Savings = **6179** units * 5.61 watts * 0.53 (NTG) = **18,372** watts = **18.37** kW	Should be clearly stated as **Net** Measure Demand Savings =	2013 **Net** Measure Demand Savings **=** **7537** units * 5.61 watts * 0.53 (NTG) = **22,410** watts = **22.41** kW
Avoided Costs = (**148,744.6 kWh** * $0.555/kWh + **5.61** kW * $0.00/kW) *** 0.53 (NTG)** = **$43,753.22**	Should be relabeled as **Net Avoided Cost Benefits.** Incorrect, NTG has effectively been applied twice, since this calculation uses Net Energy and Net Demand Savings. Incorrect net measure demand savings value was listed, and should be **22.41** kW (this does not affect the result given capacity avoided costs = $0 over the measure life).	**Net Avoided Cost Benefits** = (**181,435.2** kWh * $0.555/kWh + **22.41** kW * $0.00/kW) = **$100,696.43**
Technology Cost = $2.84 (per unit) * 0.53 (NTG) * **6179** (bulbs) *** 0.53 NTG** = **$4,929.33**	Incorrect, NTG has been applied twice.	Technology Cost = $2.84 (per unit) * 0.53 (NTG) * **7537** (bulbs) = **$11,344.69**
Administrative Costs = $0.175/kWh * **148,744.6** kWh = **$26,030.31**	Administrative costs increased due to increased number of units.	Administrative Costs = $0.175/kWh * **181,435.2** kWh = **$31,751.16**
Portion of Incentive for Free Riders Included = 6,179 (units) / 0.53 (NTG) * ($1.02/$2.84) (Incentive %) * (1 – 0.53 (NTG)) = $1,569.97	Remove Incentives paid to Free Riders from TRC calculation.	-
TRC = **$43,753.22** (**Avoided Costs**) / {**$26,030.31** (Admin Cost) + **$4,929.23** (**Tech** Cost) **+** **$1,569.97 (Portion of Incentive)**} = **1.35**	Incorrect, all terms with the exception of Admin Costs have had NTG applied twice. Remove Incentives paid to Free Riders from TRC calculation.	TRC = **$100,696.43** (**Net Avoided Cost Benefits**) / {**$31,751.16** (Admin Cost) + **$11,344.69** (**Technology** Cost)} = **2.34**

Note that the example measure has a relatively low NTG factor of 0.53 so the effect of the error on the three parameters is more significant than for many of the other measures with higher NTG factors.

3 Changes to and Testing of the Revised RAM Tool

After fixing the above noted error, the revised RAM Tool has undergone significant testing by Navigant to confirm the veracity of the results. This testing included sample calculations of

residential and commercial/industrial measure-specific TRC results and of the program parameters that were previously incorrect. This testing was undertaken by a Senior Consultant with extensive DSM analysis experience who was not involved in the development of the RAM Tool.

Based on this exhaustive review and testing, Navigant is able to confirm that the measure-specific results as calculated in the revised RAM tool reflect the appropriate treatment of the NTG factor and that the program parameters similarly reflect the appropriate treatment of the NTG factor.

The revised RAM Tool was then used to recalculate the following parameters for each measure:

- Net Avoided Cost Benefits
- Total Resource Cost Test, and
- Program Administrator Cost Test.

Navigant then recalculated these parameters for each program and sector for each year of the analysis period. Navigant also recalculated the ENSC Investment for each of the programs (other than investments for the Enabling Strategy programs, whose budgets were not directly affected by the error) included in ENSC's 2013-2015 DSM Plan.

4 Impact of the Error

Across the entire DSM Plan, the error had the effect of understating or overstating several overall parameters, as shown in the table below for 2013 projected results. Note that the magnitude of the error is given relative to the 2013 projections per the ENSC filed Evidence figure 4.2 and that of the projections for other years in the DSM planning horizon had errors of a similar magnitude.

Table 2: Impact of Error on 2013 Projected Results

Parameter	Impact of Error
ENSC Investment ($)	Understated by $3.9M (8.4%)
Lifetime Benefits ($)	Understated by $13.8M (13.3%)
Total Resource Cost Test (TRC)	No change
Program Administrator Cost Test (TRC)	Understated by 0.1 (4.5%)

Within programs, the error has the greatest impact on those programs with a relatively high percentage of measures with relatively low NTG factors, such as the Existing Residential and New Residential programs.

The following aggregate program and sectoral results were not materially affected by this error:

- Incremental Annual Net Energy Savings at the Generator (GWh), and
- Incremental Annual Net Demand Savings at Generator (MW).

5 Scope of Changes Required to ENSC's Evidence

Navigant is aware that, given the above stated error, the following IRs filed by ENSC with input from Navigant were incorrect.

- Avon IR-3a DSM Technical Tables
- Avon IR-3b/Synapse IR-9 Customer Participation Rates
- Avon IR-5 Comparison to Evidence
- Avon IR-6 Benefits
- Avon IR-11a EE RAM Tool
- CA IR-3 Existing Residential
- Multeese IR-5b, d, e TRCs
- Multeese IR-7 Expenditures
- Synapse IR-6 TRCs
- Synapse IR-7 PACs

Corrected versions of these IRs are being provided to ENSC for filing with the NSUARB, along with corrections to the Evidence and Appendix A.

Navigant is working with ENSC to determine the other elements of ENSC's evidence that will need to be revised and will provide whatever support is desired by ENSC in making such revisions. At minimum, Navigant is aware that to the degree the sector-specific ENSC Investment changes, the cost allocation work previously undertaken will need to be updated.

The most significant aspect of the error is that ENSC's Investment was understated.

6 Navigant Energy Practice Model Quality Assurance/Quality Control Policies

It is Navigant's Energy Practice Quality Assurance/Quality Control (QA/QC) policy that all analytic models used for client engagements are subject to an independent review by a suitably qualified staff member. The independent review is to cover:

- Overall model structure
- Random testing of formula, and
- Sample calculations.

The RAM Tool containing the error was subject to such an independent review. Unfortunately, the error in question was not identified.

6.1 Testing of Prior RAM Tools

Navigant confirms that the NTG duplication error was not present in the RAM Tool used in previous years. In checking the tool used to support ENSC in its 2012 DSM plan Navigant discovered that only net incentives were considered in determining the ENSC Investment. As a result, the forecast ENSC Investments were underforecast in that they did not consider incentives paid to free riders. The understatement of ENSC's investment in the 2012 DSM Plan was $2.2M (4.8%). No other years were affected.

6.2 Changes to Energy Practice Quality Assurance/Quality Control Policies

In light of this incident, Navigant's Energy Practice is currently reviewing its QA/QC policies and the various analytic tools used across the practice with a view to ensuring accurate and robust models and analysis that our clients and their stakeholders can rely upon. Changes being considered include:

- Use of tested and proven modules for frequently used calculations (such as measure characterization) and/or established input assumptions with known results to test the veracity of key modules within a model.
- Enhancements to the independent review protocol to provide the appropriate focus on the key computational steps within a given model and the key potential contributors to modeling errors.
- Adding more than one independent reviewer with a separate focus on computational accuracy and methodological accuracy.
- Formal documentation of the review process and the results of the review, followed by approval of the model by the Engagement Director.

Navigant is also exploring the use of different modeling software for the types of analysis undertaken for ENSC that can provide greater transparency and simpler error-checking than traditional software choices, such as the EXCEL platform used for the RAM Tool.

Navigant's internal review is still underway, but we are confident the changes that are implemented will further enhance Navigant's QA/QC processes.