MARITIME ELECTRIC
A FORTIS COMPANY

July 3, 2015

Mr. Mark Lanigan
Regulatory Services
Island Regulatory and Appeals Commission
PO Box 577
501–134 Kent Street
Charlottetown PE C1A 7L1

Dear Mr. Lanigan:

DSM Filing Docket UE21406
Response to Interrogatories from the Government of PEI

Please find attached the Company's response to the Interrogatories filed by the Government of PEI with respect to the DSM filing. An electronic copy will follow shortly.

Yours truly,

MARITIME ELECTRIC

Jason C. Roberts
Director, Regulatory & Financial Planning

JCR29
Enclosure

MARITIME ELECTRIC
A FORTIS COMPANY

July 3, 2015

Ms. Kim Horrelt
Chief Executive Officer
PEI Energy Corporation
PO Box 2000
Charlottetown PE C1A 7N8

Dear Ms. Horrelt:

DSM Filing Docket UE21406
Response to Interrogatories

Please find attached the Company's response to the Interrogatories filed by the Government of PEI with respect to the DSM filing.

Yours truly,

MARITIME ELECTRIC

Jason C. Roberts
Director, Regulatory & Financial Planning

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1. General:

a. The Electric Power Act provides the Island Regulatory and Appeals Commission (Commission) with the authority to direct any public utility to prepare an energy efficiency and demand-side resources plan. The Act also states that an order made by Commission shall include a number of requirements, including:

i. the date of the order;
ii. the name of the public utility to whom the order is addressed;
iii. the date by which the required energy efficiency and demand-side resources plan must be submitted to the Commission;
iv. the term or period of time that the Commission requires the energy efficiency and demand-side resources plan to be implemented, which may not exceed *5* years;
v. a description of the particular energy efficiency and demand side resource measures, if any, that the Commission requires the public utility to include in the energy efficiency and demand-side resources plan;
vi. a statement of the results that the Commission expects the public utility to achieve, if its energy efficiency and demand-side resources plan is approved, by implementing the plan over the course of its term; and
vii. such other requirements and matters as the Commission considers appropriate.

Please provide a copy of the order of the Commission to Maritime Electric in this matter.

Response – 1:

The Commission has not issued an order to Maritime Electric in regard to energy efficiency and demand-side resources.

During the November 2013 sitting of the PEI Legislative Assembly, amendments to the Electric Power Act were enacted to transfer responsibility for energy efficiency and demand side programs back to utilities. As a result, the Company through discussions with Commission staff indicated its intent to prepare and file an energy efficiency and demand side management plan with the Commission for its approval without an order from the Commission to do so.

2. General:

a. Will commercial clients be eligible for the programs proposed by Maritime Electric? If so, what percentage of clients will be commercial versus residential? If not, why not?

Response – 2:

Commercial customers will be eligible for the programs proposed by Maritime Electric:

- For the LED rebate coupon program, it may be necessary, from a cost perspective, to limit the number of rebate coupons that may be redeemed at one time by a customer, which may impact larger commercial and institutional customers.
- For the heat pump programs, Maritime Electric is proposing to partner with the OEE on its existing heat pump grant program which is available to both commercial and residential customers. Maritime Electric is not proposing any changes to this aspect of OEE's program.

Maritime Electric has not made an estimate of the relative participation by commercial and residential customers.

3. General:

a. Please provide a list of all energy efficiency and demand side resource measures considered by Maritime Electric that are not included in this plan. Please include all economic analysis for each measure not included.

Response – 3:

The energy efficiency and demand side measures that were considered by Maritime Electric but not included in the Plan are as follows:

1. Rebate for replacing 43 Watt incandescent halogen bulb with 13 Watt CFL bulb. See Appendix 2 of the Company's Application for the benefit cost analysis.

2. Rebate for replacing 13 Watt CFL bulb with 11 Watt LED bulb. See Appendix 4 of the Company's Application for the benefit cost analysis.

3. Replace 65 Watt BR30 reflector bulb with 16 Watt CFL BR30 reflector bulb. See Appendix 6 of the Company's Application for the benefit cost analysis.

4. Replace 16 Watt CFL BR30 reflector bulb with 13 Watt LED BR30 bulb. See Appendix 8 of the Company's Application for the benefit cost analysis.

5. Rebate for ENERGY STAR refrigerator. See Appendix 10 of the Company's Application for the benefit cost analysis.

6. Rebate for ENERGY STAR front loading clothes washer. See Appendix 11 of the Company's Application for the benefit cost analysis.

7. Rebate for a Refrigerator Roundup program. See Appendix 12 of the Company's Application for the benefit cost analysis.

8. Rebate for LED holiday lighting. The benefit cost analysis is attached to these interrogatory responses as Schedule 1, pages 1 to 4.

9. Rebate for ENERGY STAR top loading clothes washer. The benefit cost analysis is attached to these interrogatory responses as Schedule 2.

4. Page 7, Paragraph 1:

a. Maritime Electric states that it will use the Total Resource Cost (TRC) test as the primary test of cost effectiveness. The Province is interested in how this compares to similar practices in other jurisdictions.

i. What is the rationale for using only the TRC as a determination of cost effectiveness?

ii. What tests are being used in other jurisdictions across Canada and the United States?

b. Maritime Electric states that cost effectiveness will be determined at the individual measure level. The Province is interested in how this compares to similar practices in other jurisdictions.

i. What other jurisdictions across Canada and the United States that deliver energy efficiency and demand-side resource measures including how those jurisdictions treat cost effectiveness, whether on a individual measure basis or on a portfolio/bundled basis.

Response – 4:

a. i. The National Action Plan for Energy Efficiency (2008) advises that the Total Resource Cost (TRC) test and the Societal Cost (SC) test are used to determine whether energy efficiency is cost-effective overall (National Action Plan for Energy Efficiency (2008). *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods and Emerging Issues for Policy-Makers*. Energy and Environmental Economics, Inc. and Regulatory Assistance Project). The difference between the TRC test and the SC test is that the SC test takes into account what are often referred to as externalities; e.g. CO2 emissions. Since Maritime Electric is not mandated to recover the cost of externalities through rates, the Company has used the TRC test as the primary test of cost effectiveness.

ii. Maritime Electric has not done an investigation into what tests are being used in other jurisdictions but has based its approach upon the recommendation of the National Action Plan for Energy Efficiency.

b. i. Maritime Electric has not done an investigation into the extent to which cost effectiveness is done on an individual measure basis or on a bundled basis in other jurisdictions. The Company has done what it believes to be in the best interest of its customers, who will pay for the Plan to the extent it is approved by the Commission. It is the Company's view that each measure should be evaluated based upon its own merits and that the measures that are cost effective should not be used to subsidize other measures that do not meet the TRC test criteria for being cost effective.

5. Page 8, Paragraph 2:

a. Maritime Electric states that "it is not cost effective to incent consumers to purchase Energy Star® appliances…".

i. Please provide the evidence Maritime Electric used to determine that Energy Star® appliances dominate the marketplace in Prince Edward Island.

Response – 5:

Maritime Electric has no evidence specific to PEI. Canada is a partner in the U.S. ENERGY STAR program, and Natural Resources Canada administers and monitors use of the ENERGY STAR name and symbol in Canada under an agreement with the U.S. Environmental protection Agency. As a result, the Company has no reason to believe that the U. S. ENERGY STAR appliances market shares data provided in Table 11 of the Company's Application do not apply generally to Canada and to PEI as well.

6. Page 12, Paragraph 2:

a. Maritime Electric states that in their analysis, the only difference in the TRC and the Societal Cost Test (SCT) is the value of CO_2 emissions.

i. Since the SCT is used to determine other benefits to society, what other non-energy items are typically included in the SCT, in addition to CO_2 emissions?

Response – 6:

Maritime Electric has not done an investigation into what other non-energy items are typically included in the Societal Cost test in other jurisdictions. The Company used CO2 emissions as an example because there is currently widespread awareness of it in society.

7. Page 13, Paragraph 2:

a. Maritime Electric states that "there is relatively little residential air conditioning" in Atlantic Canada.

i. Please provide data to support this statement.

ii. Please provide data, if available, on how much residential air conditioning is installed on PEI.

iii. Please provide data, if available, on how much commercial air conditioning is installed on PEI.

Response – 7:

The Company does not have data with respect to the amount of residential or commercial air conditioning installations on PEI.

The statement that there is relatively little residential air conditioning in Atlantic Canada is made in comparison to jurisdictions outside Atlantic Canada, where it is generally recognized that residential air conditioning is more widespread. The Company expects that this is a possible reason for not taking lost space heating into account in those jurisdictions, since the savings in air conditioning costs due to more efficient appliances and lighting offsets a larger portion of the cost for replacement space heating.

8. Page 13, Paragraph 2-4:

a. Maritime Electric states that Atlantic Canada has an 8 month heating season and as a result, does not consider the potential savings in cooling costs from energy efficient lighting.

i. What other jurisdictions across Canada and the United States, with a similar climate (~ 4,500 heating degree days) use the same approach to calculating energy savings from lighting?

ii. How many of those jurisdictions (~4,500 heating degree days) use an 8 month heating season?

iii. How many of those jurisdictions (~4,500 heating degree days) do not calculate the reduced air conditioning costs?

Response – 8:

The rationale for taking an 8 month heating season into account is to quantify the cost to replace the space heating that is lost when more efficient appliances and lighting are introduced. The reason that savings in cooling costs due to more efficient lighting were not considered is that, as discussed in Response 7, there is relatively little residential air conditioning in PEI.

Maritime Electric has not done an investigation into the practices in other jurisdictions in regard to i, ii and iii. The Company suggests that if a comparison were to be made with other jurisdictions in regard to taking reduced air conditioning costs into account, it would be on the basis of cooling degree days, as opposed to heating degree days.

Maritime Electric has not taken reduced air conditioning costs into account because with relatively little air conditioning in PEI, the impact on the benefit cost analyses is considered negligible. This is demonstrated below, based on the benefit cost analysis for the potential ENERGY STAR refrigerator rebate in Appendix 10.

The steps are as follows:

1. From Appendix 10, the energy saving with an ENERGY STAR refrigerator compared to a non-ENERGY STAR unit is 40 kWh per year. This is 3.3 kWh monthly.
2. For 2003 to 2012, the average annual cooling degree days above 18 C for Charlottetown is 131. For days when the mean temperature is above 18 C, the average cooling degree days is 2.5. Thus there are on average 131 / 2.5 = 52 days per year with a mean temperature above 18 C, which implies 52 days with residential air conditioning in use.
3. During the 52 days with a mean temperature above 18 C, there would be an additional 5.7 kWh of heat to be removed from the cooled space due to a non-ENERGY STAR refrigerator compared to an ENERGY STAR refrigerator (52 days x 1 month / 30 days x 3.3 kWh / month).
4. Using 1 kWh of energy for air conditioning to remove 3 kWh from the cooled space, and assuming a 20% penetration for residential air conditioning, the resulting annual saving in air condition energy is 0.4 kWh (5.7 kWh x 1/3 x 0.2).

0.4 kWh is only 1% of the 40 kWh direct saving with the ENERGY STAR refrigerator, and hence including it in the benefit cost analysis would have a negligible impact.

9. Pages 19-20, paragraph 6-1:

a. Maritime Electric states that "the penetration of CFL's has not increased above the 25% level since 2008", in reference to the argument that in 2008, "consumers were purchasing one compact fluorescent (CFL) bulb for every three standard incandescent bulbs".

i. Please provide evidence to support this statement.

Response – 9:

The 25% penetration for CFL bulbs since 2008 is based on quarterly press releases by the National Electrical Manufacturers Association (NEMA) which provide a breakdown by type on shipments of general service light bulbs. These press releases are available at www.nema.org.

Most recently (since the second quarter 2014), the market share of CFLs has increased to approximately 40%, as the phase out of traditional incandescent bulbs has occurred in the U.S. (The U.S. is approximately a year ahead of Canada). For the first quarter of 2015, the breakdown of shipments of general service light bulbs was:

- 44% - halogen
- 40% - CFL
- 10% - incandescent
- 6% - LED

Although the market share of CFL's, as reported for the US, has recently increased more than is suggested in the Company's Application, the Company believes there is still ample opportunity for replacing halogen incandescents with LEDs under the proposed LED rebate coupon program.

10. Page 21, Paragraph 2:

a. With respect to Maritime Electric's proposal to incent the purchase of LED lamps:

i. How many 43 watt incandescent halogen lamps were sold on PEl in 2014?

ii. How many BR30 incandescent reflector lamps were sold on PEl in 2014?

iii. How many 13 watt CFL lamps were sold on PEl in 2014?

iv. How many 60 watt incandescent lamps were sold on PEl in 2014?

Response – 10:

Maritime Electric does not have this data. However, the Company has no reason to believe that the market share breakdown provided by the NEMA press releases, as discussed in Response 9, does not apply to PEI as well.

11. Page 23, Paragraph 3:

a. Maritime Electric assumes a 50% free ridership for its LED lighting program:

i. Please provide the evidence to support this assumption.

Response – 11:

The assumption of 50% free riders for the LED rebate program is based on judgement. The purpose of the assumption was to evaluate the potential effect of free riders on the cost effectiveness of the program. Based on the benefit cost analysis for the proposed LED Lighting Programs, the program would still be cost effective with 50% free riders.

12. Page 24, Paragraph 1:

a. Maritime Electric states that because the system peak now occurs in January/February they do not intend to offer a rebate on LED Holiday Lighting. However, the Act requires that "public utilities should utilize energy-efficiency and demand-side resources whenever it is cost effective to do so".

i. Please provide the economic analysis for a LED Holiday Lighting rebate program.

Response – 12:

The benefit cost analysis for a LED holiday lighting rebate program is attached to these interrogatory responses as Schedule 1, Pages 1 to 4.

Schedule 1 shows that if the system peak load occurs in December, then the benefit cost ratio for the TRC test is greater than 1.0 because there would be a peak load reduction benefit due to the LED holiday lighting rebate program. However, if the system peak load occurs in January or February, the benefit cost ratio for the TRC test is less than 1.0 because there would be no peak load reduction benefit due to the LED holiday lighting rebate program.

If Maritime Electric were to propose a LED holiday lighting rebate program for Commission approval, the onus would be on the Company to demonstrate that the system peak load will continue to occur in December. Based on the increased growth in electric space heating during the past few years, Maritime Electric expects that the system peak load will shift from December to January or February sooner than had previously been anticipated. As a result, the Company has not proposed a LED holiday lighting rebate program for Commission approval.

13. Page 24, Paragraph 5:

a. Maritime Electric states that the majority of consumers are already purchasing Energy Star® qualified appliances.

i. What percentage of appliances sold on PEl are Energy Star® qualified versus non-Energy Star®?

Response – 13:

Please see Response 5.

14. Page 27, Refrigerator Roundup:

a. Maritime Electric discusses the Refrigerator Roundup proposal and indicates it does not pass the TRC test and is therefore not proposed.

i. Please provide details on how the analysis for this program was completed.

ii. How did Maritime Electric calculate the program administration costs to be $287?

Response – 14:

See Appendix 12 of the Company's Application for the benefit cost analysis.

The program administration cost of $287 is the same cost used in the Company's 2010 DSM Application. It was developed as follows, based on 1,500 refrigerators annually:

Table 1 – Estimated Costs for a Refrigerator Roundup Program	
FIXED EXPENSES	
Program Delivery - Call Centre Rep Expenses	$ 49,680
Program Delivery - Appliance Retirement Expenses	27,500
Marketing and Media Buy Expenses	-
Fixed Management Expenses	115,830
Admin on 3rd party costs (10%) excl labour	2,750
Sub-Total Fixed Expenses	**$195,760**
VARIABLE EXPENSES	
Incentive Expenses - 1500 @ $35/ea	$ 52,500
Pick Up and Recycling Expenses	213,000
Admin on 3rd party costs (10%)	21,300
Sub-Total Variable Expenses	**$286,800**
TOTAL FIXED AND VARIABLE EXPENSES	**$482,560**

Backing out the $52,500 for the incentive rebates and dividing by 1,500 units gives $287 per refrigerator for program administration costs.

15. Page 30, Paragraph 2, Clarification:

a. The "most efficient" designation for air source heat pumps comes from Energy Star®.

Response – 15:

Correct. The Energy Star "Guidelines for using the Energy Star® Most Efficient Mark" states that the Energy Star Most Efficient Mark is an extension of the Energy Star brand and is designed to recognize and advance the most efficient products among those that qualify for the Energy Star.

16. Page 30, Cold Climate Heat Pump:

a. Maritime Electric wishes to incent the use of heat pumps in electrically heated homes.

i. Why did Maritime Electric select -25 C as the desired minimum operating temperature for cold climate heat pumps?

ii. Over the past 5 years, what was the outdoor temperature when the annual system peak was set? Please include the month, day and hour when each annual peak was set.

iii. What additional measures did Maritime Electric consider to help reduce the demand in electrically heated homes? Please provide the economic analysis for each of these additional measures.

iv. Will businesses be eligible for this program?

Response – 16:

a. i. The objective of the "cold climate" heat pump program for homes with electric resistance heating is to have heat pumps installed that will be operating at time of system peak, and thus displacing a portion of the electric resistance heating. For customers who currently use electric resistance heating and have decided to purchase a heat pump, Maritime Electric proposes to incent those customers to purchase a unit that will operate down to -25 C. The -25 C was selected as the desired minimum operating temperature for the heat pump because -25 C is typically the coldest temperature experienced in PEI and, in reviewing the capabilities of heat pump equipment in 2014, operation down to -25 C appeared to be the best that was available.

Subject to approval by IRAC, Maritime Electric expects that part of program implementation would be a further review of the capabilities of available heat pump equipment, and a change in the -25 C criterion, if necessary, to ensure that there are heat pumps available from at least two manufactures that meet the minimum operating temperature criterion.

ii.

Table 2 - Ambient Temperature at Time of PEI Annual System Peak load

Year	Month	Day	Hour ending	Temperature at start of hour (deg. C)
2010	Feb	2	19:00	-19 C
2011	Jan	24	18:00	-18 C
2012	Dec	10	18:00	0 C
2013	Dec	12	18:00	-15 C
2014	Dec	30	18:00	-15 C

iii. In the past Maritime Electric has not been involved with building envelope efficiency measures because most space heating in PEI is done with furnace oil. In light of the recent surge in heat pump installations, the Company gave some preliminary consideration to potential building envelope efficiency measures. However, most heat pumps are being installed to displace a portion of the furnace oil used by a home for

space heating, and furnace oil is still the main source of space heating in PEI. As a result, it was decided to leave building envelope upgrade measures with the OEE.

iv. As indicated in Response 2, businesses will be eligible for this program.

17. Pages 31-33, Thermostat shut off of heat pumps for homes with oil furnaces:

a. Maritime Electric proposes to conduct a pilot program to determine the potential for shutting off heat pumps in homes with oil heating. It proposes to shut systems off when the outdoor temperature reaches -15 C.

i. Are there other jurisdictions conducting similar programs?

ii. Why was -15 C selected?

iii. If systems are to be shut down at -15 C, why is Maritime Electric proposing that qualifying heat pumps need to be able to operate down to -25C?

Response – 17:

a. i. The one jurisdiction that Maritime Electric is aware of with a similar program is Quebec. Hydro Quebec's Residential Rate DT is available to homes that install a dual-energy heating system – electricity and a fuel, usually oil. The rate has two prices that apply at different temperatures. When the outdoor temperature is greater than or equal to -12 C or -15 C (depending on the location in the Province) the heating system uses electricity and the lower price applies to all electricity used by the home. When the outdoor temperature goes below -12 C or -15 C (depending on the location in the Province) the heating system automatically switches from electricity to the fuel and the higher price applies to all electricity used by the home.

ii. The temperature at which the heat pump would be shut off is a trade-off between two factors:

1. The higher the shut-off temperature, the more likely that the heat pump will be off at system peak, and thus the more likely that the desired reduction in peak load will be achieved.

2. The higher the shut-off temperature, the larger the amount of furnace oil that will be used to replace the output of the heat pump, and thus the larger the amount of compensation that must be paid to the homeowner to incent them to participate in the program; i.e. the higher the cost of running the program.

A -15 C shut-off temperature has been proposed as the starting point for the proposed pilot phase because it is the lower of the two temperatures used in the Hydro Quebec Residential Rate DT and because it will require a lower level of incentive to compensate for the additional furnace oil usage than would be needed for a -12 C shut-off temperature.

iii. The requirement for being capable of operating down to -25 C is to provide for a possible future conversion to electric resistance heating. Given the current transition from oil heat to electric heat generally, Maritime Electric expects that over a 15 year life for the heat pumps that there will be some homes where the oil heat is replaced with electric resistance heating. In those cases, the need would then be for a heat pump that would be operating at system peak, and the thermostat control would be removed. As indicated in Response 16, the -25 C value may be revised as needed to accommodate the capabilities of available equipment.

18. Page 35, Customer outreach activities:

a. Maritime Electric proposes to participate in various public outreach activities such as tradeshows, presentations, media marketing, etc.…

i. Please provide the cost-benefit analysis completed for these activities.

ii. Please provide a breakdown of costs for these initiatives.

iii. What specific information does Maritime Electric plan to communicate through these activities?

iv. What specific training does Maritime Electric plan to give its Customer Service staff!

Response – 18:

a. i. A benefit cost analysis has not been done for the customer outreach activities. However, the Company believes public outreach activities are an essential part of responsibly operating an electric utility. These activities have been included in the proposed Plan with an increased level of spending to reflect an expected increase in these activities generally and in support of the proposed Plan specifically.

ii. The following is a breakdown of the annual costs for customer outreach activities:

Program promotion and marketing	$105,000
Customer information website development and tools	$ 2,500
Commercial sector energy efficiency communications and information	$ 60,000
Total	**$167,500**

iii. & iv.

Program promotion and marketing will include participation in trade shows, presentations, promotions and lighting exchanges, all intended to help customers understand more about energy efficiency and conservation. Marketing of Plan programs will include newspaper and radio ads. Additional training with respect to energy efficiency and conservation will also be provided for Customer Service staff.

The customer information website development and tools will include modifications to the Company's customer information and website in order to provide updated energy conservation information, tools and program information for customers.

Under commercial sector energy efficiency communications and information, Maritime Electric plans to partner with OEE to develop energy efficiency communications and information programming for the commercial sector, including seminars and workshops. These initiatives will focus on demand management as well as energy efficiency.

19. Appendix 11, Benefit cost analysis of Energy Star® clothes washer rebate:

a. Analysis of clothes washer rebates compares Energy Star® front loading washers to non- Energy Star® front loading washers.

i. What is the rational for choosing non- Energy Star® front loading washers as the comparison option?

ii. How many front loading clothes washers were sold on PEl in 2014 compared to top loading clothes washers?

iii. Please complete an economic analysis comparing a non Energy Star® top loading clothes washer to an Energy Star® front loading clothes washer.

Response – 19:

a. i. Top-loading clothes washers and front-loading clothes washers are considered to be different product classes, and thus Maritime Electric compared an ENERGY STAR front-loading clothes washer to a non-ENERGY STAR front-loading clothes washer (like to like) in the benefit cost analysis that is included in the Application.

In a May 2012 Direct Final Rule, the Office of Energy Efficiency and Renewable Energy of the U.S. Department of Energy (DOE) issued amended energy conservation standards for residential clothes washers that became effective in March 2015. One of the items that DOE considered in developing the amended standards was whether there should be one set of standards for all residential clothes washers, or separate standards for top-loading and front-loading units. There were reasons brought forward in support of each approach, and DOE concluded that in particular because of the longer cycle time needed by front-loading clothes washers, the product class distinction between top-loading and front-loading clothes washers should be maintained, and thus prescribed different efficiency standards for the two types of clothes washers.

ii. Maritime Electric does not have data on number of units sold in PEI. However, part of DOE's analysis in developing the amended conservation standards for residential clothes washers that came into effect in March 2015 involved an analysis of shipments in the U.S to determine the relative market shares of top loading and front loading units. DOE's analysis showed that top loading and front loading clothes washers each have approximately 50% of the residential market. Also, in a recent conversation at an appliance retailer in Charlottetown, the sales person stated that they sell equal numbers of top loading and front loading clothes washers.

iii. A benefit cost analysis for a rebate coupon comparing a non-ENERGY STAR top-loading clothes washer to an ENERGY STAR front-loading clothes washer is attached to these interrogatories as Schedule 3. The benefit cost ratio for the TRC test is less than 1.0.

SCHEDULE 1

Benefit Cost Analysis for LED Holiday Lighting Rebate

Schedule 1 (Page 1 of 4)

BENEFIT COST ANALYSIS FOR LED HOLIDAY LIGHTING REBATE

System peak in December

		Participant Cost test ($)	Utility Cost test ($)	Rate Impact test ($)	Total Resource Cost test ($)	Societal Cost test ($)
Benefits:	- Utility avoided generating capacity cost		6	6	6	6
	- Utility avoided T&D capacity cost		7	7	7	7
	- Utility avoided energy supply cost		1	1	1	1
	- Reduction in participant's bills	1				
	- Cost for replacement incandescents	3			3	3
	- Incentive rebate to participant	3				
	- Value of avoided CO2 emissions					0
	total	7	13	13	16	17
Costs:	- Utility DSM program admin. costs		5	5	5	5
	- Utility DSM program rebate costs		3	3		
	- Revenue reduction to utility			1		
	- Participant's incremental capital cost	4			4	4
	- Cost to replace lost space heating	1			1	1
	total	5	8	9	10	10
	Net benefit (cost)	3	5	4	7	7
	Benefit / cost ratio	1.58	1.68	1.47	1.71	1.73

Schedule 1 (Page 2 of 4)

BENEFIT COST ANALYSIS FOR LED HOLIDAY LIGHTING REBATE

System peak in December

Inputs and Assumptions

Advance replacement of incandescent with LED by	years	2	
Escalation rate	%	2.0	
Present value factor for 2 yrs at 7.0 % discount rate is		1.9	for escalating items
		1.8	for non-escalating items
Estimated annual average incremental T&D losses	%	11.5	
Estimated incremental T&D losses at system peak	%	15.7	
Utility avoided generating capacity cost:			
- participant load reduction at time of system peak	kW	0.024	
- cost of generating capacity	$ / kW - year	100	(purchases on the margin)
- present value is	$	6	(+ 15 % planning reserve)
Utility avoided T&D capacity cost:			
- demand related T&D capacity cost	$ / kW - year	160	(adjusted for losses)
- present value is	$	7	
Utility avoided energy supply cost:			
- annual energy saving by participant	kWh	5	
- price of purchased energy	$ / kWh	0.08	
- present value is	$	1	
Reduction in participant's bills:			
- retail energy charge for electricity	$ / kWh	0.1316	Residential first block
- present value is	$	1	(HST at 14 % applied)
Rebate to participants:			
- higher price for LED 70 light string ($ 8.00 - $ 4.00)	$	4.00	
- portion rebated to participants	%	75	
- participants rebate	$	3.00	
Cost to replace lost space heating:			
- furnace oil equivalent of annual energy savings	litres	1	(1 litre = 8.5 kWh)
- portion of energy savings that provided space heating	%	50	(50 % of lights outdoors)
- assumed furnace oil price	$ / litre	1.00	
- present value of cost for additional furnace oil	$	1	(GST at 5 % applied)
Benefit of avoided CO2 emissions:			
- assumed CO2 emissions rate	kg / kWh	0.60	
- assumed price of CO2 emissions	$ / tonne	40	
- present value is		0	

Annual saving with LED for 70 light string is	4.725	kWh	(35 W - 3.5 W x 150 h)
Reduction in customer load for one string is	0.032	kW	(35 W - 3.5 W))
Assume average reduction at system peak is	0.024	kW	(75 % on at time of system peak)

Schedule 1 (Page 3 of 4)

BENEFIT COST ANALYSIS FOR LED HOLIDAY LIGHTING REBATE

System peak in December - 50 % free riders

		Participant Cost test ($)	Utility Cost test ($)	Rate Impact test ($)	Total Resource Cost test ($)	Societal Cost test ($)
Benefits:	- Utility avoided generating capacity cost		6	6	6	6
	- Utility avoided T&D capacity cost		7	7	7	7
	- Utility avoided energy supply cost		1	1	1	1
	- Reduction in participant's bills	1				
	- Cost for replacement incandescents	3			3	3
	- Incentive rebate to participant	3				
	- Value of avoided CO2 emissions					0
	total	7	13	13	16	17
Costs:	- Utility DSM program admin. costs		10	10	10	10
	- Utility DSM program rebate costs		6	6		
	- Revenue reduction to utility			1		
	- Participant's incremental capital cost	4			4	4
	- Cost to replace lost space heating	1			1	1
	total	5	16	17	15	15
	Net benefit (cost)	3	(3)	(4)	2	2
	Benefit / cost ratio	1.58	0.84	0.78	1.12	1.14

Note: This table is the same as in Page 1 of 4, except that the Utility DSM program admin. costs and the Utility DSM program rebate costs have been doubled to account for 50 % free riders.

Schedule 1 (Page 4 of 4)

BENEFIT COST ANALYSIS FOR LED HOLIDAY LIGHTING REBATE

System peak in January or February

		Participant Cost test ($)	Utility Cost test ($)	Rate Impact test ($)	Total Resource Cost test ($)	Societal Cost test ($)
Benefits:	- Utility avoided generating capacity cost		0	0	0	0
	- Utility avoided T&D capacity cost		0	0	0	0
	- Utility avoided energy supply cost		1	1	1	1
	- Reduction in participant's bills	1				
	- Cost for replacement incandescents	3			3	3
	- Incentive rebate to participant	3				
	- Value of avoided CO2 emissions					0
	total	7	1	1	4	4
Costs:	- Utility DSM program admin. costs		5	5	5	5
	- Utility DSM program rebate costs		3	3		
	- Revenue reduction to utility			1		
	- Participant's incremental capital cost	4			4	4
	- Cost to replace lost space heating	1			1	1
	total	5	8	9	10	10
	Net benefit (cost)	3	(7)	(8)	(6)	(6)
	Benefit / cost ratio	1.58	0.10	0.09	0.38	0.40

Note: This table is the same as in Page 1 of 4 except that Utility avoided generating capacity cost and Utility avoided T&D capacity cost have been set to zero because the system peak is assumed to occur in January or February, and therefore there is no reduction in annual system peak due to LED holiday lighting.

SCHEDULE 2

Benefit Cost Analysis for Energy Star Clothes Washer Rebate
(Non-Energy Star Top Loading Versus Energy Star Top Loading)

Schedule 2 (Page 1 of 2)

BENEFIT COST ANALYSIS FOR ENERGY STAR CLOTHES WASHER REBATE

(Non-ENERGY STAR top loading versus ENERGY STAR top loading)

Free riders have not been taken into account		Participant Cost test ($)	Utility Cost test ($)	Rate Impact test ($)	Total Resource Cost test ($)	Societal Cost test ($)
Benefits:	- Utility avoided generating capacity cost		12	12	12	12
	- Utility avoided T&D capacity cost		14	14	14	14
	- Utility avoided energy supply cost		59	59	59	59
	- Reduction in participant electric bills	98				
	- Reduction in participant fce oil bills	8			8	8
	- Incentive rebate to participant	50				
	- Avoided CO2 emissions: electricity					18
	- Avoided CO2 emissions: furnace oil					1
	total	156	85	85	93	112
Costs:	- Utility DSM program admin. costs		5	5	5	5
	- Utility DSM program rebate costs		50	50		
	- Revenue reduction to utility			86		
	- Participants incremental capital cost	100			100	100
	- Cost to replace lost space heating	0			0	0
	total	100	55	141	105	105
	Net benefit (cost)	56	30	(56)	(12)	7
	Benefit / cost ratio	1.56	1.55	0.61	0.89	1.07

Schedule 2 (Page 2 of 2)

BENEFIT COST ANALYSIS FOR ENERGY STAR CLOTHES WASHER REBATE

(Non-ENERGY STAR top loading versus ENERGY STAR top loading)

Inputs and Assumptions

Equipment life	years	14	
Escalation rate	%	2.0	
Present value factor for 14 yrs at 7.0 % discount rate is		10.0	for escalating items
		8.7	for non-escalating items
Estimated annual average incremental T&D losses	%	11.5	
Estimated incremental T&D losses at system peak	%	15.7	
Utility avoided generating capacity cost:			
- participant load reduction at time of system peak	kW	0.010	
- cost of generating capacity	$ / kW - year	100	(purchases on the margin)
- present value is	$	12	(+ 15 % planning reserve)
Utility avoided T&D capacity cost:			
- demand related T&D capacity cost	$ / kW - year	160	(adjusted for losses)
- present value is	$	14	
Utility avoided energy supply cost:			
- annual electricity saving by participants	kWh	66	
- price of purchased energy	$ / kWh	0.08	
- present value is	$	59	
Reduction in participant's electricity bill:			
- retail energy charge for electricity	$ / kWh	0.1316	Residential first block
- present value is	$	98	(HST at 14 % applied)
Reduction in participant's furnace oil bill:			
- annual reduction in furnace oil for water heating	litres	1	(1 litre = 8.5 kWh)
- assumed furnace oil price	$ / litre	1.00	
- present value of reduction in furnace oil	$	8	(GST at 5 % applied)
Benefit of avoided CO2 emissions:			
- assumed CO2 emissions rate for electricity	kg / kWh	0.60	
- assumed price of CO2 emissions	$ / tonne	40	
- present value for reduction in electricity is	$	18	
- present value for reduction in furnace oil is	$	1	

Annual saving with ENERGY STAR unit:	3	kWh for mechanical (25 % of EnerGuide usage)
	10	kWh for water heating (75 % of EnerGuide usage)
	60	kWh for dryer energy
Average reduction in customer load is	0.0075	kW (25 % of water heating is by electricity)
Assume average reduction at system peak is	0.0101	kW (1.35 times average load)

SCHEDULE 3

Benefit Cost Analysis for Energy Star Clothes Washer Rebate
(Non-Energy Star Top Loading Versus Energy Star Front Loading)

Schedule 3 (Page 1 of 2)

BENEFIT COST ANALYSIS FOR ENERGY STAR CLOTHES WASHER REBATE

(Non-ENERGY STAR top loading versus ENERGY STAR front loading)

Free riders have not been taken into account		Participant Cost test ($)	Utility Cost test ($)	Rate Impact test ($)	Total Resource Cost test ($)	Societal Cost test ($)
Benefits:	- Utility avoided generating capacity cost		22	22	22	22
	- Utility avoided T&D capacity cost		26	26	26	26
	- Utility avoided energy supply cost		108	108	108	108
	- Reduction in participant electric bills	178				
	- Reduction in participant fce oil bills	34			34	34
	- Incentive rebate to participant	50				
	- Avoided CO2 emissions: electricity					32
	- Avoided CO2 emissions: furnace oil					3
	total	262	155	155	189	225
Costs:	- Utility DSM program admin. costs		10	10	10	10
	- Utility DSM program rebate costs		50	50		
	- Revenue reduction to utility			157		
	- Participants incremental capital cost	200			200	200
	- Cost to replace lost space heating	0			0	0
	total	200	60	217	210	210
	Net benefit (cost)	62	95	(61)	(21)	15
	Benefit / cost ratio	1.31	2.59	0.72	0.90	1.07

Schedule 3 (Page 2 of 2)

BENEFIT COST ANALYSIS FOR ENERGY STAR CLOTHES WASHER REBATE

(Non-ENERGY STAR top loading versus ENERGY STAR front loading)

Inputs and Assumptions

Equipment life	years	14	
Escalation rate	%	2.0	
Present value factor for 14 yrs at 7.0 % discount rate is		10.0	for escalating items
		8.7	for non-escalating items
Estimated annual average incremental T&D losses	%	11.5	
Estimated incremental T&D losses at system peak	%	15.7	
Utility avoided generating capacity cost:			
- participant load reduction at time of system peak	kW	0.018	
- cost of generating capacity	$ / kW - year	100	(purchases on the margin)
- present value is	$	22	(+ 15 % planning reserve)
Utility avoided T&D capacity cost:			
- demand related T&D capacity cost	$ / kW - year	160	(adjusted for losses)
- present value is	$	26	
Utility avoided energy supply cost:			
- annual electricity saving by participants	kWh	119	
- price of purchased energy	$ / kWh	0.08	
- present value is	$	108	
Reduction in participant's electricity bill:			
- retail energy charge for electricity	$ / kWh	0.1316	Residential first block
- present value is	$	178	(HST at 14 % applied)
Reduction in participant's furnace oil bill:			
- annual reduction in furnace oil for water heating	litres	3	(1 litre = 8.5 kWh)
- assumed furnace oil price	$ / litre	1.00	
- present value of reduction in furnace oil	$	34	(GST at 5 % applied)
Benefit of avoided CO2 emissions:			
- assumed CO2 emissions rate for electricity	kg / kWh	0.60	
- assumed price of CO2 emissions	$ / tonne	40	
- present value for reduction in electricity is	$	32	
- present value for reduction in furnace oil is	$	3	

Annual saving with ENERGY STAR unit:	12	kWh for mechanical (25 % of EnerGuide usage)
	37	kWh for water heating (75 % of EnerGuide usage)
	98	kWh for dryer energy
Average reduction in customer load is	0.0136	kW (25 % of water heating is by electricity)
Assume average reduction at system peak is	0.0184	kW (1.35 times average load)