

MANITOBA PUBLIC UTILITIES BOARD

Efficiency Manitoba
2020/23 EFFICIENCY PLAN SUBMISSION

Testimony of James (Jim) Grevatt, Energy Futures Group, Inc.

For

Consumers' Association of Canada (Manitoba)

And

Winnipeg Harvest

December 9, 2019

I. Introduction and Summary

The Consumers' Association of Canada (Manitoba) and Winnipeg Harvest (collectively, "the Coalition") retained James (Jim) Grevatt, Energy Futures Group, Inc. (EFG), to review and analyze the Efficiency Manitoba ("EM") 2020/23 Efficiency Plan ("Plan") submission in order to determine if the Plan appropriately capitalizes on the opportunities to support Manitobans in reducing their energy costs through energy efficiency programs.

Mr. Grevatt has provided expert review of programs in Maryland, Pennsylvania, Mississippi, New Hampshire, Colorado, Nevada, Kentucky, North Carolina, West Virginia, Virginia, Florida, and Maine, as well as in recent FortisBC and BC Hydro cases, and currently leads strategic planning for the New Jersey Clean Energy Program for EFG. He brings 25 years' leadership experience in energy efficiency program operations to his consulting practice. As Director of Residential Energy Services for Efficiency Vermont for over five years, and then in the same role for the District of Columbia Sustainable Energy Utility for its startup operation, Mr. Grevatt has hands-on experience with industry-leading markets-based approaches to managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. Mr. Grevatt's CV is attached as Appendix B.

Based on his review and analysis, Mr. Grevatt offers the following observations regarding Efficiency Manitoba's Plan and possible areas for improvement:

- 1. Efficiency Manitoba's initial Efficiency Plan filing failed to include numerous critical details regarding the measures and programs that are proposed for implementation. These omissions, coupled with an unreasonably accelerated procedural schedule made review and analysis difficult, with the unfortunate result that it was not possible to address all the relevant issues in the Plan.**
- 2. The Plan contains many of the programs that are typically included in comprehensive energy efficiency portfolios. These programs could, if budgeted appropriately and implemented effectively, provide significant opportunities to increase the energy efficiency of homes and businesses in the province.**

- 3. There are significant risks to success of Efficiency Manitoba's 2020-2023 Plan, however, Efficiency Manitoba fails to address such concerns, appearing to simply assume that it will complete the myriad steps leading up to program launch, full implementation, and the realization of participation and savings targets.**
- 4. Based on the available information, it appears that Efficiency Manitoba is unreasonably conservative in the scope and scale of its proposed residential sector programs.**

These observations lead Mr. Grevatt to the following recommendations for the Public Utilities Board ("PUB" or "Board"):

- 1. Efficiency Manitoba should develop and file with the Board a well-documented project management plan for launching and implementing its 2020/23 programs. The project management plan should demonstrate that Efficiency Manitoba has identified critical milestones and has clearly established processes for achieving them. The project management plan should identify significant risks to the successful launch and implementation of programs and achievement of participation and savings targets and should document potential risk mitigation strategies.**
- 2. Efficiency Manitoba should, as early as possible once it has engaged an evaluator, request an independent review of its assumptions regarding codes and standards savings that it included in its Plan to identify areas of potential concern, so that it can adjust other program savings levels as necessary to assure it can meet its annual savings targets.**
- 3. Efficiency Manitoba should increase its proposed residential and income-eligible program budgets, participation, and savings to better meet the needs of Manitoba's households, consistent with the evidence of Mr. Neme.**
- 4. Efficiency Manitoba should provide significantly more detail in future filings to better serve the needs of the Board and stakeholders. Future Plan filings should include at the program level: assumed measure quantities, measure cost and savings assumptions, and measure incentive levels. Filings should also**

demonstrate that Efficiency Manitoba is using a well-documented project management approach to assure effective execution and realization of its plans.

As will be described in the evidence below, the Plan and Interrogatory Request Responses (“IRR”) did not provide all the information that is required to make more specific recommendations. Given the current lack of measure-level detail, Mr. Grevatt will monitor the proceedings and may provide further recommendations regarding the adequacy of the filing and implications for the approval of the Plan during oral testimony.

II. Detail

A detailed explanation of Mr. Grevatt’s findings follows.

1. Efficiency Manitoba’s initial Efficiency Plan filing failed to include numerous critical details regarding the measures and programs that are proposed for implementation.

Regrettably, Efficiency Manitoba was unable to file its complete 2020/23 Efficiency Plan until October 25, 2019, a full three and a half weeks after the initial announced filing date of October 1, 2019. Anticipating that the procedural schedule would be quick, in discussion during the September 19, 2019 meeting in which EM previewed its Plan, the Coalition requested that EM provide electronic workpapers along with the filing in order to expedite thoughtful review given the anticipated procedural schedule. While EM did not do this, in early November the Coalition followed up with EM to request specific workpapers in advance of the Interrogatory process. EM agreed to provide certain workpapers, and on November 7, 2019, EM provided a link to a shared drive containing the electronic workpapers. However, the files that were provided did not include the fundamental information that the Coalition requested for each program—information that was also not included in the Plan as filed, and which is critical to any meaningful review, namely “a listing of the measures that result in the projected savings, by year, including:

- Assumed quantity of each measure
- Assumed gross and net savings of each measure
- Assumed estimated useful life of each measure

- Assumed program incentive cost of each measure
- Assumed customer cost of each measure”¹

There is not a definition of the term “measure” in EM’s Plan, but it is a widely-used term in the energy efficiency industry. The following definition is included in the Massachusetts Technical Reference Manual (“TRM”):²

Measure	A product (a piece of equipment), combination of products, or process designed to provide energy and/or demand savings. Measure can also refer to a service or a practice that provides savings. Measure can also refer to a specific combination of technology and market/customer/practice/strategy (e.g., direct install low income CFL).
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In common use, a measure is the thing that an efficiency program is encouraging customers to install in order to save energy. For residential customers, for example, a measure in a comprehensive home retrofit program might be wall insulation, or air sealing, or a new heat pump. In an appliance program a measure might be an efficient refrigerator, or clothes washer, or dehumidifier. Measure level detail is needed to understand what a program is actually promoting. It is insufficient to say only, as EM does in reference to the Home Renovation Rebate Offers, that it “will provide rebates to homeowners on a variety of energy-saving measures and technologies with higher upfront costs such as insulation, windows, HRV controls, drain water heat recovery units, and geothermal systems.”³ In order to assess the value of such a program, it is necessary to understand the program’s assumptions about the costs and savings for each measure, and how the relative prioritization of the measures is reflected in incentive levels.

¹ Electronic request to Efficiency Manitoba dated November 4, 2019, attached as Appendix C.

² Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures, 2016-2018 Program Years – Plan Version, October 2015, pdf p.434. <http://ma-eeac.org/wordpress/wp-content/uploads/2016-2018-Plan-1.pdf>. The Table of Contents listing the individual measures that are included in the TRM, such as “APPLIANCES – REFRIGERATOR (LOST OPPORTUNITY),” “BUILDING SHELL – AIR SEALING,” “HVAC – DUCT SEALING” and over a hundred others is attached as Appendix D.

³ Efficiency Manitoba 2020/23 Efficiency Plan, pdf pp. 295-296, lines 349-351.

No measure level data were provided to the Coalition until IRR were received on November 27, 2019, a month after the Plan was filed—and even at this point the data were incomplete and difficult to interpret. For example, a listing of individual measures and an incentive budget for each was provided in IRR Coalition/EM 1-91c, but the quantities of each measure were not provided. However, measure quantities and individual measure incentive amounts were provided for many of the same measures in IRR Daymark/EM 1-13de— but only for the natural gas measures (the electric measures were omitted). Trying to piece these data together is cumbersome, time-consuming, and prone to error and would be unnecessary if EM had provided a full set of electronic workpapers along with the filing as originally requested. At this point it is not known whether EM has the data that were requested but was not able to provide them for some reason, or if the detailed data are not even available.

There are additional examples of confusing and conflicting data coming from EM. While EM originally indicated that it would annually reach between 3,420 and 3,950 electric houses in the income qualified program, in IRR it revised the estimates to around 500 houses each year, without an explanation of why there had been a change other than to say that “this table has been enhanced to provide more detail regarding the number of homes...participating in Income Qualified Offers.”⁴ Unfortunately this leaves the impression that EM staff may themselves be confused about the data, which should cause the Board to require assurance from EM that it has the resources to carry out the plan and that it has done appropriate implementation planning before it recommends approval of the Plan.

This level of data, which tells the Board and stakeholders what EM is actually planning to do, matters. Without it reviewers and decision makers can only guess at what might be implied by the program narratives, which does not provide a sufficient basis for determining how well the programs should be expected to perform, and whether the savings that are planned will sufficiently benefit participants. The poor quality of the data provided in the original filing and in IRR effectively means that the Coalition has not had

⁴ Response to COALITION/EM I-102.

access to the basic information about EM’s programs that is needed for a thoughtful review. While the information in the IRR was helpful, it did not fully resolve all the Coalition’s questions. Without an opportunity to propound follow up Interrogatory Requests (“IR”) there are significant questions about EM’s Plan that remain unanswered. Unfortunately, this limits the specificity of the observations and recommendations that can be made regarding the individual program plans that EM has provided.

For the Board’s consideration for future EM filings, several excerpts from Public Service Company of Colorado’s (“PSCO”) 2019-2020 DSM Plan⁵ are attached. Appendix E contains PSCO’s electric budget and savings projections by program, by year for 2019 and 2020.⁶ Appendix F contains participation estimates for each of PSCO’s programs, including expected average incentives and savings for each participant. And lastly Appendix G is the program description for PSCO’s ENERGYSTAR New Homes Program. Similar descriptions are included in PSCO’s filing for each program it proposes to offer. The level of detailed information that is included in PSCO’s filing provides the Colorado Public Service Commission and stakeholders a firm basis for understanding the programs that PSCO proposes to implement—a level of detail that is lacking in EM’s filing, and that would greatly improve future filings. Another excerpted example of a more informative energy efficiency program plan filing, this from Nevada, is attached as Appendix H. In this case, a description of Nevada Power Company’s Residential Lighting Program is provided.⁷

A similar level of detail would greatly improve EM’s future filings. Should the Board determine to recommend that EM provide more detail in future filings, it might

⁵ Public Service Company of Colorado 2019/2020 Demand-Side Management Plan, Proceeding No. 18A-0606EG, https://www.dora.state.co.us/pls/efi/EFI_Search_UI.search.

⁶ Similar tables are included in PSCO’s filing for its gas programs.

⁷ From Application of Nevada Power Company d/b/a NV Energy and Sierra Pacific Power Company d/b/a NV Energy for approval of their 2019 Combined Annual Electric Demand Side Management Update Report as it relates to the Action Plan of their 2019-2038 Triennial Joint Integrated Resource Plan, Docket No. 19-07004. http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2019-7/40012.pdf.

consider requesting specific recommendations from stakeholders on the types of data that would facilitate their review and analysis.

2. The Plan contains many of the programs that are typically included in comprehensive energy efficiency portfolios. These programs could, if budgeted appropriately and implemented effectively, provide significant opportunities to increase the energy efficiency of homes and businesses in the province.

While detail is lacking in EM's program descriptions, it is fair to say that the *types* of programs that are proposed have the potential to address many of the energy saving opportunities that are available to Manitoba's utility customers. Residential customers will be offered programs that promote efficient appliances and lighting products, that encourage building efficiency in new construction, and that offer audits and incentives for building retrofit measures. Non-residential customers will have access to incentives for a wide variety of equipment types, and there will be programs that promote custom efficiency projects and operational efficiency as well. Such programs can provide the structure for reaching customers with effective promotions that will achieve significant amounts of energy efficiency.

However, as will be discussed below, the plan does not adequately provide true efficiency program savings opportunities for customers due to its over-reliance on savings from codes and standards initiatives for which EM had no role. It is also notable that in the industrial sector the largest fraction of proposed savings comes from the load displacement program. In fact, load displacement is expected to provide about one-third of the total program (not including codes and standards) savings in each of the three years of the plan. Combined, load displacement and codes and standards are expected to produce 50% or more of the total portfolio savings in each of the three plan years.⁸ For the vast majority of customers this means that they will have fewer opportunities to

⁸Program Savings from Tab "PVT Electric Savings" in file "3-Year Plan Electric Portfolio Summary 21Oct2019 v1.4" provided by Efficiency Manitoba to the Coalition on November 4, 2019. Codes and Standards savings from IRR PUB/EM 1-39 Revised.

reduce energy use at their homes and businesses than they would have had under a plan that relies more heavily on broadly available programs.

3. There are significant risks to success of Efficiency Manitoba’s 2020-2023 Plan, which should be accounted for and addressed through project management and risk mitigation strategies. However, Efficiency Manitoba fails to address such concerns, appearing to simply assume that it will complete the myriad steps leading up to program launch, full implementation, and the realization of participation and savings targets.

Launching a new enterprise of nearly any kind requires thoughtful planning and the highly coordinated execution of many inter-related, dependent actions and activities. The launch of Efficiency Manitoba is no different, and as with any similar launch there are a multitude of inherent risks to success—yet there is no evidence in the Plan or in subsequent IRR that EM is cognizant of these risks, or that it has developed any kind of risk mitigation strategy to assure that it will succeed in accomplishing its mandate.

A few of the notable risks that EM faces are:

- Whether the required staff transition from Manitoba Hydro (“Hydro”) will be successful and accomplished in a timely manner;
- Whether procurement for third party program implementers will be successful and accomplished in a timely manner;
- Whether all the programs will ramp up according to plan and meet participation and savings targets within the proposed budgets;
- Whether the proposed Customer Relationship Management (“CRM”) tool and proposed Online Home Energy Questionnaire will be fully deployed and operational according to the expected timelines;
- And, whether the significant savings that are projected to come from Codes and Standards will be verified by the independent assessor.

This subset of potential risks is discussed below, although because this list only addresses operational issues related to the startup of the programs and does not consider whether the outreach and marketing approaches that EM proposes to use to engage

potential customers will be effective, or whether incentive levels will be sufficient to draw participants, or whether the participation processes themselves will be sufficiently transparent and streamlined, there are likely other issues that could similarly effect EM's ability to meet its targets at the budget levels it proposes.

- *Will the required staff transition from Manitoba Hydro be successful and accomplished in a timely manner?*

As of November 8, 2019, Efficiency Manitoba had 5 full-time equivalent staff,⁹ with a budget that suggests up to 75 full-time equivalent staff will be engaged.¹⁰ In its response to IR from Daymark, EM indicates that “Efficiency Manitoba is working through its implementation plan including organization structure to ensure staffing levels are adequate to deliver on the Plan. Being fully operational has assumed that required staff will be employees of Efficiency Manitoba by April 1, 2020.”¹¹ EM then states that there “are labour and employee relations dimensions of Efficiency Manitoba’s requirements to staff the organization”¹² including the fact that “bargaining units currently represent a portion of employees doing this work.”¹³

Clearly there are complexities related to transitioning staff from Hydro, and filling positions that remain vacant with experienced and qualified staff in the case that not all transitions are successful may also be challenging. However, EM does not seem to fully acknowledge the risk or provide a level of assurance that EM has contingency plans in case it is not fully staffed—with staff that are fully trained—in time to launch its programs and meet its projected participation and savings targets. In IRR EM simply states that “[i]t is not anticipated that Efficiency Manitoba will be operating with insufficient staff levels on April 1, 2020”¹⁴

⁹ Response to DAYMARK/EM 1-81a.

¹⁰ Efficiency Manitoba 2020/23 Efficiency Plan, pdf pp. 50-51, lines 50-54.

¹¹ Response to DAYMARK/EM 1-81b.

¹² Response to DAYMARK/EM 1-81c.

¹³ Response to DAYMARK/EM 1-81c.

¹⁴ Response to DAYMARK/EM 1-81d.

- *Will procurement for third party program implementers be successful and accomplished in a timely manner?*

In its response to Daymark IR, EM provides a table in which it shows the categories of service providers it anticipates engaging in a variety of program areas. In the table there are 32 service provider roles or categories listed, 21 of which show onboarding timeframes of either “Spring 2020” or “Early 2020,” and another four of which show onboarding timeframes later in 2020.¹⁵ The fact that EM had only five staff as of early November, and that these staff must both hire the rest of the organization and fill two dozen service provider roles in early 2020 is concerning. Yet there is no mention in EM’s Plan or IRR of the risk that these tasks will not be completed on time, and no indication that there are contingencies should it turn out not to be able to accomplish these daunting tasks. In fact, in IRR to the Coalition EM dismisses any such risks associated with vendor procurement, stating that “Efficiency Manitoba will require third-party service providers to meet its first year savings target, but this is not a risk to Efficiency Manitoba as procurement has already begun for the earliest offers and contracting is on schedule for initiation in early 2020.”¹⁶

Sadly, the fact that EM did not file its Plan by the initial filing deadline of October 1, 2019, or fully respond to IR according to the procedural schedule, does not provide much reassurance that it will be able to meet the upcoming hiring, procurement, and other operational deadlines, any of which could delay program launch and ramp up and prevent EM from meeting its savings obligations.

- *Will all the programs ramp up according to plan and meet participation and savings targets within the proposed budgets?*

As outlined in the points above, there is a lack of discussion in the Plan about how EM will undertake to operationalize the programs it proposes to offer. EM also may be unrealistically optimistic about the program budgets that will be required. It is critical that EM be adequately funded to meet its savings targets, especially given the statement that

¹⁵ Response to DAYMARK/EM I-13b.

¹⁶ Response to COALITION/EM I-81c, underline added.

“Section 12(5) within the Act allows Efficiency Manitoba to modify the Plan as deemed necessary during any approved three-year period, provided these changes maximize the amount or cost-effectiveness of net savings and do not exceed approved costs for the three-year plan in place.”¹⁷ In other words, if EM is unreasonably optimistic in its budget projections, and those budgets are approved, it will have no room to modify the plan to increase budgets until the subsequent plan cycle. This could have the disastrous effect of making it impossible for EM to achieve its savings targets.

For the entire electric portfolio, EM provides a chart comparing its proposed 2020/21 Plan costs per kWh saved with those of dozens of other portfolios.¹⁸ Surprisingly, EM’s Plan cost, at approximately \$0.10 USD/kWh, is lower than all the other portfolios, with the 2017 US average at \$0.26 USD/kWh. One explanation for such anomalous low costs could be that EM’s proposed Codes and Standards savings are very low cost compared with traditional program savings. This could bring the overall portfolio cost down when compared with the many jurisdictions that do not claim savings from Codes and Standards initiatives. Another possible explanation could be that EM’s programs are failing to adequately promote long-lived, comprehensive efficiency measures, instead favoring low cost measures. This could be the case if, for example, EM prioritized low-cost commercial LED linear lighting over the same lighting with integrated or networked lighting controls that would cost-effectively save more energy, but at a higher cost per kWh.

Unfortunately analysis of the latter potential explanation was not possible due to data and time limitations. However, to better understand the extent to which the proposed Codes and Standards savings lower the overall portfolio cost the Coalition requested that EM provide its average cost per kWh saved with the Codes and Standards savings excluded to provide a better, “apples-to-apples” comparison with other portfolios. EM responded to the Coalition’s IR by stating that “the first-year acquisition cost (at the generator level), excluding costs and savings associated with Codes and Standards, range

¹⁷ Efficiency Manitoba 2020/23 Efficiency Plan, pdf p. 178, underline added.

¹⁸ Efficiency Manitoba 2020/23 Efficiency Plan, Figure 5, pdf p. 533.

from \$0.15-\$0.17/kWh for electricity.”¹⁹ This response is concerning in that it was provided as a range of values rather than as a specific value, which logically should have been available by re-calculating the weighted average of the programs’ savings costs absent the Codes and Standards programs. Indeed, it would be useful to understand that proposed savings acquisition costs for each program, which should be a relatively simple calculation, however EM did not make such data available.

However, it is more concerning that even if one ignores the fact that EM did not provide a specific value and simply looks at \$0.17/kWh at the high end of the range, the projected cost per kWh saved is still far less than most of the portfolios shown. Of course, it is desirable for EM to achieve savings at low costs, but it is difficult to believe that it will be possible for EM to achieve costs that are as low as it projects, for two primary reasons.

First, many if not all of the comparison portfolios were still capturing very significant savings from retail lighting programs in 2017, and most likely at lower costs per kWh saved than EM will be able to do.²⁰ This is true in large part because in 2017, these portfolios were able to claim that their programs played a larger role in convincing customers to purchase efficient LED bulbs than they will be able to claim in 2020 and beyond due to increasing market acceptance of the technology and the effect of standards in driving the manufacture and sale of increasingly efficient products. For example, in 2017, Massachusetts program evaluators determined that retail lighting programs promoting standard LED bulbs had a net-to-gross ratio of 80%, yielding net savings of 29.4 kWh per bulb. However Massachusetts plans to use a net-to-gross ratio of only 30% for the same bulb in 2020, yielding net savings of only 10.4 kWh per bulb.²¹ This means

¹⁹ Response to COALITION/EM I-123b.

²⁰ This is because increasing market acceptance of efficient lighting technologies will reduce the savings that can be claimed for each bulb due to increasing free ridership rates. EM already appears to account for this by estimating that it will capture 11.63 kWh per bulb in 2020/21, 10.03 in 2021/22, and 8.42 kWh in 2022/23, values calculated from IRR Coalition/EM I-89b-Attachment.

²¹ 2017 and 2020 National Grid MA lighting data provided by Glenn Reed, Massachusetts Energy Efficiency Advisory Council Consultant Team, and attached as Appendix I.

that Massachusetts programs will need to promote more measures that are more costly in order to meet program savings targets, with the result that the cost of saving electricity through efficiency programs in 2020 will likely be higher than it was in 2017—and there is no reason to think that this would not also be true in Manitoba, all other things being equal. In spite of this EM still projects that its costs will be far less than the 2017 average. EM’s projections are therefore inconsistent with the implementation experience of numerous other jurisdictions.

Second, it simply defies logic and experience to think that all aspects of the launch of EM will occur on schedule and on budget, and that participation will meet or exceed projections, within expected budgets. The launch of a complex, multi-faceted organization, especially when there is considerable pressure on the organization to produce results from the get-go, will inevitably experience bumps in the road that will slow down program ramp-up. This was certainly Mr. Grevatt’s personal experience as a member of the management team for the startup District of Columbia Sustainable Energy Utility when it launched in 2012.

An article in the Harvard Business Review states that organizations tend to “favor information that supports our positions (typically successes) and suppress information that contradicts them (typically failures).”²² Consistent with this observation, EM does not appear to have budgeted for any contingencies related to unexpected costs of a startup organization, and instead indicates that its 2020/21 electric saving costs will be well below industry standards, that its 2020/23 average acquisition cost for electric savings will be 39% less than Manitoba Hydro’s 2015/16 electric acquisition cost, and that its 2020/23 average gas savings acquisition cost will be 10% less than Manitoba Hydro’s 2015/16 gas acquisition cost.²³ There is nothing in the Plan that sufficiently explains why this could be the case.

²² Robert S. Kaplan and Anette Mikes, *Managing Risks: A New Framework*, June 2012. <https://hbr.org/2012/06/managing-risks-a-new-framework>.

²³ Efficiency Manitoba 2020/23 Efficiency Plan, Figure 5.6, pdf p. 150.

- *Will the proposed Customer Relationship Management (“CRM”) tool be fully deployed and operational according to the expected timelines?*

EM states that “Foundational to the success of Efficiency Manitoba is the procurement and implementation of a comprehensive customer relationship management and demand side management (CRM/DSM) system. This is an integral and overarching strategy that will provide optimal performance of Efficiency Manitoba from both customer facing and internal operations perspectives.”²⁴ EM further states that the CRM/DSM system “manages all aspects of customer and contractor relationships, including but not limited to:

- tracking customer data, project status, and issues.
- Simplifies transfer of customer utility information from Manitoba Hydro to Efficiency Manitoba.
- Stores, tracks, and manages Demand Side Management data and workflows, and has the ability to:
 - Track customer participation, savings (including incorporating calculation methodologies), costs;
 - Offer online customer and vendor application forms;
 - Provide vendor specific portals for direct entry of program data by outside parties; and
 - Show dashboards and generate reporting.”²⁵

Clearly the CRM/DSM system will be a cornerstone of EM’s operations. Inevitably, the development of such a multi-functional, foundational tool will require a comprehensive scoping phase by knowledgeable developers. Failing to adequately address scoping before beginning to build the tool would be risky indeed if the system will succeed in delivering on its promise. Yet, EM proposes what appears to be an aggressive, and perhaps overly optimistic schedule for the CRM/DSM system, calling for

²⁴ Efficiency Manitoba 2020/23 Efficiency Plan, pdf p. 208, lines 71-75.

²⁵ Response to COALITION/EM I-23.

the issuance of a Request for Proposals in December, 2019 with implementation work slated to begin in March, 2020 and features of the system being implemented starting in August 2020.²⁶

Perhaps EM will succeed with this schedule, but there are important questions that have not been answered, including:

- How will EM track savings and customer interactions before the tool is fully functional, given that programs are intended to launch in the Spring of 2020, before the tool is complete?
- How will EM manage transitions that participants and/or contractors will have to make between program launch and the point at which the CRM/DSM system is functional?
- If development is delayed, will that push back the launch of any programs, or reduce the participation that EM can generate in the near term?

Given the fundamental nature of the CRM/DSM system, it is critical to understand whether the development plan is realistic, and especially how EM will manage to garner program participants if its launch is delayed.

- *Will the proposed Online Home Energy Questionnaire tool be fully deployed and operational according to the expected timelines?*

²⁶ In Mr. Grevatt's role as the Director of Residential Energy Services for Efficiency Vermont, he oversaw program management staff who undertook a CRM development process for a subset of the residential programs. The scoping alone took several months, and development took over a year—and that project was less comprehensive than what EM appears to be proposing, and it was done with in-house management and IT development staff, so procurement was not required. Mr. Grevatt also consults for the New Jersey Clean Energy Program, where development of a comprehensive CRM system took roughly two years from scoping through development and testing. Perhaps EM can develop its CRM more quickly, but it should be prepared to adjust its implementation plans if there are delays.

In response to an IR from the Coalition, EM indicates that it expects to procure a service provider to “develop and implement an online energy efficiency questionnaire”²⁷ in the Spring of 2020, with “a targeted rollout for fall 2020.”²⁸ EM also indicates that customers “will be required to complete the questionnaire to be eligible for the Home Energy Check-Up.”²⁹ But what will happen if the online questionnaire is delayed? Will the Home Energy Check-Up program also be delayed?

- *Will the significant savings that are projected to come from Codes and Standards be verified by the independent assessor?*

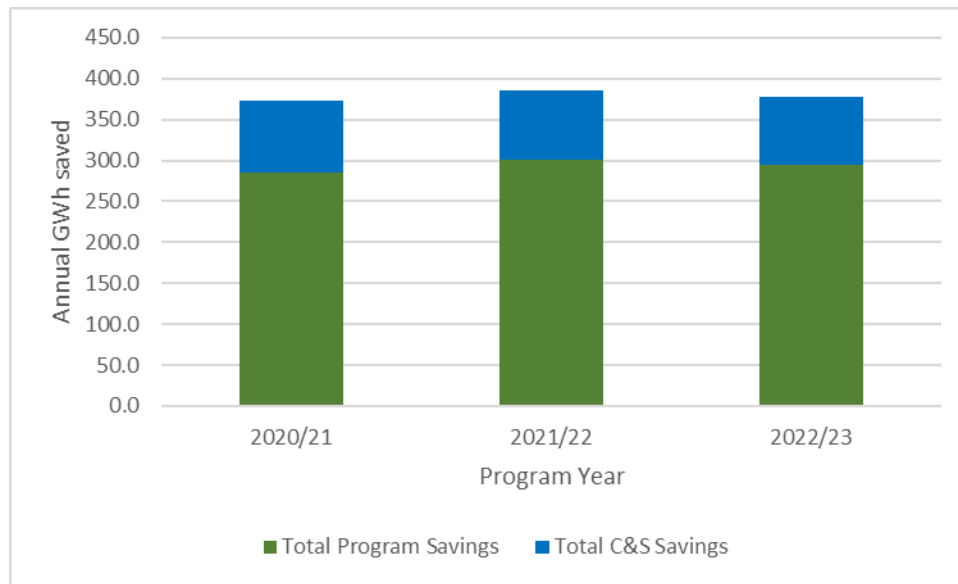
Efficiency Manitoba proposes to rely heavily on savings from Codes and Standards to meet its statutory obligations, as did Manitoba Hydro in the past. The percentage of electric savings from Codes and Standards in the Plan ranges from 24% in 2020/21 to 22% in 2021/22 and 2022/23, as seen in Figure 1 below:

²⁷ Response to COALITION/EM I-85.

²⁸ Response to COALITION/EM I-85.

²⁹ Response to COALITION/EM I-86b.

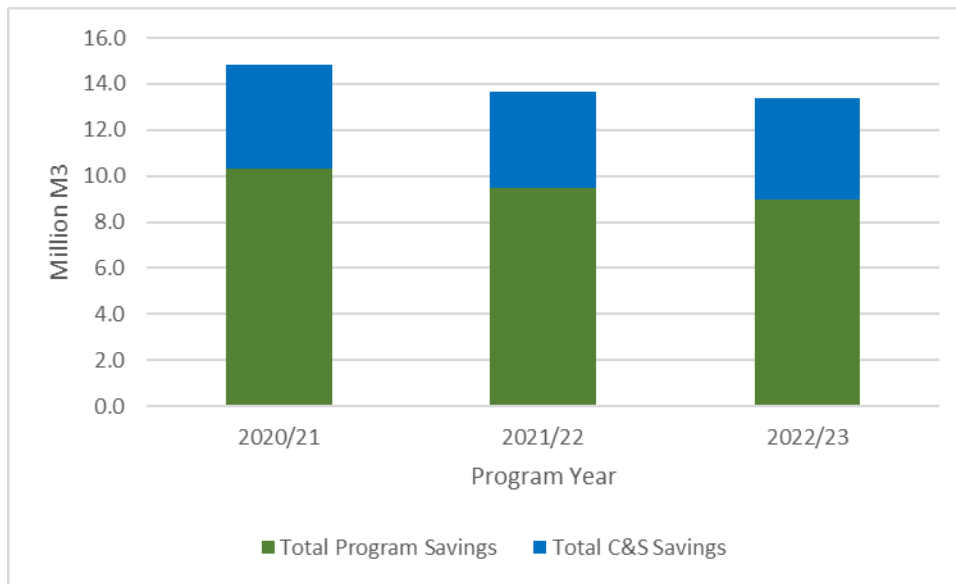
Figure 1: Projected Portfolio Electric Savings from Codes and Standards³⁰



The total fraction of natural gas portfolio savings that are expected to come from codes and standards is even higher. As illustrated below in Figure 2, codes and standards savings account for nearly one-third of total portfolio savings in each of the three Plan years:

³⁰ Program Savings from Tab “PVT Electric Savings” in file “3-Year Plan Electric Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019. Codes and Standards savings from PUB/EM 1-39 Revised.

Figure 2: Projected Portfolio Natural Gas Savings from Codes and Standards³¹



In response to IR, EM indicates that it “will rely on its third-party evaluator to implement the methodology...to assess the success and impact of Efficiency Manitoba’s participation in codes and standard committees,”³² however it is interesting to note that EM appears to expect to count savings from codes and standards towards its savings goals beginning in 2020/21— before it has taken any action to advance codes and standards in the province. In fact, EM proposes to claim savings for activities that were undertaken by Manitoba Hydro, and that occurred before EM began implementing any programs. Given that EM will rely on the judgment of the evaluator to determine the amount of savings it can claim for codes and standards, it seems likely that the savings that are ultimately attributable to EM may vary considerably from projections. Should the evaluator determine that EM can claim less savings from Codes and Standards than it

³¹ Program Savings from Tab “PVT NG Savings Summary” in file “3-Year Plan NG Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019 (interactive effects excluded from program savings). Codes and Standards savings from PUB/EM 1-39 Revised.

³² Response to DAYMARK/EM I-62b.

projects, it could result in a significant shortfall towards the required targets—and there is reason to think this could be the case. For example, EM indicates that it plans to claim savings in each year of the proposed three-year Plan for Residential General Service Lighting Standards that became effective in 2014,³³ even though in the ensuing years efficient LED lighting has become the most common type of bulb in residential lighting applications in Manitoba, effectively superseding the impact of the lighting standard.³⁴ It is hard to see why EM should be allowed to take credit for such savings, and it seems plausible to think that the evaluator might disagree with EM’s proposal.

Taken together, even these few examples suggest a strong need for a risk mitigation strategy to assure that EM will be able to meet its savings requirements. And it is likely that there are additional aspects of its planned launch and implementation that EM will rely on for success, and for which it has not contemplated contingency preparations. It would be useful to understand EM’s launch plan, including details regarding which hires, contracts, operational tasks, and programs it has prioritized. The Plan merely outlines, at a relatively high level, the programs EM intends to implement, and the costs and savings associated with each. It does not provide sufficient information about how it will carry out the many, many necessary tasks that would lead to successful implementation for the province. It would be reasonable and appropriate for the Board to require EM to document and demonstrate such contingency planning, so that the Board and stakeholders can be confident that EM will not find itself unable to meet its obligations.

Experience dictates that any complex project such as the launch of Efficiency Manitoba should acknowledge that it is probable that not all critical tasks will be accomplished on schedule. By first identifying key milestones in program launch—those things that must happen for programs to become fully operational— and by then listing the things that might not go according to plan, EM management staff can begin to come

³³ PUB/EM I-39 (Revised).

³⁴ LED bulbs fill 56% of sockets in Manitoba households per the response to COALITION/EM I-72d.

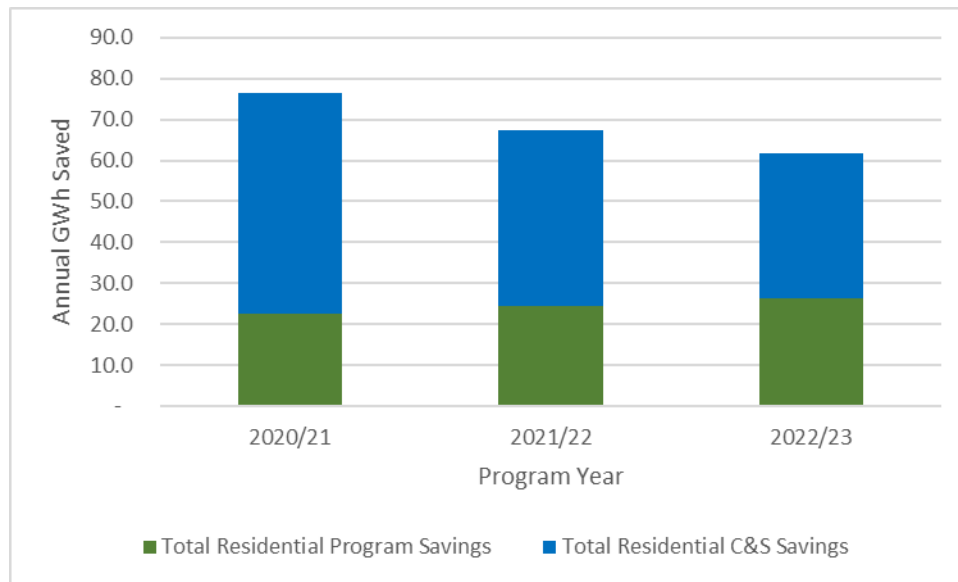
up with options for addressing the risks, should they occur. For example, when CFL lighting was scaling up in efficiency portfolios around North America, program administrators began to contract with manufacturers for the delivery of specified volumes of lighting products to retailers in their operational territory. But as demand for efficient lighting increased the manufacturers' ability to manufacture and ship products was not able to keep up. If program administrators were unprepared for such a possibility they would be unable to meet participation targets for their programs because there would not be any efficient lighting available in stores for customers to buy. Eventually, it became common practice to contract with multiple manufacturers with flexible volume agreements so that demand and manufacturing and delivery capacity could be managed to ensure that goals could be met.

EM should look at each program and the portfolio as a whole to identify critical startup and implementation milestones—the things that must occur in order to achieve objectives— and then assess the risk of something happening that could keep them from meeting each critical milestone. Where the risks are perceived to be moderate to high, EM should develop alternate steps that it could undertake if needed in order to keep programs on track towards goals. A straightforward introduction to this common practice in project management is available online through BC Open Education at <https://opentextbc.ca/projectmanagement/chapter/chapter-16-risk-management-planning-project-management/>.

4. Based on the available information, it appears that Efficiency Manitoba is unreasonably conservative in the scope and scale of its proposed residential sector programs.

The portion of total portfolio electric savings that EM projects it will capture through Codes and Standards makes up a large fraction of the overall electric savings—over 20% in each of the three program years. However, looking only at the Residential sector, the fraction of savings that are expected to come from Codes and Standards is much, much higher, as seen in Figure 3:

Figure 3: Projected Residential Electric Savings from Codes and Standards³⁵

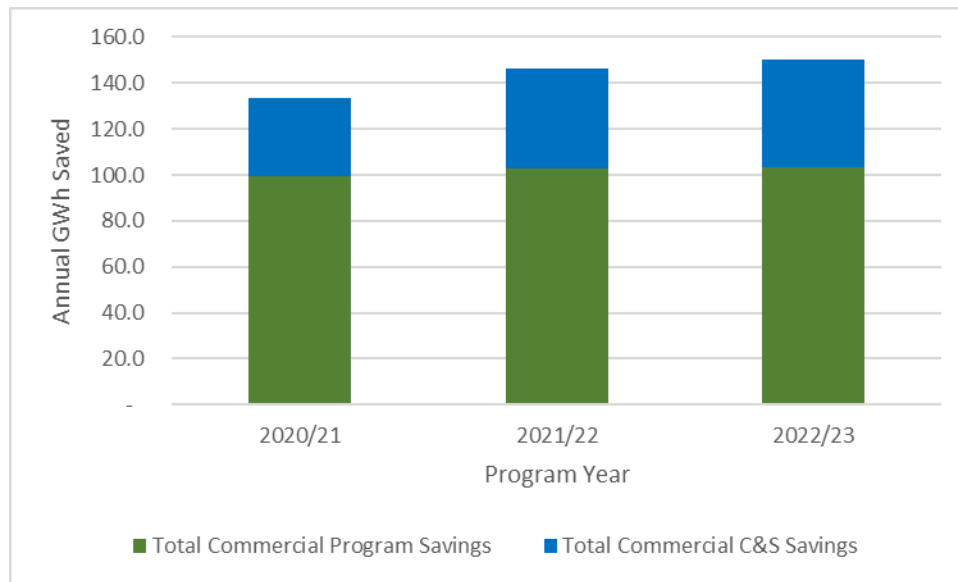


In fact, in the first year of EM’s Plan, residential program electric savings make up only 29% of the projected savings, compared with 71% of electric savings from Codes and Standards—savings that EM proposes to take credit for when it has done nothing to influence them. In addition to the evaluation risks discussed above, EM’s over-reliance on codes and standards to deliver residential sector savings means that residential customers will have far fewer opportunities to obtain support for reducing their electric bills through Efficiency Manitoba than the overall savings projections would suggest.

For comparison, Codes and Standards savings are expected to make up 25% of the Commercial electric savings in the first program year, growing to 31% in the third year, suggesting that commercial customers will have relatively greater opportunities to participate directly in programs that will help them reduce their electric bills. This is illustrated in Figure 4:

³⁵ Program Savings from Tab “PVT Electric Savings” in file “3-Year Plan Electric Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019. Codes and Standards savings from PUB/EM 1-39 Revised.

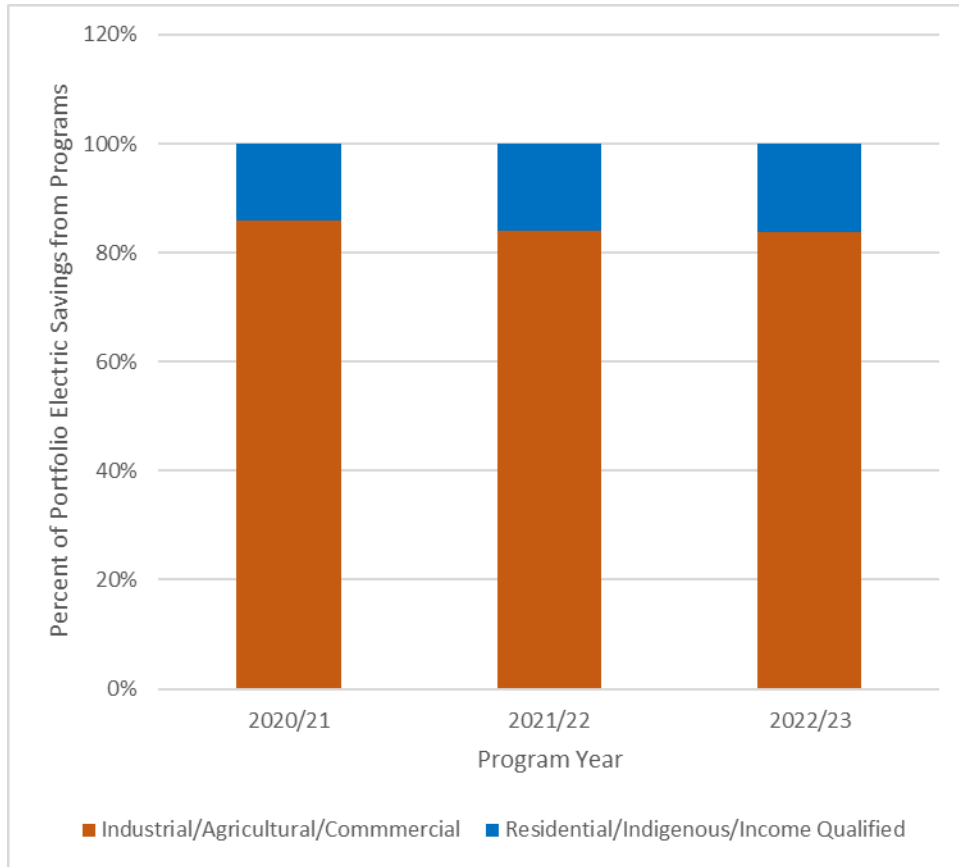
Figure 4: Projected Commercial Electric Savings from Codes and Standards³⁶



The relative lack of opportunities for residential customers to reduce their electric bills is made more stark by looking at the magnitude of residential electric program projected savings compared with the total portfolio savings. Setting aside load displacement and codes and standards savings to focus only on the energy efficiency opportunities that are available to customers through program participation, residential customer savings are only 14% of the total electric portfolio, compared with 86% for non-residential customers. This is illustrated in Figure 5:

³⁶ Program Savings from Tab “PVT Electric Savings” in file “3-Year Plan Electric Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019. Codes and Standards savings from PUB/EM 1-39 Revised.

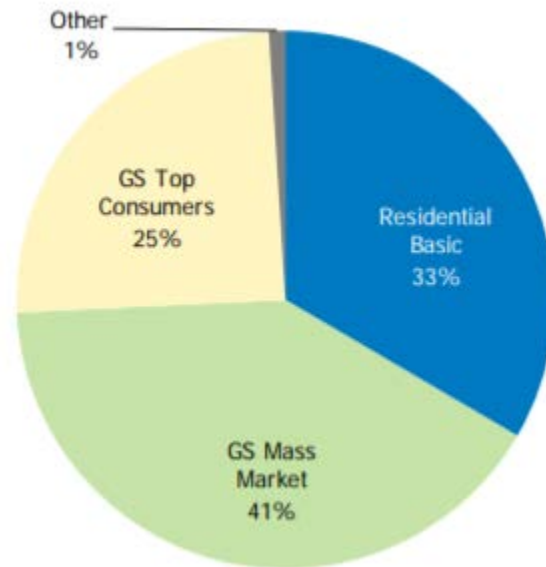
Figure 5: Comparison of Combined Residential Electric Savings to Non-Residential Electric Savings³⁷



Yet residential customers of Manitoba Hydro in aggregate use one-third of the electric energy sold in the province, as seen in Figure 6 below —more than double the percentage of portfolio electric savings that they are slated to receive in EM’s Plan:

³⁷ Program Savings from Tab “PVT Electric Savings” in file “3-Year Plan Electric Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019. Codes and Standards savings from PUB/EM 1-39 Revised. Load displacement and codes and standards savings are removed.

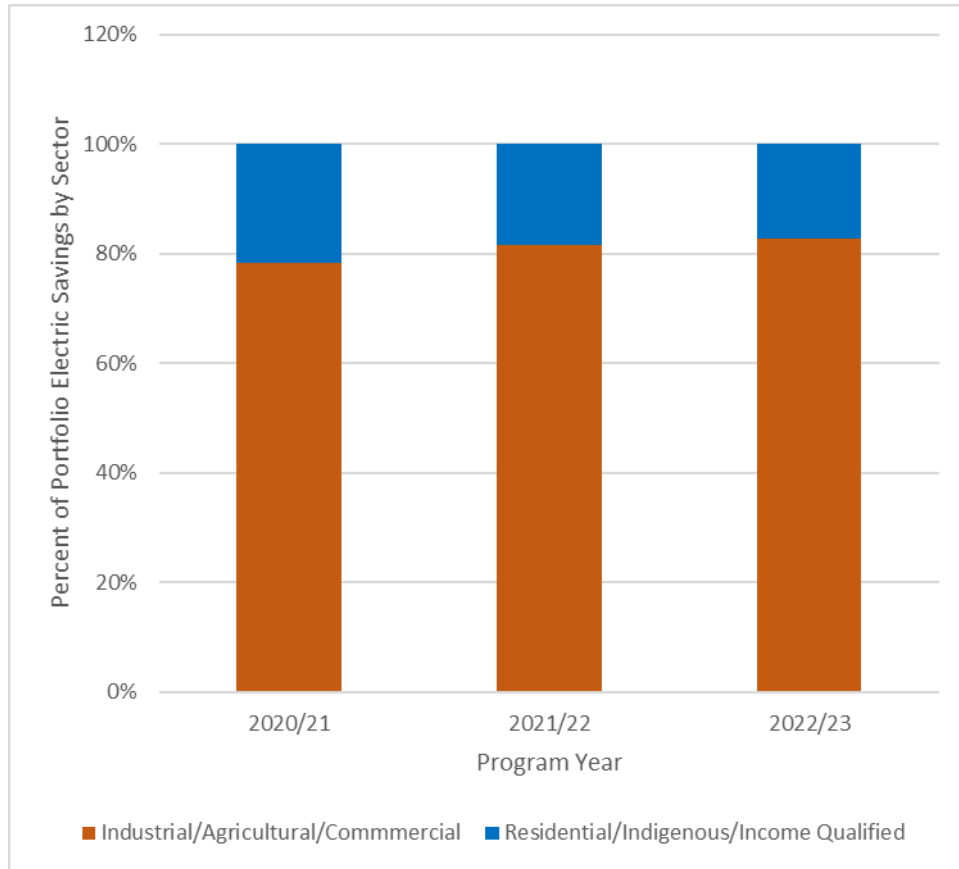
Figure 6: Components of Manitoba Electricity Use³⁸



Even when the full complement of offerings is considered, including load displacement and savings from Codes and Standards, residential customers do not receive electric savings in proportion to the 33% residential load as illustrated in Figure 7:

³⁸ Reproduced from Manitoba Hydro 2019/20 Electric Rate Application, Appendix 15, pdf. p. 14. https://www.hydro.mb.ca/docs/regulatory_affairs/pdf/electric/electric_rate_application_2019/15_appendix_15_-_2018_electric_load_forecast.pdf.

Figure 7: Comparison of Combined Residential Electric Program Savings to Non-Residential Electric Program Savings³⁹



The situation is similar for the natural gas savings portfolio, where, even after excluding the negative savings attributed to interactive effects, savings from Codes and Standards make up 81% of the residential savings in 2020/21, and 65% or more in the following two years, as illustrated in Figure 8.

³⁹ Program Savings from Tab “PVT Electric Savings” in file “3-Year Plan Electric Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019. Codes and Standards savings from PUB/EM 1-39 Revised. Load displacement and codes and standards savings are removed.

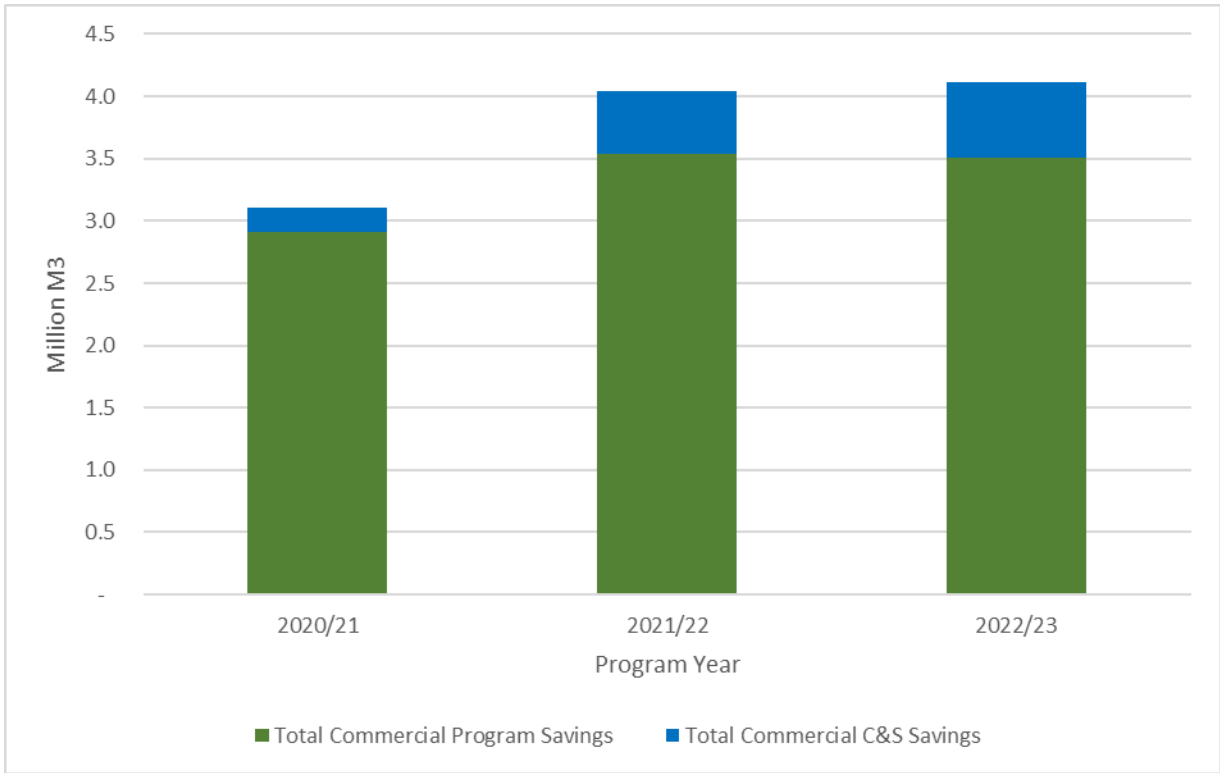
Figure 8: Projected Residential Natural Gas Savings from Codes and Standards⁴⁰



As with the electric savings portfolio, commercial customers will have far greater opportunities to save natural gas through program participation than will residential customers. For the commercial portfolio, after excluding negative savings attributed to interactive effects, codes and standards savings make up only 6% of the total commercial savings in 2020/21, increasing to 15% in 2022/23, as seen in Figure 9:

⁴⁰ Program Savings from Tab “PVT NG Savings Summary” in file “3-Year Plan NG Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019 (interactive effects excluded from program savings). Codes and Standards savings from PUB/EM 1-39 Revised.

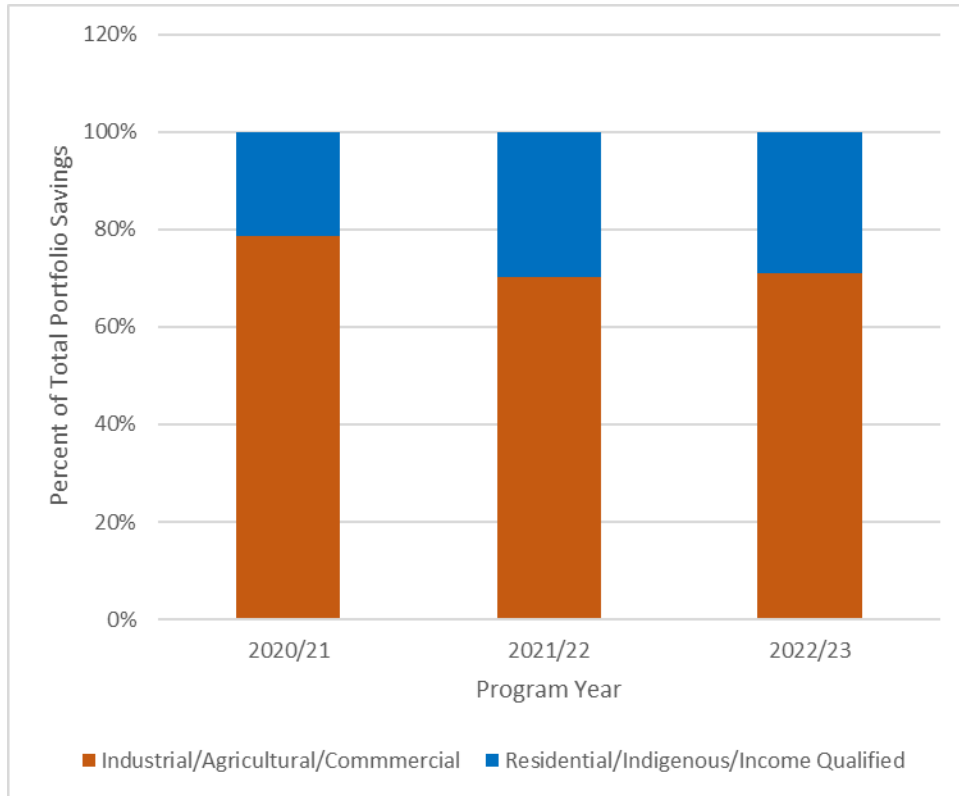
Figure 9: Projected Commercial Natural Gas Savings from Codes and Standards⁴¹



Excluding negative interactive effects and codes and standards savings, the proposed residential programs make up on average about 27% of the total program (not including codes and standards) savings as proposed, as seen below in Figure 10.

⁴¹ Program Savings from Tab “PVT NG Savings Summary” in file “3-Year Plan NG Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019 (interactive effects excluded from program savings). Codes and Standards savings from PUB/EM 1-39 Revised.

Figure 10: Comparison of Combined Residential NG Program Savings to Non-Residential NG Program Savings⁴²



This is considerably more than the 13% of 2017 natural gas consumption in the province that is attributed to residential customers.⁴³ Unfortunately, the fact that the ratio of residential to non-residential gas savings seems better than the same ratio does for electric savings, is misleading, because the vast majority of residential natural gas savings do not come from program opportunities that could help customers reduce their bills, but rather are attributed to the effects of codes and standards that EM has had nothing to do with. In other words, the ratio is a relative measure that only matters if the savings are significant— and as proposed, they are not.

⁴² Program Savings from Tab “PVT NG Savings Summary” in file “3-Year Plan NG Portfolio Summary 21Oct2019 v1.4” provided by Efficiency Manitoba to the Coalition on November 4, 2019 (interactive effects and codes and standards savings excluded from program savings).

⁴³ <https://www.cer-rec.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/mb-eng.html#s3>

Efficiency Manitoba can do more to provide meaningful opportunities for its residential customers, and certainly there are other portfolios in North America that do. For example, compare EM’s proposal to reach 800 houses in its electric Direct Install program in 2020/21 and 1,200 houses in its gas Direct Install program,⁴⁴ with the similar Quick Home Energy Checkup (“QHEC”) that BGE, a Maryland utility which has roughly twice as many residential customers as there are in Manitoba, has implemented for several years. In 2018, BGE reported the completion of 36,000 QHECs, which, if adjusted for Manitoba’s smaller residential customer base, would mean about 15,000-20,000 Direct Install participants annually. Such numbers are achievable. Energy Efficiency Alberta, for example carried out direct installations in over 113,000 homes⁴⁵ in its first year of operation.

These examples are not meant to suggest that increasing the number of participants in the Direct Install program is the specific change that EM should make in its Plan. Rather, my intention is to illustrate with this example that EM is proposing to do far less with this program than other program administrators have demonstrated is possible.

The savings opportunities that EM proposes to make available for residential customers can and should be increased. To have the most impact in reducing customers’ energy bills, comprehensive approaches that improve the efficiency of residential building envelopes should be expanded. Installing insulation and air sealing measures, especially when done in conjunction with replacement of electric resistance heat in homes with high efficiency cold-climate heat pumps, can reduce customers’ energy use by significant amounts. The need for expanding this approach is described in greater detail by Mr. Neme in his evidence, but the lack of detail in EM’s filing that has been

⁴⁴ Response to COALITION/EM I-102, Revised Attachment 3 – Technical Tables.

⁴⁵ Slide 7, from 2019 ACEEE Energy Efficiency as a Resource Conference, presentation 1b-Ottoni, which can be downloaded with other conference presentations at <https://aceee.org/conferences/2019/eeer#presentations>.

noted throughout this evidence does not provide a sufficient basis for a specific numeric recommendation regarding the magnitude of increase that the Board should consider.

EM’s proposed Income-Qualified Program should also expand its participation estimates. In its Plan, EM states:

“Lower income customers are...more likely to live in older homes located within older neighborhoods, which means these homes may be in higher need of energy efficiency improvements. However...these customers often lack the financial resources to carry out energy efficiency upgrades. In addition, while energy efficiency improvements may not be technologically complex, the project scope itself may be overwhelming to a lower income customer who may be a senior citizen, an individual, or family with other socio-economic barriers.”⁴⁶

Given the importance of providing support for these customers to reduce their energy bills the projection of reaching roughly 1,800 homes in each of the three plan years is far too small. EM proposes to reach barely more than 1% of the estimated 159,000 income-qualified households each year, which means that most income-qualified households will have to wait far too long for much-needed assistance. And further, as Mr. Neme discusses, EM does not propose any heat pump retrofits for income-eligible customers, despite the significant bill savings that these customers could receive from the replacement of electric resistance heating with high efficiency cold-climate heat pumps—especially when combined with building envelope retrofits including insulation and air sealing measures.

III. Conclusion

As discussed above, the Efficiency Manitoba plan includes many program types that are found in other energy efficiency program portfolios in North America, but more detail is needed to fully review and analyze the Plan, and Efficiency Manitoba does not propose to devote enough of its efforts to serve the needs of residential customers—

⁴⁶ Efficiency Manitoba 2020/23 Efficiency Plan, pdf p. 316, lines 64-70.

especially those who currently use electricity to heat their homes. Based on these observations, the Board is respectfully urged to consider the following recommendations:

- 1. Efficiency Manitoba should develop and file with the Board a well-documented project management plan for launching and implementing its 2020/23 programs. The project management plan should demonstrate that Efficiency Manitoba has identified critical milestones and has clearly established processes for achieving them. The project management plan should identify significant risks to the successful launch and implementation of programs and achievement of participation and savings targets and should document potential risk mitigation strategies.**
- 2. Efficiency Manitoba should, as early as possible once it has engaged an evaluator, request an independent review of its assumptions regarding codes and standards savings that it included in its Plan to identify areas of potential concern, so that it can adjust other program savings levels as necessary to assure it can meet its annual savings targets.**
- 3. Efficiency Manitoba should increase its proposed residential and income-eligible program budgets, participation, and savings to better meet the needs of Manitoba's households, consistent with the evidence of Mr. Neme.**
- 4. Efficiency Manitoba should provide significantly more detail in future filings to better serve the needs of the Board and stakeholders. Future Plan filings should include at the program level: assumed measure quantities, measure cost and savings assumptions, and measure incentive levels. Filings should also demonstrate that Efficiency Manitoba is using a well-documented project management approach to assure effective execution and realization of its plans.**

Appendix A – Statement of Qualifications and Duties

A. Qualifications

Jim Grevatt has been a Managing Consultant with Energy Futures Group (EFG) since 2013. EFG is a clean energy consulting firm based in Hinesburg, Vermont with additional offices in New York and Massachusetts. EFG designs, implements and evaluates programs and policies to promote investments in energy efficiency, renewable energy, demand response, other distributed resources, and strategic electrification.

Mr. Grevatt has provided expert review of programs in Maryland, Pennsylvania, Mississippi, New Hampshire, Colorado, Nevada, Kentucky, North Carolina, West Virginia, Virginia, Florida, and Maine, as well as in recent FortisBC and BC Hydro cases, and currently leads strategic planning for the New Jersey Clean Energy Program for EFG. He brings 25 years' leadership experience in energy efficiency program operations to his consulting practice. As Director of Residential Energy Services for Efficiency Vermont for over five years, and then in the same role for the District of Columbia Sustainable Energy Utility for its startup operation, Mr. Grevatt has hands-on experience with industry-leading markets-based approaches to managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs.

More information on Mr. Grevatt's experience can be found in his curriculum vitae, attached as Appendix B.

B. Duties

The Public Interest Law Centre retained Mr. Grevatt to assist the Consumers Coalition with its participation in the Public Utilities Board review of the 2020/23 Efficiency Plan on issues relating to:

1. An assessment of the reasonableness of the projected savings in Efficiency Manitoba's 3-year plan, including an assessment of the methodology used to determine the net savings;

2. An examination of Efficiency Manitoba's proposed plan to reach the savings target, including:
 - a. the appropriateness of the methodologies used by Efficiency Manitoba to select or reject demand-side management initiatives;
 - b. whether the plan adequately considers the interests of residential customers;
 - c. the accessibility of initiatives in the plan to residential customers, including low-income and other hard-to-reach or vulnerable groups, including but not limited to, Indigenous customers, rural customers, customers with disabilities, newcomers, renters and residents of multi-unit residential buildings and older customers;
 - d. an examination of the use of long-term versus short-lived initiatives;
 - e. whether the efficiency plan adequately considers new and emerging technologies that may be included in a future efficiency plan.
3. An analysis of Efficiency Manitoba's proposed evaluation framework;
4. The impact of decarbonization and electrification on the way Efficiency Manitoba savings goals are defined, and the role Efficiency Manitoba could/should play in supporting decarbonization and electrification, including a discussion of best practices and trends in other jurisdictions.

Mr. Grevatt's testimony focuses primarily on the first two of these topics – the reasonableness of the projected savings in the Plan and the examination of Efficiency Manitoba's proposed plan to reach the savings target. Mr. Grevatt also touches on Efficiency Manitoba's proposed evaluation framework, specifically on how evaluation of the savings attributed to Codes and Standards could result in dramatic reductions to the amount of savings EM achieves. Mr. Grevatt's Energy Futures Group colleague, Chris Neme, (a Principal with Energy Futures Group), focuses primarily on the fourth issue listed above.

Energy Futures Group's duties included:

- Review Efficiency Manitoba 2020/23 Efficiency Plan;
- Draft information requests;
- Review responses to information requests;
- Prepare briefing notes and attend meetings with clients and legal team, where necessary; and
- Prepare independent expert evidence relating to the issues under examination.

Energy Futures Group's retainer letter includes that Mr. Neme's and Mr. Grevatt's duties are to provide evidence that:

1. is fair, objective and non-partisan;
2. is related only to matters that are within their area of expertise; and
3. to provide such additional assistance as the Public Utilities Board may reasonably require to determine an issue.

Energy Futures Group's retainer letter also specifies that Mr. Neme's and Mr. Grevatt's duties in giving evidence is to help the Public Utilities Board. This duty overrides any obligation to CAC Manitoba. By signing the letter of retainer, Mr. Neme confirmed that EFG, including both Mr. Neme and Mr. Grevatt, will comply with this duty.

APPENDIX B

Professional Summary

Jim Grevatt has 25+ years of experience in energy efficiency program planning and operations. At Energy Futures Group Jim has advised regulators, program implementers, and advocates in Florida, Louisiana, West Virginia, Colorado, Nevada, British Columbia, Maryland, Pennsylvania, Delaware, Virginia, New Jersey, Illinois, Iowa, Mississippi, North Carolina, California, Vermont, Maine, Kentucky, and New Hampshire, and has provided expert witness testimony in eleven of those jurisdictions. Jim has hands-on experience with industry-leading markets-based approaches to designing and managing energy efficiency programs and was on the leadership team for the new business startup of the District of Columbia Sustainable Energy Utility. His program management experience includes multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. His in-depth knowledge of the nuts and bolts of program operations and clear understanding of strategic thinking and planning ensure that programs achieve their desired market impacts. Throughout his career, Jim has focused on building strong relationships with staff, peers, trade allies, regulators, and clients as the best way to understand the needs and challenges that each sector faces. In past leadership roles at Efficiency Vermont, the DCSEU, and Vermont Gas, Jim had overall responsibility both for program design and operations. He was responsible for finding successful consensus approaches among diverse groups of partners and stakeholders, and for policy interactions with regulators, assuring that program processes were efficient and effective.

Experience

2013-present: Managing Consultant, Energy Futures Group, Hinesburg, VT

2012-2013: Director, Targeted Implementation, Vermont Energy Investment Corp., Burlington, VT

2011-2012: Director, Residential Energy Services, District of Columbia Sustainable Energy Utility
for Vermont Energy Investment Corp., Washington, D.C. and Burlington, VT

2010-2012: Managing Consultant, Vermont Energy Investment Corporation, Burlington, VT

2005-2010: Director, Residential Services, Vermont Energy Investment Corp., Burlington, VT

2001-2005: Manager, Energy Services, Vermont Gas Systems, S. Burlington, VT

1998-2001: Manager, Residential Energy Services, Vermont Gas Systems, S. Burlington, VT

1996-1998: Manager, HomeBase Retrofit Program, Vermont Gas Systems, S. Burlington, VT

1994-1996: Technical Specialist, Vermont Gas Systems, S. Burlington, VT

1991-1994: Associate Director and Technical Specialist, Champlain Valley Weatherization Program, Burlington, VT

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Education

B.F.A., University Honors, University of Illinois, 1982

Selected Projects

- **Southern Alliance for Clean Energy and Earthjustice.** Provided expert witness testimony in the Florida Energy Efficiency and Conservation Act goal setting proceeding. (2019)
- **Natural Resources Defense Council and Earthjustice.** Provided expert witness testimony in Virginia Electric and Power Company's Application to implement demand-side management programs. (2019)
- **Energy Efficient West Virginia, West Virginia Citizen Action Group, and Earthjustice.** Provided expert witness testimony in Appalachian Power Company and Wheeling Power Company's Petition regarding EE/DR program approvals. (2019)
- **Alliance for Affordable Energy and Natural Resources Defense Council.** Provided expert technical support for Louisiana Public Service Commission EE Rulemaking and Entergy New Orleans DSM Plan. (2019)
- **Natural Resources Defense Council and Sierra Club.** Provided expert witness testimony in Public Service Company of Colorado's Strategic Issues and 2019-2020 DSM Plan proceedings. (2017-2019)
- **Natural Resources Defense Council and Sierra Club.** Provided expert witness testimony in Nevada Energy Company's 2019-2038 Triennial Integrated Resource Plan and 2019-2021 Energy Supply Plan and participate in stakeholder collaboratives. (2018-2019)
- **Environmental Law & Policy Center and Iowa Environmental Council.** Provided expert witness testimony in DSM proceedings regarding MidAmerican Energy Company's and Interstate Power and Light's 2019-2023 Energy Efficiency Plans. (2018)
- **Pueblo County Colorado.** Provided expert witness testimony in DSM proceedings regarding Black Hills Energy Company's 2019-2021 DSM Plan. (2018)
- **Sierra Club.** Provided expert witness testimony in proceedings regarding Kentucky Power Company's DSM programs and cost-effectiveness. (2017-2018)
- **California Alternative Energy and Advance Transportation Financing Authority.** Provide technical assistance on development of commercial energy efficiency financing pilot. (2017-2019)
- **Coalition of Maryland Energy Efficiency Advocates.** Prepared written comments and multiple appearances before the Commission to present evidence regarding Maryland utilities' 2015-2017 and 2018-2020 EmPOWER Maryland energy efficiency plans, and in additional proceedings related to utility goal-setting, cost-effectiveness testing, best-practices in low-income programs, and energy efficiency financing. (2014-2019)
- **Sierra Club of British Columbia and British Columbia Sustainable Energy Association.** Provided expert witness testimony in DSM proceedings with Fortis BC and BC Hydro. (2017-2018)
- **New Jersey Clean Energy Program.** Planning Team Lead for F2018-F2022 Strategic Plan Facilitated focus groups, worked with Board of Public Utilities Staff, program administrators, utility companies,

and other stakeholders to identify opportunities to improve NJCEP strategic direction and increase benefits for ratepayers. Lead author drafting strategic plan. (2015-2019)

- **Energy Efficiency for All.** Expert technical support for affordable multifamily energy efficiency advocacy in Pennsylvania and Virginia Worked with a coalition of energy efficiency and affordable housing advocates to shape advocacy efforts with utilities and regulators. (2015-2019)
- **Southern Environmental Law Center.** Provided expert witness testimony in DSM proceedings with Duke Energy Progress and Dominion Virginia, as well as technical support for SELC staff regarding pre-pay programs and other policy issues. (2015-2019)
- **Regulatory Assistance Project.** Researched and co-authored with Chris Neme: The Next Quantum Leap in Efficiency: 30 Percent Electric Savings in Ten Years, addressing program and policy questions related to doubling the best efficiency program results. (2016)
- **Natural Resources Defense Council.** Provided expert witness testimony in support of NRDC's intervention in Ameren Illinois' 2014-2016 energy efficiency plan. Testimony demonstrated that Ameren would be capable of capturing significantly greater efficiency savings than it had proposed. (2013)
- **Regulatory Assistance Project.** Expert technical support for DSM in China Worked with various government agencies and grid companies, as well as advocacy organizations to provide technical support related to advancing DSM and energy efficiency in China. (2015)
- **Vermont Public Service Department.** Evaluation of Clean Energy Development Fund Conducted interviews of staff and key stakeholders under contract to NMR and prepared memo outlining process findings and recommendations. (2014-2015)
- **Evaluation of Efficiency Maine Low-Income Multi-Family Weatherization Program.** Responsible for program staff and building owner interviews and process evaluation under contract to NMR and Efficiency Maine. (2014-2015)
- **Northeast Energy Efficiency Partnerships.** Researched and co-authored meta-study of the use of energy efficiency to defer T&D investments. (2014)
- **Northeast Energy Efficiency Partnerships-** Researched and co-authored meta-study of ductless heat pump performance and market acceptance. (2014)
- **New Hampshire Electric Co-op.** Conducted assessment of the co-op's environmental and social responsibility programs' promotion of whole building efficiency retrofits, cold climate heat pumps and renewable energy systems. Presented recommendations to the co-op Board. (2014)
- **High Meadows Fund.** Co-authored a study assessing the market viability of "High Performance Homes" in Vermont. (2014)
- **Energy Savings Potential Study, Delaware Department of Natural Resources.** Led narrative development for the residential programs for a study of the energy efficiency savings potential in Delaware. (2013-2014)
- **Regulatory Assistance Project.** Provide technical support to energy efficiency advocates in proceedings in Maryland, Mississippi, and Missouri. (2013-2017)
- **Better Buildings Solutions Center, U. S. Department of Energy.** Energy Futures Group's lead author in drafting and reviewing web content for ten how-to "handbooks" detailing proven approaches to designing and implementing residential retrofit efficiency programs. (2013-2014)

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- **Utility Program Benchmarking.** Led research on behalf of a large IOU to compare the cost of saved energy across ~10 leading utility portfolios. The research sought to determine if there are discernable differences in the cost of saved energy related to utility spending in specific non-incentive categories, including administration, marketing, and EM&V. (2013)
- **Research on trends in multi-family, HVAC, and new construction programs.** Developed an analysis of emerging program trends on behalf of a leading energy efficiency industry firm. (2013-2014)
- **Efficiency Power Plant, Regulatory Assistance Project.** Partnered with RAP to develop a demonstration tool to show how energy efficiency measures can be used to mitigate air quality impacts related to power production. (2013)
- **Natural Gas Energy Efficiency Analysis, the Green Energy Coalition.** Provided analytical support to demonstrate in testimony that Enbridge Gas could reduce the scale of its proposed pipeline expansion by implementing aggressive energy efficiency programs. (2013)
- **Targeted Implementation, VEIC.** Responsible for market analysis and strategic planning for a new division expanding VEIC's energy efficiency program implementation projects. (2012-2013)
- **DC Sustainable Energy Utility.** Led the planning and startup implementation of Residential programs for the DC SEU, including single and multi-family and retail market programs. Led the development of the initial portfolio-level Annual Plan. Led client and partner interactions around planning and policy development. Member of DC SEU Senior Management Team. (2011-2012)
- **EmPOWER Maryland Critical Program Review.** Expert consultant to the Maryland Office of Peoples' Counsel in EmPOWER Maryland hearings regarding utility energy efficiency planning and reporting. Represented the OPC in stakeholder meetings that informed the current 2012-2014 EmPOWER plans. Multiple appearances before the Maryland Public Service Commission. (2010-2012)
- **Efficiency Vermont 20 year Forecast of Efficiency Potential.** Senior Advisor in developing the forecast scenarios that led to significantly increased efficiency investment in Vermont. (2010-2011)
- **Efficiency Vermont Residential Programs.** Directed 100% growth in program budgets to nearly \$10M annually. Responsible for strategic direction, leadership, and results for Efficiency Vermont's award-winning residential retrofit, new construction, retail, and low-income programs. Supported excellence in a staff of 30. (2005-2010)
- **Vermont Gas Systems Efficiency Program Leader.** Directed strategic planning and program operations that led to six programs and portfolio as a whole being recognized as exemplary in Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs (ACEEE, 2003). Built contractor infrastructure and internal support to consistently meet program objectives. Led development of Annual Reports, planning and budgeting. Collaborated with Efficiency Vermont staff to develop a fuel-blind, state-wide, jointly offered residential new construction program. (2001-2005)
- **Residential Retrofit Program Development.** Enhanced design and performance of VGS' residential retrofit offerings by streamlining delivery and building strong relationships with contractors, homeowners, and property managers. (1994-2005)

- **Demonstrated Technical Excellence in Approaches to Residential Retrofits.** Conducted hundreds of residential energy audits and quality assurance inspections for natural gas and alternative-fueled homes. Trained and coached installers to obtain desired quality. Worked to satisfy homeowners through explanation, education, sound listening to concerns, and ultimately assuring that concerns were addressed. Trained new staff in auditing techniques. (1991-1998)

Selected Presentations

Keys to the House: Unlocking Residential Savings with Program Models for Home Energy Upgrades- ACEEE 2016 Summer Study on Energy Efficiency in Buildings, August, 2016

Home Upgrade Program Design & Implementation Models for Acquiring Savings in Multiple Climate Zones- 2016 National Home Performance Conference, April, 2016

EERS Advancements in Maryland: EmPOWER After 2015- Presentation at ACEEE Energy Efficiency as a Resource Conference, September, 2015

Leveling the Playing Field for Distributed Energy Resources- Panelist discussing the use of energy efficiency to defer T&D investments, Acadia Center forum on Envisioning Our Energy Future, February, 2015

Residential Retrofit Programs: What's Working? Perspectives from National Program Leaders- Panelist at AESP National Conference 2012

Elements of Retrofit Program Incentive Design- DOE Technical Assistance Program Publication, April, 2011

Designing Effective Incentives to Drive Residential Retrofit Participation- DOE Technical Assistance Program Webinar, October, 2010

Quality Assurance for Residential Retrofit Programs- DOE Technical Assistance Program Webinar, October, 2010

Home Performance with ENERGY STAR, Quality Assurance in Vermont- Panelist at the ACI Home Energy Retrofit Summit, April 2010

Delivering on the Promise-Engaging Communities and the Public- Panelist at 2010 NEEP Summit, March, 2010

Home Performance with Energy Star in Vermont - Presentation at CEE Member meeting, June 2009

Leading by Example: Exemplary Low Income Energy Efficiency Programs –Presented on Efficiency Vermont’s Residential low income services at California’s Low Income Energy Efficiency Symposium, June 2006

“Natural Gas Efficiency Policies, Responding to the Natural Gas Crisis One Therm at a Time” - Co-presented with Dan York and Anna Monis Shipley of American Council for an Energy-Efficient Economy (ACEEE) -ACEEE/CEE Market Transformation Symposium, 2004

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APPENDIX C

Requested workpapers in electronic, executable Excel format with formulas intact:

- For each program table listed below, provide a listing of the measures that result in the projected savings, by year, including:
 - Assumed quantity of each measure
 - Assumed gross and net savings of each measure
 - Assumed estimated useful life of each measure
 - Assumed program incentive cost of each measure
 - Assumed customer cost of each measure
 - TABLE A4.2 DIRECT INSTALL ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
 - TABLE A4.4 PRODUCT REBATE ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
 - TABLE A4.6 HOME RENOVATION ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
 - TABLE A4.8 NEW HOME & MAJOR RENOVATION ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
 - TABLE A4.10 HOME ENERGY KITS & EDUCATION ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
 - TABLE A5.1 INCOME QUALIFIED ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
 - TABLE A6.2 INSULATION & DIRECT INSTALL OFFER ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
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 - TABLE A7.2 SMALL BUSINESS & APPLIANCE OFFERS ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
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 - TABLE A7.12 CUSTOM OFFERS ENERGY & GREENHOUSE GAS EMISSIONS SAVINGS SUMMARY
- The data that support Figure A3.2 ELECTRIC ENERGY SAVING SUMMARY – ANNUAL PROGRAM BUNDLE SAVINGS BY CUSTOMER SEGMENT

- The data that support Figure A3.4 NATURAL GAS SAVINGS SUMMARY – ANNUAL PROGRAM BUNDLE SAVINGS BY CUSTOMER SEGMENT
- The data that support Figure A3.5 ELECTRIC BUDGET SUMMARY – ANNUAL PROGRAM BUNDLE BUDGET BY CUSTOMER SEGMENT
- The data that support Figure A3.6 NATURAL GAS BUDGET SUMMARY – ANNUAL PROGRAM BUNDLE BUDGET BY CUSTOMER SEGMENT
- Attachment 3 — Technical Tables — all
- Attachment 4 — Consultant Memos
 - Comparing Efficiency Manitoba’s Cost of Savings
 - Data that support the following figures:
 - Figure 1: First-year acquisition costs vs DSM targets
 - Figure 2 Electricity program savings vs acquisition costs for US States and Efficiency Manitoba
 - Figure 3 Natural gas program savings vs acquisition costs for US States and Efficiency Manitoba
 - Figure 4 Gas program savings acquisition costs, by US State
 - Figure 5 Electricity program savings acquisition costs, by US State

APPENDIX D



Massachusetts Technical Reference Manual

for Estimating Savings from Energy Efficiency Measures

2016-2018 Program Years – Plan Version

October 2015



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APPENDIX E

Executive Summary: Electric DSM Tables

The following tables summarize the forecasted impacts of the Company’s proposed electric DSM portfolio for 2019 and 2020, including anticipated expenditures, energy savings, demand response, costs by budget category, and Modified Total Resource Cost (MTRC) test ratios.

Table 4a: Public Service’s 2019 Electric DSM Budgets and Targets

2019	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Business Program				
Commercial Refrigeration Efficiency	\$673,311	514	2,904,334	1.38
Compressed Air Efficiency	\$552,960	566	3,566,851	1.49
Cooling	\$4,215,311	4,645	8,286,620	1.17
Custom Efficiency	\$738,279	300	2,797,968	1.12
Data Center Efficiency	\$1,091,167	637	6,410,828	1.35
Energy Management Systems	\$565,759	36	4,986,861	0.90
Heating Efficiency	\$16,180	7	98,026	1.96
LED Street Lighting	\$43,000	0	2,658,138	0.55
Lighting Efficiency	\$14,418,016	21,476	170,981,005	1.45
Lighting - Small Business	\$6,244,206	5,409	35,272,551	1.12
Motor & Drive Efficiency	\$1,879,498	1,624	9,175,413	1.39
Multifamily Buildings	\$1,436,441	902	7,548,698	1.22
New Construction	\$11,511,392	11,436	39,338,167	1.21
Recommissioning	\$371,394	311	2,659,770	0.84
Self Direct	\$632,733	769	5,053,868	1.64
Strategic Energy Management	\$2,865,001	2,006	14,974,245	1.60
General Advertising-Bus	\$810,064	0	0	
Business Program Total	\$48,064,711	50,636	316,713,344	1.31
Residential Program				
Energy Efficient Showerhead	\$37,727	86	1,011,152	13.36
Energy Feedback Residential	\$2,990,084	4,511	20,380,784	1.11
ENERGY STAR New Homes	\$1,038,889	924	2,767,019	0.93
Evaporative Cooling	\$3,158,848	4,849	3,168,467	3.54
High Efficiency Air Conditioning	\$2,104,735	1,819	1,347,137	1.19
Home Energy Squad	\$448,214	275	1,597,985	0.93
Home Lighting & Recycling	\$5,621,245	18,508	131,356,183	3.24
Home Performance with ENERGY STAR	\$289,957	405	210,613	0.96
Insulation & Air Sealing	\$179,412	385	423,150	1.10
Refrigerator & Freezer Recycling	\$1,232,233	542	3,909,851	1.02
Residential Heating	\$841,100	1,056	5,769,742	1.24
School Education Kits	\$1,455,629	1,052	8,325,738	1.25
Water Heating	\$33,610	33	221,307	1.51
Thermostat Optimization	\$261,695	1,653	1,352,112	1.67
General Advertising-Res	\$575,496	0	0	
Residential Program Total	\$20,268,875	36,097	181,841,242	2.13

Table 4a: Public Service’s 2019 Electric DSM Budgets and Targets (cont’d)

2019	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Low-Income Program				
Energy Savings Kit	\$273,489	241	2,214,873	3.10
Multifamily Weatherization	\$1,081,511	407	1,889,123	0.89
Non-Profit	\$1,119,608	383	1,701,178	0.99
Single-Family Weatherization	\$1,439,268	226	1,775,444	0.70
Low-Income Program Total	\$3,913,875	1,257	7,580,618	0.98
Indirect Products & Services				
Education/Market Transformation				
Business Education	\$176,739			
Business Energy Analysis	\$760,350			
Consumer Education	\$899,908			
Energy Benchmarking	\$94,407			
Energy Efficiency Financing	\$60,000			
ENERGY STAR Retail Products Platform	\$509,271			
Home Energy Audit	\$444,675			
Partners in Energy	\$799,000			
Education/Market Transformation Total	\$3,744,350			
Planning and Research				
EE Market Research	\$350,791			
EE Measurement & Verification	\$12,000			
EE Planning & Administration	\$522,162			
EE Program Evaluations	\$404,005			
EE Product Development	\$1,840,082			
Geo-targeting Pilot - EE	\$14,116	-	-	0.81
EE Product Development Total	\$1,854,198	-	-	
EE Planning and Research Total	\$3,143,157	-	-	
EE Indirect Products & Services Total	\$6,887,507	-	-	
EE PORTFOLIO TOTAL	\$79,134,969	87,989	506,135,204	1.39

Table 4a: Public Service’s 2019 Electric DSM Budgets and Targets (cont’d)

2019	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Demand Response Program				
Critical Peak Pricing Pilot	\$58,400	5,588	0	
Geo-targeting Pilot - DR	\$78,189	1,195	0	12.37
Peak Partner Rewards	\$1,725,420	12,000	0	
Residential Battery Demand Response	\$323,500	389	-16,752	1.55
Residential Demand Response	\$13,133,000	14,517	53,834	1.83
DR Program Total	\$15,318,509	33,689	37,082	1.75
Planning and Research				
DR Planning & Administration	\$58,018	0	0	
DR Program Evaluations	\$315,573	0	0	
DR Product Development	\$1,384,082	0	0	
DR Planning and Research Total	\$1,757,673	0	0	
DR PORTFOLIO TOTAL	\$17,076,182	33,689	37,082	1.57
PORTFOLIO TOTAL	\$96,211,151	121,684	506,172,286	1.40

Table 4b: Public Service's 2019 Electric DSM Costs by Category

2019	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/ Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Business Program							
Commercial Refrigeration Efficiency	\$ -	\$ 427,477	\$ 9,100	\$ 209,734	\$ -	\$ 27,000	\$ 673,311
Compressed Air Efficiency	\$ -	\$ 166,222	\$ 1,750	\$ 381,988	\$ -	\$ 3,000	\$ 552,960
Cooling	\$ -	\$ 2,296,304	\$ -	\$ 1,907,007	\$ -	\$ 12,000	\$ 4,215,311
Custom Efficiency	\$ -	\$ 597,304	\$ 600	\$ 136,375	\$ -	\$ 4,000	\$ 738,279
Data Center Efficiency	\$ -	\$ 207,050	\$ 44,000	\$ 818,117	\$ -	\$ 22,000	\$ 1,091,167
Energy Management Systems	\$ -	\$ 202,059	\$ 20,000	\$ 323,937	\$ -	\$ 19,764	\$ 565,759
Heating Efficiency	\$ -	\$ 10,035	\$ -	\$ 6,145	\$ -	\$ -	\$ 16,180
LED Street Lighting	\$ -	\$ -	\$ 43,000	\$ -	\$ -	\$ -	\$ 43,000
Lighting Efficiency	\$ -	\$ 2,712,702	\$ 542,065	\$ 11,108,249	\$ -	\$ 55,000	\$ 14,418,016
Lighting - Small Business	\$ -	\$ 3,079,849	\$ 18,553	\$ 3,118,304	\$ -	\$ 27,500	\$ 6,244,206
Motor & Drive Efficiency	\$ -	\$ 384,181	\$ 16,250	\$ 1,470,067	\$ -	\$ 9,000	\$ 1,879,498
Multifamily Buildings	\$ -	\$ 344,974	\$ -	\$ 1,091,467	\$ -	\$ -	\$ 1,436,441
New Construction	\$ -	\$ 2,991,157	\$ 18,650	\$ 8,071,508	\$ -	\$ 430,077	\$ 11,511,392
Recommissioning	\$ -	\$ 182,950	\$ 11,000	\$ 177,444	\$ -	\$ -	\$ 371,394
Self Direct	\$ -	\$ 130,550	\$ 1,500	\$ 500,683	\$ -	\$ -	\$ 632,733
Strategic Energy Management	\$ -	\$ 1,328,710	\$ 61,397	\$ 1,420,813	\$ -	\$ 54,080	\$ 2,865,001
General Advertising-Bus	\$ -	\$ -	\$ 810,064	\$ -	\$ -	\$ -	\$ 810,064
Business Program Total	\$ -	\$ 15,061,524	\$ 1,597,931	\$ 30,741,836	\$ -	\$ 663,421	\$ 48,064,711
Residential Program							
Energy Efficient Showerhead	\$ -	\$ 20,065	\$ 4,600	\$ 13,062	\$ -	\$ -	\$ 37,727
Energy Feedback Residential	\$ -	\$ 2,990,084	\$ -	\$ -	\$ -	\$ -	\$ 2,990,084
ENERGY STAR New Homes	\$ -	\$ 197,478	\$ 30,861	\$ 587,314	\$ -	\$ 223,236	\$ 1,038,889
Evaporative Cooling	\$ -	\$ 829,444	\$ 179,373	\$ 2,125,031	\$ -	\$ 25,000	\$ 3,158,848
High Efficiency Air Conditioning	\$ -	\$ 330,525	\$ 55,000	\$ 1,671,210	\$ -	\$ 48,000	\$ 2,104,735
Home Energy Squad	\$ -	\$ 70,145	\$ 49,424	\$ 114,227	\$ 211,918	\$ 2,500	\$ 448,214
Home Lighting & Recycling	\$ -	\$ 947,283	\$ 643,506	\$ 4,025,457	\$ -	\$ 5,000	\$ 5,621,245
Home Performance with ENERGY STAR	\$ -	\$ 156,782	\$ -	\$ 103,175	\$ -	\$ 30,000	\$ 289,957
Insulation & Air Sealing	\$ -	\$ 21,189	\$ 405	\$ 142,636	\$ -	\$ 15,182	\$ 179,412
Refrigerator & Freezer Recycling	\$ -	\$ 666,886	\$ 205,347	\$ 350,000	\$ -	\$ 10,000	\$ 1,232,233
Residential Heating	\$ -	\$ 77,500	\$ 26,000	\$ 730,100	\$ -	\$ 7,500	\$ 841,100
School Education Kits	\$ -	\$ 513,665	\$ 5,832	\$ 936,132	\$ -	\$ -	\$ 1,455,629
Water Heating	\$ -	\$ 5,010	\$ -	\$ 23,600	\$ -	\$ 5,000	\$ 33,610
Thermostat Optimization	\$ -	\$ 77,994	\$ -	\$ 177,327	\$ -	\$ 6,374	\$ 261,695
General Advertising-Res	\$ -	\$ -	\$ 575,496	\$ -	\$ -	\$ -	\$ 575,496
Residential Program Total	\$ -	\$ 6,904,051	\$ 1,775,845	\$ 10,999,270	\$ 211,918	\$ 377,792	\$ 20,268,875
2017							
Low-Income Program							
Energy Savings Kit	\$ -	\$ 84,022	\$ 48,379	\$ 136,588	\$ -	\$ 4,500	\$ 273,489
Multifamily Weatherization	\$ -	\$ 169,785	\$ 10,851	\$ 885,524	\$ -	\$ 15,351	\$ 1,081,511
Non-Profit	\$ -	\$ 212,162	\$ 3,274	\$ 876,346	\$ -	\$ 27,825	\$ 1,119,608
Single-Family Weatherization	\$ -	\$ 160,186	\$ 165,000	\$ 994,420	\$ -	\$ 119,662	\$ 1,439,268
Low-Income Program Total	\$ -	\$ 626,155	\$ 227,504	\$ 2,892,878	\$ -	\$ 167,338	\$ 3,913,875

Table 4b: Public Service's 2019 Electric DSM Costs by Category

2019	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/ Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Indirect Products & Services							
Education/Market Transformation							
Business Education	\$ -	\$ -	\$ 176,739	\$ -	\$ -	\$ -	\$ 176,739
Business Energy Analysis	\$ -	\$ 109,350	\$ 249,000	\$ 402,000	\$ -	\$ -	\$ 760,350
Consumer Education	\$ -	\$ 389,381	\$ 510,527	\$ -	\$ -	\$ -	\$ 899,908
Energy Benchmarking	\$ -	\$ 94,407	\$ -	\$ -	\$ -	\$ -	\$ 94,407
Energy Efficiency Financing	\$ -	\$ 33,000	\$ 17,000	\$ 10,000	\$ -	\$ -	\$ 60,000
ENERGY STAR Retail Products Platform	\$ -	\$ 498,384	\$ -	\$ -	\$ -	\$ 10,887	\$ 509,271
Home Energy Audit	\$ -	\$ 193,265	\$ 17,014	\$ 196,992	\$ -	\$ 37,404	\$ 444,675
Partners in Energy	\$ -	\$ 719,000	\$ 10,000	\$ -	\$ -	\$ 70,000	\$ 799,000
Education/Market Transformation	\$ -	\$ 2,036,787	\$ 980,280	\$ 608,992	\$ -	\$ 118,291	\$ 3,744,350
Planning and Research							
EE Market Research	\$ -	\$ 350,791	\$ -	\$ -	\$ -	\$ -	\$ 350,791
EE Measurement & Verification	\$ -	\$ 12,000	\$ -	\$ -	\$ -	\$ -	\$ 12,000
EE Planning & Administration	\$ -	\$ 522,162	\$ -	\$ -	\$ -	\$ -	\$ 522,162
EE Program Evaluations	\$ -	\$ 32,005	\$ -	\$ -	\$ -	\$ 372,000	\$ 404,005
EE Product Development	\$ -	\$ 1,840,082	\$ -	\$ -	\$ -	\$ -	\$ 1,840,082
Geo-targeting Pilot - EE	\$ -	\$ 7,458	\$ -	\$ 6,658	\$ -	\$ -	\$ 14,116
EE Product Development Total	\$ -	\$ 1,847,540	\$ -	\$ 6,658	\$ -	\$ -	\$ 1,854,198
EE Planning and Research Total	\$ -	\$ 2,764,498	\$ -	\$ 6,658	\$ -	\$ 372,000	\$ 3,143,157
EE Indirect Products & Services Total	\$ -	\$ 4,801,286	\$ 980,280	\$ 615,650	\$ -	\$ 490,291	\$ 6,887,507
EE PORTFOLIO TOTAL	\$ -	\$ 27,393,016	\$ 4,581,559	\$ 45,249,635	\$ 211,918	\$ 1,698,841	\$ 79,134,969
Demand Response Program							
Critical Peak Pricing Pilot	\$ -	\$ 21,200	\$ 5,000	\$ -	\$ 7,200	\$ 25,000	\$ 58,400
Geo-targeting Pilot - DR	\$ -	\$ 67,542	\$ -	\$ 10,647	\$ -	\$ -	\$ 78,189
Peak Partner Rewards	\$ -	\$ 253,420	\$ 142,000	\$ 1,330,000	\$ -	\$ -	\$ 1,725,420
Residential Battery Demand Response	\$ -	\$ 177,500	\$ 5,250	\$ 133,750	\$ -	\$ 7,000	\$ 323,500
Residential Demand Response	\$ -	\$ 3,314,000	\$ 1,150,000	\$ 8,569,000	\$ -	\$ 100,000	\$13,133,000
DR Program Total	\$ -	\$ 3,833,662	\$ 1,302,250	\$ 10,043,397	\$ 7,200	\$ 132,000	\$ 15,318,509
Planning and Research							
DR Planning & Administration	\$ -	\$ 58,018	\$ -	\$ -	\$ -	\$ -	\$ 58,018
DR Program Evaluations	\$ -	\$ 15,573	\$ -	\$ -	\$ -	\$ 300,000	\$ 315,573
DR Product Development	\$ -	\$ 1,384,082	\$ -	\$ -	\$ -	\$ -	\$ 1,384,082
DR Planning and Research Total	\$ -	\$ 1,457,673	\$ -	\$ -	\$ -	\$ 300,000	\$ 1,757,673
DR PORTFOLIO TOTAL	\$ -	\$ 5,291,335	\$ 1,302,250	\$ 10,043,397	\$ 7,200	\$ 432,000	\$ 17,076,182
PORTFOLIO TOTAL	\$ -	\$ 32,684,350	\$ 5,883,809	\$ 55,293,032	\$ 219,118	\$ 2,130,841	\$ 96,211,151

Table 4c: Public Service’s 2020 Electric DSM Budgets and Targets

2020	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Business Program				
Commercial Refrigeration Efficiency	\$673,041	514	2,904,334	1.44
Compressed Air Efficiency	\$599,343	597	3,748,646	1.54
Cooling	\$3,885,899	4,805	9,160,334	1.29
Custom Efficiency	\$757,761	343	3,197,678	1.22
Data Center Efficiency	\$1,139,232	720	7,239,860	1.45
Energy Management Systems	\$532,829	72	4,582,521	0.94
Heating Efficiency	\$16,297	7	103,747	2.15
LED Street Lighting	\$43,000	0	2,658,138	0.58
Lighting Efficiency	\$16,899,462	27,788	202,483,550	1.64
Lighting - Small Business	\$5,771,300	5,066	31,775,428	1.18
Motor & Drive Efficiency	\$1,879,498	1,624	9,175,413	1.44
Multifamily Buildings	\$1,531,170	956	7,964,023	1.24
New Construction	\$12,733,572	12,721	43,897,225	1.22
Recommissioning	\$375,509	373	2,649,638	0.92
Self Direct	\$639,733	769	5,053,868	1.70
Strategic Energy Management	\$2,836,229	2,215	18,140,019	1.86
General Advertising-Bus	\$809,147	0	0	
Business Program Total	\$51,123,020	58,569	354,734,424	1.43
Residential Program				
Energy Efficient Showerhead	\$38,017	86	1,011,152	13.46
Energy Feedback Residential	\$2,990,084	4,425	19,543,257	1.12
ENERGY STAR New Homes	\$956,678	808	2,626,700	0.92
Evaporative Cooling	\$3,376,218	5,303	3,465,795	3.67
High Efficiency Air Conditioning	\$2,912,986	2,704	1,942,297	1.23
Home Energy Squad	\$535,511	314	1,826,658	0.85
Home Lighting & Recycling	\$4,618,414	14,006	99,404,496	2.88
Home Performance with ENERGY STAR	\$289,378	405	205,341	0.97
Insulation & Air Sealing	\$179,412	385	423,150	1.11
Refrigerator & Freezer Recycling	\$1,249,390	628	3,948,618	1.07
Residential Heating	\$18,300	0	0	-
School Education Kits	\$1,499,118	1,052	8,325,738	1.16
Water Heating	\$33,760	33	221,307	1.56
Thermostat Optimization	\$334,751	2,282	1,955,134	1.72
General Advertising-Res	\$515,496	0	0	
Residential Program Total	\$19,547,514	32,431	144,899,644	2.02

Table 4c: Public Service’s 2020 Electric DSM Budgets and Targets (cont’d)

2020	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Low-Income Program				
Energy Savings Kit	\$264,383	225	2,067,215	2.98
Multifamily Weatherization	\$1,081,511	407	1,889,123	0.90
Non-Profit	\$1,119,608	383	1,701,178	1.02
Single-Family Weatherization	\$1,429,718	226	1,775,444	0.71
Low-Income Program Total	\$3,895,220	1,241	7,432,960	0.99
Indirect Products & Services				
Education/Market Transformation				
Business Education	\$176,739	-	-	
Business Energy Analysis	\$760,350	-	-	
Consumer Education	\$899,908	-	-	
Energy Benchmarking	\$97,240	-	-	
Energy Efficiency Financing	\$60,000	-	-	
ENERGY STAR Retail Products Platform	\$509,271	-	-	
Home Energy Audit	\$444,675	-	-	
Partners in Energy	\$836,000	-	-	
Education/Market Transformation Total	\$3,784,183	-	-	
Planning and Research				
EE Market Research	\$382,134			
EE Measurement & Verification	\$12,000			
EE Planning & Administration	\$522,162			
EE Program Evaluations	\$378,737			
EE Product Development	\$1,854,964			
Geo-targeting Pilot - EE	\$75,544	-	-	0.93
EE Product Development Total	\$1,930,508	-	-	
EE Planning and Research Total	\$3,225,541	-	-	
EE Indirect Products & Services Total	\$7,009,724	-	-	
EE PORTFOLIO TOTAL	\$81,178,666	92,241	507,067,028	1.45

Table 4c: Public Service’s 2020 Electric DSM Budgets and Targets (cont’d)

2020	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Demand Response Program				
Critical Peak Pricing Pilot	\$66,000	5,588	0	
Geo-targeting Pilot - DR	\$309,067	387	0	0.83
Peak Partner Rewards	\$1,725,420	20,000	0	
Residential Battery Demand Response	\$365,500	389	-16,752	1.51
Residential Demand Response	\$13,339,940	14,517	53,834	1.83
DR Program Total	\$15,805,927	40,881	37,082	1.68
Planning and Research				
DR Planning & Administration	\$58,018	0	0	
DR Program Evaluations	\$206,937	0	0	
DR Product Development	\$1,854,964	0	0	
DR Planning and Research Total	\$2,119,919	0	0	
DR PORTFOLIO TOTAL	\$17,925,847	40,881	37,082	1.49
PORTFOLIO TOTAL	\$99,501,325	133,188	507,104,110	1.46

Table 4d: Public Service's 2020 Electric DSM Costs by Category

2020	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/ Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Business Program							
Commercial Refrigeration Efficiency	\$ -	\$ 427,207	\$ 9,100	\$ 209,734	\$ -	\$ 27,000	\$ 673,041
Compressed Air Efficiency	\$ -	\$ 192,472	\$ 1,500	\$ 402,371	\$ -	\$ 3,000	\$ 599,343
Cooling	\$ -	\$ 2,085,300	\$ -	\$ 1,796,599	\$ -	\$ 4,000	\$ 3,885,899
Custom Efficiency	\$ -	\$ 597,304	\$ 600	\$ 155,857	\$ -	\$ 4,000	\$ 757,761
Data Center Efficiency	\$ -	\$ 217,050	\$ 41,500	\$ 858,682	\$ -	\$ 22,000	\$ 1,139,232
Energy Management Systems	\$ -	\$ 205,723	\$ 20,000	\$ 287,342	\$ -	\$ 19,764	\$ 532,829
Heating Efficiency	\$ -	\$ 10,035	\$ -	\$ 6,262	\$ -	\$ -	\$ 16,297
LED Street Lighting	\$ -	\$ -	\$ 43,000	\$ -	\$ -	\$ -	\$ 43,000
Lighting Efficiency	\$ -	\$ 2,712,710	\$ 542,076	\$ 13,589,676	\$ -	\$ 55,000	\$ 16,899,462
Lighting - Small Business	\$ -	\$ 2,914,605	\$ 19,110	\$ 2,810,085	\$ -	\$ 27,500	\$ 5,771,300
Motor & Drive Efficiency	\$ -	\$ 384,181	\$ 16,250	\$ 1,470,067	\$ -	\$ 9,000	\$ 1,879,498
Multifamily Buildings	\$ -	\$ 344,974	\$ -	\$ 1,186,196	\$ -	\$ -	\$ 1,531,170
New Construction	\$ -	\$ 3,264,022	\$ 5,632	\$ 9,033,840	\$ -	\$ 430,077	\$ 12,733,572
Recommissioning	\$ -	\$ 193,950	\$ 11,000	\$ 170,559	\$ -	\$ -	\$ 375,509
Self Direct	\$ -	\$ 137,550	\$ 1,500	\$ 500,683	\$ -	\$ -	\$ 639,733
Strategic Energy Management	\$ -	\$ 1,312,173	\$ 54,497	\$ 1,376,986	\$ -	\$ 92,574	\$ 2,836,229
General Advertising-Bus	\$ -	\$ -	\$ 809,147	\$ -	\$ -	\$ -	\$ 809,147
Business Program Total	\$ -	\$ 14,999,256	\$ 1,574,913	\$ 33,854,937	\$ -	\$ 693,915	\$ 51,123,020
Residential Program							
Energy Efficient Showerhead	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Energy Feedback Residential	\$ -	\$ 20,342	\$ 4,612	\$ 13,062	\$ -	\$ -	\$ 38,017
ENERGY STAR New Homes	\$ -	\$ 2,990,084	\$ -	\$ -	\$ -	\$ -	\$ 2,990,084
Evaporative Cooling	\$ -	\$ 197,478	\$ 30,861	\$ 531,707	\$ 242,192	\$ 196,632	\$ 956,678
High Efficiency Air Conditioning	\$ -	\$ 847,031	\$ 179,373	\$ 2,324,814	\$ -	\$ 25,000	\$ 3,376,218
Home Energy Squad	\$ -	\$ 430,963	\$ 45,000	\$ 2,382,023	\$ -	\$ 55,000	\$ 2,912,986
Home Lighting & Recycling	\$ -	\$ 110,567	\$ 49,707	\$ 130,545	\$ -	\$ 2,500	\$ 535,511
Home Performance with ENERGY STAR	\$ -	\$ 956,203	\$ 629,149	\$ 3,028,061	\$ -	\$ 5,000	\$ 4,618,414
Insulation & Air Sealing	\$ -	\$ 156,782	\$ -	\$ 102,596	\$ -	\$ 30,000	\$ 289,378
Refrigerator & Freezer Recycling	\$ -	\$ 21,189	\$ 405	\$ 142,636	\$ -	\$ 15,182	\$ 179,412
Residential Heating	\$ -	\$ 678,158	\$ 211,232	\$ 350,000	\$ -	\$ 10,000	\$ 1,249,390
School Education Kits	\$ -	\$ 6,000	\$ -	\$ 11,300	\$ -	\$ 1,000	\$ 18,300
Water Heating	\$ -	\$ 529,045	\$ 5,857	\$ 964,216	\$ -	\$ -	\$ 1,499,118
Thermostat Optimization	\$ -	\$ 5,160	\$ -	\$ 23,600	\$ 242,192	\$ 5,000	\$ 33,760
General Advertising-Res	\$ -	\$ 107,674	\$ -	\$ 220,703	\$ -	\$ 6,374	\$ 334,751
Residential Program Total	\$ -	\$ -	\$ 515,496	\$ -	\$ -	\$ -	\$ 515,496
2017	\$ -	\$ 7,056,678	\$ 1,671,692	\$ 10,225,263	\$ -	\$ 351,688	\$ 19,547,514
Low-Income Program							
Energy Savings Kit	\$ -	\$ 84,022	\$ 48,379	\$ 127,482	\$ -	\$ 4,500	\$ 264,383
Multifamily Weatherization	\$ -	\$ 169,785	\$ 10,851	\$ 885,524	\$ -	\$ 15,351	\$ 1,081,511
Non-Profit	\$ -	\$ 212,162	\$ 3,274	\$ 876,346	\$ -	\$ 27,825	\$ 1,119,608
Single-Family Weatherization	\$ -	\$ 150,636	\$ 165,000	\$ 994,420	\$ -	\$ 119,662	\$ 1,429,718
Low-Income Program Total	\$ -	\$ 616,605	\$ 227,504	\$ 2,883,772	\$ -	\$ 167,338	\$ 3,895,220

Table 4d: Public Service’s 2020 Electric DSM Costs by Category (cont’d)

2020	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/ Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Indirect Products & Services							
Education/Market Transformation							
Business Education	\$ -	\$ -	\$ 176,739	\$ -	\$ -	\$ -	\$ 176,739
Business Energy Analysis	\$ -	\$ 109,350	\$ 249,000	\$ 402,000	\$ -	\$ -	\$ 760,350
Consumer Education	\$ -	\$ 389,381	\$ 510,527	\$ -	\$ -	\$ -	\$ 899,908
Energy Benchmarking	\$ -	\$ 97,240	\$ -	\$ -	\$ -	\$ -	\$ 97,240
Energy Efficiency Financing	\$ -	\$ 33,000	\$ 17,000	\$ 10,000	\$ -	\$ -	\$ 60,000
ENERGY STAR Retail Products Platform	\$ -	\$ 498,384	\$ -	\$ -	\$ -	\$ 10,887	\$ 509,271
Home Energy Audit	\$ -	\$ 193,265	\$ 17,014	\$ 196,992	\$ -	\$ 37,404	\$ 444,675
Partners in Energy	\$ -	\$ 752,800	\$ 10,000	\$ -	\$ -	\$ 73,200	\$ 836,000
Education/Market Transformation	\$ -	\$ 2,073,420	\$ 980,280	\$ 608,992	\$ -	\$ 121,491	\$ 3,784,183
Planning and Research							
EE Market Research	\$ -	\$ 382,134	\$ -	\$ -	\$ -	\$ -	\$ 382,134
EE Measurement & Verification	\$ -	\$ 12,000	\$ -	\$ -	\$ -	\$ -	\$ 12,000
EE Planning & Administration	\$ -	\$ 522,162	\$ -	\$ -	\$ -	\$ -	\$ 522,162
EE Program Evaluations	\$ -	\$ 30,737	\$ -	\$ -	\$ -	\$ 348,000	\$ 378,737
EE Product Development	\$ -	\$ 1,854,964	\$ -	\$ -	\$ -	\$ -	\$ 1,854,964
Geo-targeting Pilot - EE	\$ -	\$ 14,749	\$ 30,213	\$ 13,317	\$ -	\$ 17,265	\$ 75,544
EE Product Development Total	\$ -	\$ 1,869,713	\$ 30,213	\$ 13,317	\$ -	\$ 17,265	\$ 1,930,508
EE Planning and Research Total	\$ -	\$ 2,816,746	\$ 30,213	\$ 13,317	\$ 242,192	\$ 365,265	\$ 3,225,541
EE Indirect Products & Services	\$ -	\$ 4,890,166	\$ 1,010,494	\$ 622,309	\$ -	\$ 486,756	\$ 7,009,724
EE PORTFOLIO TOTAL	\$ -	\$ 27,562,705	\$ 4,484,603	\$ 47,586,282	\$ 14,800	\$ 1,699,696	\$ 81,575,478
Demand Response Program							
Critical Peak Pricing Pilot	\$ -	\$ 21,200	\$ 5,000	\$ -	\$ -	\$ 25,000	\$ 66,000
Geo-targeting Pilot - DR	\$ -	\$ 60,251	\$ 144,787	\$ 21,294	\$ -	\$ 82,735	\$ 309,067
Peak Partner Rewards	\$ -	\$ 253,420	\$ 142,000	\$ 1,330,000	\$ 14,800	\$ -	\$ 1,725,420
Residential Battery Demand Response	\$ -	\$ 80,000	\$ 1,000	\$ 177,500	\$ -	\$ 107,000	\$ 365,500
Residential Demand Response	\$ -	\$ 3,395,940	\$ 1,150,000	\$ 8,694,000	\$ -	\$ 100,000	#####
DR Program Total	\$ -	\$ 3,810,811	\$ 1,442,787	\$ 10,222,794	\$ -	\$ 314,735	\$ 15,805,927
Planning and Research							
DR Planning & Administration	\$ -	\$ 58,018	\$ -	\$ -	\$ -	\$ -	\$ 58,018
DR Program Evaluations	\$ -	\$ 26,937	\$ -	\$ -	\$ -	\$ 180,000	\$ 206,937
DR Product Development	\$ -	\$ 1,854,964	\$ -	\$ -	\$ 14,800	\$ -	\$ 1,854,964
DR Planning and Research Total	\$ -	\$ 1,939,919	\$ -	\$ -	\$ -	\$ 180,000	\$ 2,119,919
DR PORTFOLIO TOTAL	\$ -	\$ 5,750,731	\$ 1,442,787	\$ 10,222,794	\$ -	\$ 494,735	\$ 17,925,847
PORTFOLIO TOTAL	\$ -	\$ 33,313,436	\$ 5,927,389	\$ 57,809,076	\$ -	\$ 2,194,432	\$ 99,501,325

APPENDIX F

DSM Participation

Decision No. C14-0731 in 2013 DSM Strategic Issues (Proceeding No. 13A-0686EG) directed the Company to “*collect, define, and analyze participant and non-participant rates. In future DSM plan filings, the Company shall explain how these data were collected and used for each program.*”¹⁴ Furthermore, the Commission clarified in Decision No. C14-0997 that “*we also require that the Company set forth proposals for tracking participants and non-participants for specific programs and measures and to provide estimates of participant and non-participant counts in its DSM Plans. While we recognize that, for certain programs or measures it may be difficult or prohibitively expensive to collect such data, it is reasonable for the Commission to consider plans for tracking participation and non-participation when programs and measures are proposed in a DSM Plan filing and when we review the cost-effectiveness and ratepayer impacts of those programs and measures.*”¹⁵

Tracking Participants / Non-Participants

To most effectively comply with the Decision, Public Service has determined that participant counts should be collected at the customer level (rather than at the premise level as had been done in the past) and provided by DSM product and by customer class. Because customers may participate in more than one product within a single year, the total number of portfolio participants will not be a direct summation of the individual product participation counts. In order to identify the non-participants, the Company will provide the number and percentage that the portfolio participation count makes up of total Public Service customers (eligible for DSM).¹⁶ Going forward, the Company will begin to identify the number of customers participating in each DSM product in a given year within the DSM Annual Status Report. Additionally within the Status Report, a portfolio participation and non-participation count will be provided.

The Company believes a thorough analysis of participants and non-participants must go beyond a counting of participation each year. It must also consider the amount of cumulative consumption savings realized by individual customers each year, due to the participation in DSM products over several program years. To this end, the Company will also identify the estimated percentages of business and residential customers by their range of consumption savings attributable to DSM participation since the expansion of the DSM programs in 2009. The extent of individual participation can further be compared to the cumulative rate impacts of DSM program since 2009. The combination of these factors results in the level and distribution of bill savings among business and residential customers. This additional participation data analysis is included in the DSM Annual Status Reports.

¹⁴ Paragraph 115, pg. 39.

¹⁵ Paragraph 24, pg. 8.

¹⁶ Public Service gas transport customer classes are not eligible to participate in DSM.

Key Assumptions

Participation data is provided with the following key assumptions:

- A participant will be “one individual customer” (based on account number) participating in DSM in a given year.¹⁷ Customers may have multiple premises,¹⁸ multiple projects, and/or participate in multiple DSM products across multiple years. (This represents a shift from historical reporting of “participant” which was based on premises).
- Some participation related data analysis is provided only at the portfolio level, such as non-participant¹⁹ data; this approach ensures that the endeavor is not undertaken in a manner that is costly or extensively laborious.
- Downstream products’ participation counts will be actual customer counts based on tracked participation data (means of tracking as identified in Tables 5b and 5c).
- Where mid/upstream products’ do not track participation at the customer level, counts will be an estimate within both the DSM Plans and the Annual DSM Status Reports, unless otherwise noted, given the nature of the approach and difficulty and cost associated with specific customer tracking.

Product-Specific Considerations

Products with unique participant tracking approaches are described below:

Cooling – Midstream: The participating tracking mechanism for the midstream rebate portion of the product will be determined in conjunction with the selected third-party implementer. The data will either be directly uploaded into Salesforce—the Company’s tracking software—or tracked separately and manually added to the Salesforce data for the third-party implemented portion of product participation.

Computer Efficiency: Product participation for the upstream component of the product is derived through monthly sales reporting from the third-party implementer. This data is manually entered into Salesforce and is also tracked separately. Based on the total quantity of units sold, it is estimated that participants buy an average of ten computers. Therefore, participation is assumed to be 10% of total units sold.

Lighting Efficiency and Small Business Lighting – Midstream: Product participation for the midstream component of the product is derived through monthly sales reporting from the third-party implementer. This data is manually entered into Salesforce and is also tracked separately.

¹⁷ Within the Detailed Technical Assumptions table at the end of Appendix G: Technical Reference Manual of this Plan, the Company identifies “units,” which differ from “participants.” Units are the total number of equipment installed by measure.

¹⁸ A premise is an individual physical location where a customer is served; a customer may have multiple premises associated with their one account, and vice versa a premise could have multiple customer accounts. For tracking participants, individual customer accounts will be tracked as one participant.

¹⁹ A non-participant is a Public Service customer who is eligible to participate in DSM, but has not chosen to do so. This type of data point is able to be tracked based on total Public Service customers and/or Public Service customers by class (business or residential).

Energy Efficient Showerhead: Public Service uploads a participation report from the third-party implementer into Salesforce; however, a manual calculation needs to be completed (given current Salesforce configuration), in order to identify the total number of unique customers that receive a showerhead.

ENERGY STAR New Homes: Upstream participation is based on the number of unique new home builders participating in the product each year and is tracked by the third-party implementer. Downstream participation is based on the number of homes completed in the product by that smaller number of builders. In other words, each home is purchased and occupied by a unique customer and no customer is assumed to own more than one participating home during the product year. Therefore, participation estimates included herein will reflect the number of homes.

Home Lighting & Recycling: This product is wide-reaching with a significant amount of bulbs sold and distributed across both the Residential and Business populations. Because the product achieves the vast majority of participation through retail outlets that do not track information on the customers purchasing the bulbs in the product, some estimation of the breadth of participation—based on average bulbs per customer, total installed bulbs, and the product saturation rate—has been performed.

Multifamily Weatherization and Multifamily Buildings: Participants are considered to be both residents living within housing units that receive energy-efficiency measures (regardless of whether they paid for improvements or received them as a direct-install measure), as well as the building and/or equipment owners, who may not represent the metered, bill-payer given the nature of multifamily building units.

Building Optimization DR Pilot: Pilot participants will be required to sign an application form. Each participant's information will then be manually recorded on a tracking spreadsheet which will be used to record relevant data during the course of the pilot. As pilot participation is capped at ten participants this manual tracking system is manageable and appropriate.

School Education Kits: The Company presumes one customer account per kit. However, it is possible that there may be very limited circumstances where a customer could receive two or more kits in one program year and/or multiple kits over the course of several program years (not unlike potential duplicate participation in other DSM products), but these instances cannot be tracked.

Class Participation Calculations

To estimate the count of unique customers participating within each segment (Business or Residential), calculations must be made to estimate the duplication of participation across the individual products. Summing the participation across products and then applying adjustments to account for duplicate participation results in an accurate measure of the breadth of participation within each segment. The methods to estimate duplicate participation across various types of products are described below:

Individually-Tracked Products: To estimate the amount of duplicate participation expected to occur in the 2019 and 2020 program years, the ratio of the sum of unique participation within each product observed in the 2017 program year over the unique participation within the Business or Residential segment is calculated. For instance, for the Business class of customers in the 2017 program year, individually-tracked products had a sum of 6,690 unique accounts within products, but these represented only 4,744 unique accounts within the Business class. This results in a factor of 29.08% to account for duplicate participation across the individually tracked products.

Non-Individually-Tracked Products: For several products, it is not feasible to track the individual participation. Home Lighting & Recycling and Computer Efficiency include upstream portions that represent very large participation that do not provide an opportunity to identify the individual participants. For 2019 and 2020, behavioral products for both the Business and Residential classes will be applied to a large fraction of the population, with the individual participants not yet determined. For these products, duplicate participation is estimated by multiplying the fraction of population represented by each product by each other. For instance, if in 2019, the Home Lighting & Recycling product is expected to reach 25% of the Residential class population, and the Residential Behavioral product is expected to reach 40% of the Residential class, the duplicate participation is estimated at 10% ($25\% * 40\%$) of the Residential class. The total fraction of the Residential class population participating in either of these products is estimated by summing the total fraction of the two products at 65% ($25\% + 40\%$) and then subtracting the duplicate participation fraction (10%) to get a fraction of 55% of the Residential class population participating in at least one of these products.

DSM Participation Tables

The following tables included in this Plan present the Company’s best estimates for participation and non-participation in DSM programs in 2019 and 2020, based on the methodology for estimating participation described above.

- 6a: 2019/2020 Electric Participant & Non-Participant Estimates, Percentage
- 6b: 2019/2020 Electric Participation Estimates, Average Rebate and Savings by DSM Product
- 6c: 2019/2020 Natural Gas Participation Estimates

Table 6a: 2019/2020 Electric Participant & Non-Participant Estimates, Percentage

	Total Unique DSM Participants[1]		Total Public Service Customers		Public Service Customers Participating in DSM		Public Service Customers Not Participating in DSM	
	Count	%	Count	%	Count	%	Count	%
2019 Total	769,696	100%	1,400,975	100.00%	769,696	54.94%	631,279	45.06%
Business	18,704	2.43%	103,837	7.41%	18,704	18.01%	85,133	81.99%
Residential	750,992	97.57%	1,297,138	92.59%	750,992	57.90%	546,146	42.10%
2020 Total	722,602	100%	1,428,995	100.00%	722,602	50.57%	706,393	49.43%
Business	16,248	2.25%	105,914	7.41%	16,248	15.34%	89,666	84.66%
Residential	706,355	97.75%	1,323,081	92.59%	706,355	53.39%	616,726	46.61%

Table 6b: 2019/2020 Electric Participation Estimates, Average Rebate and Savings by DSM Product

Product	2019 Estimated Participants	Average Rebate Per Customer	Average kWh Savings Per Customer	2020 Estimated Participants	Average Rebate Per Customer	Average kWh Savings Per Customer
Business Program						
Commercial Refrigeration Efficiency	55	\$3,813.35	52,806	55	\$3,813.35	52,806
Compressed Air Efficiency	64	\$5,968.56	55,732	72	\$5,588.49	52,065
Cooling	1,004	\$1,899.41	8,683	1,000	\$1,796.60	9,591
Custom Efficiency	7	\$19,482.14	399,710	8	\$19,482.13	399,710
Data Center Efficiency	48	\$17,044.10	133,559	48	\$17,889.21	150,830
Energy Management Systems	38	\$8,524.65	131,738	37	\$7,766.01	125,406
Heating Efficiency	58	\$105.97	1,690	64	\$97.84	1,621
LED Street Lighting	13	\$0.00	204,472	13	\$0.00	204,472
Lighting Efficiency	4,246	\$2,616.17	40,269	4,339	\$3,131.98	46,666
Lighting - Small Business	4,112	\$758.37	8,578	3,755	\$748.42	8,463
Motor & Drive Efficiency	131	\$11,264.88	70,310	117	\$12,545.91	78,305
Multifamily Buildings	1,036	\$1,053.54	7,242	1,140	\$1,040.93	6,944
New Construction	104	\$77,910.31	379,712	96	\$93,712.04	455,365
Recommissioning	46	\$3,857.48	59,415	46	\$3,707.80	62,382
Self Direct	3	\$166,894.33	1,684,623	3	\$166,894.33	1,684,623
Strategic Energy Management	74	\$19,200.18	203,471	97	\$14,195.73	187,862
Residential Program Total						
Energy Efficient Showerhead	2,366	\$5.52	427	2,366	\$5.52	427
Energy Feedback Residential	533,461	\$0.00	38	524,475	\$0.00	37
ENERGY STAR New Homes	2,790	\$210.51	992	2,521	\$210.91	1,042
Evaporative Cooling	3,136	\$677.62	1,010	3,431	\$677.59	1,010
High Efficiency Air Conditioning	3,695	\$452.29	365	5,249	\$453.81	370
Home Energy Squad	2,116	\$53.98	755	2,419	\$53.97	755
Home Lighting & Recycling	223,175	\$18.04	590	167,735	\$18.05	594
Home Performance with ENERGY STAR	392	\$561.28	537	392	\$561.28	524
Insulation & Air Sealing	530	\$278.08	798	530	\$278.08	798
Refrigerator & Freezer Recycling	7,000	\$50.00	559	7,000	\$50.00	564
Residential Heating	7,200	\$101.40	801			
School Education Kits	38,500	\$24.32	216	38,500	\$25.04	216
Water Heating	56	\$421.43	3,952	56	\$421.43	3,952
Thermostat Optimization	17,564	\$10.10	77	30,925	\$7.14	63
Low-Income Program						
Energy Savings Kit	5,482	\$22.38	404	5,117	\$23.98	404
Multifamily Weatherization	35	\$25,300.69	53,975	35	\$25,300.69	53,975
Non-Profit	39	\$22,470.41	43,620	39	\$22,470.41	43,620
Single-Family Weatherization	1,500	\$662.95	1,184	1,500	\$662.95	1,184
Indirect Products & Services						
Business Education	1,337	\$0.00	0	1,340	\$0.00	0
Business Energy Analysis	316	\$1,272.15	0	316	\$1,272.15	0
Consumer Education	22,936	\$0.00	0	22,960	\$0.00	0
Energy Benchmarking	265	\$0.00	0	273	\$0.00	0
Energy Efficiency Financing	15	\$666.67	0	15	\$666.67	0
ENERGY STAR Retail Products Platform	25,630	\$0.00	0	25,630	\$0.00	0
Home Energy Audit	1,889	\$104.28	0	1,889	\$104.28	0
Partners in Energy	N/A			0		
Demand Response						
Residential Battery Demand Response	250	\$710.00	-67	250	\$0.00	-67
Critical Peak Pricing Pilot	15	\$0.00	0	15	\$0.00	0
Peak Partner Rewards	N/A			N/A		
Residential Demand Response	12,000	\$724.50	4	12,000	\$0.00	4
Geo-targeting Pilot - DR	N/A			N/A		

APPENDIX G

➤ ENERGY STAR New Homes

A. Description

The ENERGY STAR® New Homes (ESNH) product provides builders of single-family and small multifamily homes with an incentive to exceed local building codes and common construction practices. Homebuilders are encouraged to look at the “whole house” as a system when considering deployment of energy saving construction methods and installation of energy-efficient appliances. Homeowners benefit with lower energy bills, fewer maintenance concerns, higher resale value, and a more comfortable, quiet home. With interval data, homeowners would also have a way to see how efficient their home is starting out and gain a deeper appreciation and understanding of that efficiency.

The current product structure gives builders the flexibility to mix and match efficient technologies and building practices to meet the product requirements and qualify for a rebate. To qualify for a rebate, participants are required to build homes that exceed local building jurisdictions’ energy codes by at least 10%. To measure this, a rating must be completed on each home by a Residential Energy Services Network (RESNET) certified Home Energy Rating System (HERS) rater. The HERS rater provides a valuable service by consulting with the homebuilder during the construction phase and ensures the designed energy efficiency measures have been properly installed in the home. HERS raters will complete the rating for each home using a RESNET accredited software approved by the Company and will provide select informational details to the Company’s third-party implementer for evaluation. Energy savings are determined individually for each home based on the difference between the energy used by the reference home (or baseline home; modeled to match the local jurisdictional energy code) and the energy used by the new as-built home. The Company plans to evaluate this product structure in 2019 to determine necessary adjustments to help the product remain cost-effective while adapting to accommodate higher energy codes and value-based energy savings.

The Company utilizes a third-party implementer that works directly with local HERS raters to get homes enrolled in the product. HERS raters in the state of Colorado have established strong relationships with the builder community. HERS rating companies have the flexibility to participate in this product by completing a standard scope of work administered and managed by the Company’s third-party implementer. The HERS rater will model each home and test the home to measure the level of energy efficiency achieved. Once the home is completed, the HERS rater provides the required information to the third-party implementer who then determines if the home meets the product requirements and is eligible for a rebate. The third-party implementer is responsible for reviewing the information submitted by the rater, working with the rater to correct or provide missing information and then reporting it to the Company. The third-party implementer provides product training for the rater and will assist with builder training as needed.

B. Targets, Participants & Budgets

Targets and Participants

The product targets builders who construct single-family and small multifamily homes (duplex, triplex, fourplex). Energy savings and participation targets are based on historical product performance and growth forecast assumptions in the residential new construction marketplace. New construction growth continues to improve and barring any significant impacts to the financial sector, the Company anticipates this growth will continue to occur around 5% year over year. As more jurisdictions adopt higher energy codes such as 2012, 2015, and 2018 IECC, it is expected that participation will be lower in the entry level rebate tiers. A home that meets the minimum 10% Better-than-Code (BTC) participation requirement in a 2009 IECC jurisdiction will likely not readily meet the minimum 10% BTC threshold once their jurisdiction adopts the 2012 IECC. Under IECC 2012, the baseline home is now more energy efficient and the energy savings the Company can claim for these homes is reduced. Generally speaking for 2019 and 2020, Public Service expects a shift in participation from mid-level BTC code tiers to lower BTC tiers for jurisdictions adopting higher energy codes. As a result, overall product savings targets are impacted and the Company anticipates the average claimable energy savings on a per-home basis to be lower than in previous years.

Budgets

The product budget is primarily driven by forecasted participation for 2019 and 2020 and established rebate levels are designed to encourage participation. Additional costs include; product administration, promotional and outreach activities, measurement and verification. Product administration costs include Company labor and third-party implementer services, which were competitively bid and implemented beginning in 2015. Builder rebates and energy rater administrative fees together comprise approximately 74% of the product budget and are the single largest expense component.

C. Application Process

Enrollment for this product is typically completed by the HERS raters on behalf of their clients (builders). HERS raters have strong, long established relationships with most of the builders operating within the Company's Colorado service territory. To initiate the enrollment process, HERS raters will contact builders to encourage their participation, or the builder will contact a rater and express interest in constructing an energy-efficient home. The rater will explain the product offering and potential rebates available, review the home's blueprints and building schedule, and enter the home details into the third-party implementer's tracking database. The rater consults with the builder throughout the construction phase to build a home that qualifies for the product rebate.

When the home is completed, the HERS rater will perform an air-tightness test on the house and determine the energy impacts using REM/Rate. This information is submitted to the third-party implementer who will review and approve each home. The builder will receive a rebate based on the local energy code requirement and the percent BTC achieved. Specific gas and electric energy savings are determined by the Company using the HERS rater's modeling information. There is no rebate application for the builder or rater to complete since all required information is entered by the HERS rater into the third-party implementer's database using a web portal

interface. The third-party implementer reviews and ensures all information is accurate and captured and works directly with the energy rater to correct any omissions or errors. Once the data is deemed complete, the third-party implementer is responsible for manually entering selected portions of the collected data for each home into the Company's database.

D. Marketing Objectives & Strategies

The Company will update existing builder and homebuyer marketing materials and make them available to participants. The objective of the builder marketing material is to increase product awareness and effectively communicate product benefits (energy savings, economics, and comfort/durability) along with the requirements for participation. The homebuyer collateral was created as an aid for builders to easily explain the benefits of an energy efficient home to their potential clients. Additionally, a certificate of completion was created for the homebuyer. The certificate demonstrates the home successfully completed the product requirements and contains useful information such as the HERS index achieved and who rated the home. The development of new marketing materials will be driven in part by the outreach plans of the third-party implementer and feedback received from participants. The product does not utilize mass marketing campaign efforts as a method of driving participation.

The Company's third-party implementer will engage in outreach activities with participants and stakeholders. The outreach objectives are intended to maintain good working relationships with builders and raters, ensuring they are satisfied with the product offering and to provide education and training support where needed. The third-party implementer will initiate monthly product update communications to all participants, and hold in-person and conference-call meetings with raters along with routine email and phone communications.

The third-party implementer will provide training to participants (primarily raters) on the product requirements, REM/Rate modeling software and use of their database system to improve efficiency and ensure more accurate data reporting. These activities are expected to encourage energy-efficient building practices resulting in increased energy savings. The third-party implementer will offer up to 30 no-cost professional sales training sessions to realtors and builders' sales agents throughout the year. The Company is also evaluating opportunities to work with the net-zero energy (NZE) home community to jointly provide training on energy efficiency and NZE homes with architects and builders. The Company's third-party implementer is working with ESNH participating energy raters to identify pathways for implementing this joint training activity. The ESNH product shares common interests with the NZE community since the best path to reach net-zero is to start with a highly energy-efficient home. The Company is also considering how renewable programs and the ESNH product may be jointly marketed to customers. Other types of training will be identified with the assistance of the product participants, key stakeholders and the third-party implementer who will be responsible for developing specific outreach plans. Key stakeholders include organizations such as local homebuilder associations, the Colorado Energy Office, the Colorado Code Compliance Collaborative and other related industry organizations.

E. Product-Specific Policies

This product applies to builders of residential single-family buildings, small multifamily buildings and townhomes that receive combined electric and natural gas service, or natural gas-only service, from Public Service. Structures that have common conditioned space such as

hallways and elevator shafts are not eligible to participate in the product. Additional product requirements are:

1. Raters must be RESNET certified and use the RESNET modeling software approved by the Company to model each home.
2. Raters must provide a RESNET-registered HERS rating for each home. Sample ratings are not accepted.
3. Raters must complete a Rater Field Checklist and the home must pass the applicable sections.
4. Builders will receive a rebate based on the local energy code requirement and the percent BTC. The percent improvement is determined using REM/Rate software to model the energy used by the reference home (or baseline home; modeled to match the local jurisdictional energy code) and the energy used by the new as-built home. The energy use is converted to MMBTU and the following formula is used to determine the percent improvement:
$$\frac{\text{Ref_Home_MMBTU} - \text{As-Built_Home_MMBTU}}{\text{Ref_Home_MMBTU}}$$
5. Homes that achieve ENERGY STAR certification and receive a percent BTC rebate (as detailed in Section G below) may be eligible for an additional \$100 rebate.
6. Natural gas-only participants are not eligible to receive the appliance rebate for installing the ENERGY STAR refrigerator or High Efficiency Lighting measures.
7. Homes that receive electric-only service from the Company are not eligible to participate in the product.
8. Homes qualifying for a product rebate are not eligible for Company's *separate prescriptive* rebates under the following products; Evaporative Cooling, Heating Efficiency, High Efficiency A/C, Insulation & Air Sealing, Thermostat Optimization, and Water Heating.
9. Impacts from PV or other renewable generation systems installed in the home will not be included in the percent BTC improvement (rebate) or energy savings calculations.

F. Stakeholder Involvement

The Company maintains ongoing relationships with the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy, which jointly oversee the national ENERGY STAR program. The Company is an active Sponsor and participant in the national program, recognizing the strong customer awareness of the ENERGY STAR brand, and has received several ENERGY STAR awards for this product.⁴⁷

This product has received significant interest and input from external Colorado stakeholders in preparation of Plan filings and during Plan Settlement. This input has been valuable and taken under consideration for the product design.

The Company serves on the new home construction committee of the Consortium for Energy Efficiency, which meets regularly and works closely with the EPA. The third-party implementer attends RESNET conferences on behalf of the Company.

Public Service will strive to work with and engage Colorado stakeholders, such as the Colorado Energy Office, Southwest Energy Efficiency Project, Energy Efficiency Business Coalition, the Colorado Energy Code Collaborative, the City of Denver and others to partner when possible and continue the product's success.

The Company will issue monthly communications to participating builders and energy raters, providing year-to-date product updates on participation, achievement, expenditures, and other important product information as it arises. The Company's third-party implementer communicates regularly with participating energy raters and builders, including requests for their input on training and education gaps related to energy efficiency and more specifically, how the product can assist filling those gaps.

⁴⁷ View the ENERGY STAR Awards Archive: <https://www.energystar.gov/about/awards/awards-archive>

G. Rebates & Incentives

Builders with qualifying homes are eligible to receive a rebate based on the local energy code requirement and the percent BTC improvement achieved (see *Product-Specific Policies* for details). A builder’s home must achieve a minimum 10% BTC improvement to qualify.

Rebate Levels – 2009 IECC or Lower, and Percent BTC

Percent BTC	Rebate
10% - 14.999%	\$200
15% - 19.999%	\$350
20% - 24.999%	\$500
25% - 29.999%	\$650
30% - 34.999%	\$800
35% - 39.999%	\$1,000
40% and higher	\$1,400

Rebate Levels – 2012 IECC or Higher and Percent BTC

Percent BTC	Rebate
10% - 14.999%	\$250
15% - 19.999%	\$400
20% - 24.999%	\$600
25% - 29.999%	\$900
30% - 34.999%	\$1,300
35% - 39.999%	\$2,000
40% and higher	\$2,550

The ENERGY STAR certified rebate is an *add-on* rebate available to qualifying homes that have earned ENERGY STAR certification and meet the following:

- a) Home must have both electric and gas service from Public Service. Gas-only or electric-only homes served by the Company are not eligible;
- b) Home must qualify for a percent BTC rebate;
- c) HERS rater verifies the home meets all national ENERGY STAR certification requirements and;
- d) ENERGY STAR label is applied to the home’s electrical breaker box.

ENERGY STAR Certified Rebate

ENERGY STAR certified	\$100
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The ENERGY STAR appliance rebate is another *add-on* rebate available to qualifying homes that have earned a percent BTC rebate and installed one or any combination of the qualifying appliances listed below. Homes that receive natural gas-only service from the Company are not eligible for the ENERGY STAR Refrigerator or High Efficiency Lighting rebates.

Appliance & Lighting Rebate Levels for Qualifying Homes

Appliance/Lamp	Rebate
ENERGY STAR Clothes Washer	\$30
Heat Pump Water Heater	\$450
High Efficiency Lighting – 2009 IECC or lower with CFL or LEDs - Minimum 20 lamps	\$20
High Efficiency Lighting – 2012 IECC or higher with 100% High Efficiency (CFLs or LEDs)	\$10

APPENDIX H

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Residential Lighting Program**

Residential Lighting Program

The Residential Lighting Program (“Program”) provides incentives to encourage customers to purchase and install energy efficient lighting products through an upstream model that partners with manufacturers and retailers. The Program will provide discounted pricing on high quality LEDs at participating retail locations.

Program measures will consist of ENERGY STAR qualified general service, reflectors and specialty LEDs. LED lamps will be available in various wattage equivalents and will be sold by participating retailers within the Company’s service territory. The Company will provide incentives to participating manufactures for selected LEDs that will be discounted at point of purchase so customers will see immediate price reductions.

Nevada Power Company Residential Lighting Program

2018 Results

This Program was not active in 2018 and was approved for implementation beginning in 2019. A request for proposal was initiated in 2018 for a competitive contract award for an implementation contractor for a three-year commitment for 2019-2021.

2019 Plan

Performance-based contracts for the Program were signed in February 2019, with a program launch in April 2019. Lighting measures at launch consisted of general service and reflector lamps, with some specialty lamps under consideration. The budget for 2019 is \$2,100,000 with an energy savings target of 11,210,000 kWh.

The Program will provide outreach to customers in the form of multiple special events, staffed in-store table tops displays and educational materials. Through the use of lighting displays and special educational material designed to aid consumers in understanding LED technology, customers will be better informed when making LED bulb buying decisions. The Program team will make store visits and will also provide formal training for store employees to equip them for providing customers with sound advice when purchasing LED lighting products.

In 2019, the Program is entering a more mature market for energy-efficient lighting than in previous years. As such, recruiting customers beyond the typical target segments (e.g., early adopters or sustainability-focused consumers) has heightened importance. To ensure that the Program reaches all customers, regardless of income, culture, or language, the program team will work closely with community-based organizations (CBOs) to explore potential outreach opportunities to diverse communities, including selecting retail outlets serving low-income, rural customers, and historically underserved communities. Target retail outlets will include a diverse mix of retailers: big box home improvement, hardware, grocery and drug, discount warehouse

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membership clubs, and, where available, low-income channels such as Goodwill stores. Additionally, the Program will respond to linguistic barriers to participation by exploring development of in-language collateral or partnering with a culturally specific CBO to convey Program information. Partnerships with CBOs can also allow us to deploy special promotions, including staffing tables at a community events. The Program will also seek out bilingual Spanish-speaking field representatives when recruiting our Program team whenever possible.

Customer eligibility continues to be a concern of the Program. Some precautions have been taken to ensure customers participating in the Program are energy customers within the Company service territory. Zip code data along with counts of active customers have been used to select retail locations with the highest likelihood of serving Company customers. Retail outlets in zip codes served by municipal and energy cooperatives have been excluded.

The Program has established heightened requirements and goals in creating customer attribution. Program messaging, collateral, and promotional material will reinforce the contribution of program benefits. In addition, the training of field resources will include understanding the Company's DSM programs and the role the Company plays in providing energy saving services to customers.

The Program team is working closely with the Department of Health and Human Services, through the Community Block Grant Programs (CBGP) and the Weatherization Assistance Programs (WAP) to share Program information and to increase awareness and to encourage participation by low income customers.

The Program will take advantage of the natural synergies with other DSM energy savings programs and seek our opportunities to educate and cross promote other DSM energy savings programs, including the Direct Installation and Home Energy Report programs. Customers provided LEDs as part of the Direct Install program will be advised to take advantage of the lighting Program for additional LED purchases and Home Reports will include customer-applicable advice and tips on the use and the Program as a source of LED bulbs and variable speed pool pumps.

The Program will leverage feedback acquired from customers to inform recommended changes throughout the Program year. Customer surveys conducted by the EM&V service provider and quality assurance customer feedback collected by Contractor will provide insight into operational performance of the program and progress toward energy savings goals.

Lessons Learned and Recommendations

The Program was last implemented by the Company in 2015. The goal is to benefit from the lessons learned and recommendations from previous implementations of the Program. Recommendations in the prior Program M&V report included revisiting baseline bulb assumptions and *ex ante* energy savings estimated. Feedback from prior Program implementation teams, included increased focus on retail staff training and Program education and improvements in

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Residential Lighting Program**

customer collateral, increase emphasis on ENERGY STAR value proposition, and use improvement in web content to leverage the trusted relationship with the Company.

2020 Plan

The 2020 Residential Program will have a budget of \$1,694,000 and a savings target of 13,200,000. Lessons-learned from the 2019 Program will factor strongly in the design and implementation of the Program in 2020.

Measurement & Verification

The EM&V Contractor will perform EM&V activities to confirm the savings realized through the Residential Lighting Program being implemented in the Company's service territory.

Financial Analysis

The cost/benefit analysis for this Program was performed utilizing the PortfolioPro financial modeling software created by the Cadmus Group for the Company. This comprehensive modeling software utilizes a stream of avoided costs broken down by each of the 8,760 hours for each year of the useful life of a measure.

A copy of the input data sheets and the financial model output sheets are provided at the end of this section. Output sheets provide the results for the cost-benefit analysis. The financial analysis results were all calculated based upon the information contained in this program data sheet and the materials referenced herein. The key inputs used in the creation of these results are described below.

Energy Savings Curve

The Curve for LEDs is the same as the Curve used previously for residential CFLs. Note that there is no significant difference between LEDs and CFLs with respect to the shape of savings or the fraction of annual savings occurring during any given hour of the year.

Incremental Costs

Incremental cost for this Program is the cost of the energy efficient measure minus the cost of the baseline measure. Establishing the appropriate baseline generally defines the incremental cost.

Measure Life

For the 2019 Program the EUL for LEDs is based on the following:

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- rated lifetime hours from the ENERGY STAR database¹⁸
- annual operating hours (“HOU”)
- dual-baseline methodology

The dual-baseline approach put forth in the ARTRM¹⁹ incorporates the Energy Independence and Security Act of 2007 (“EISA”)²⁰ lighting standards for general service lamps (“GSLs”) and affects the calculation of lifetime savings for LED bulbs that are defined by EISA to be GSLs. The dual baseline methodology applies to each LED measure that is subject to EISA codes: as such, a dual baseline is needed for the A19 LEDs but not for the BR30 LEDs. A dual baseline for A19 LEDs will use Tier 1 savings through the end of 2022 and will use Tier 2 savings for 2023 through end of nominal EUL. While the statutory date for second-tier EISA codes is 2020, the evaluation community does not expect timely compliance or enforcement.

Savings

The determination of ex-post verified energy savings will be determined by the M&V service provider a based upon the following variables:

- Baseline wattage
- Watts per LED
- Hours of use
- In-service rate (ISR) for specific time periods

Methodologies used for determining these variables are described in the 2019 M&V Plan for Lighting.

Incentives/Rebates

The Program incentives will be paid directly to the manufacturer based on retail sales to Nevada Power’s customers. The implementation contractor will negotiate lamp discounts with manufacturers, then the manufacturers will sell their lamps to retailers at the lower incentive lamp cost. Company customers will then receive the lower prices lamps through the retailers.

The incentive structure will be based on an LED lamp sales projection, lamp retail pricing, potential lamp energy savings and the propensity of customer to purchase LED lamps. By monitoring lamp sales volume throughout the Companies territories, incentive levels can be established and adjusted to drive a higher number of lamp installations or increasing energy

¹⁸ The ENERGY STAR lighting database can be downloaded from the following website:
<https://www.energystar.gov/productfinder/product/certified-light-bulbs/results>

¹⁹ <http://www.apscservices.info/EEInfo/TRMv7.0.pdf>

²⁰ <https://www.govinfo.gov/content/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf>

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savings by moving incentives to higher energy savings lamps, while managing available incentive funding to better influence customer lamp purchases.

Units

A unit for this Program is a single LED lamp.

Inputs and Outputs of Portfolio Pro Cost Benefit Model

The following pages provide the input and output sheets for the cost benefit analysis. The benefits, costs, net benefits and benefits/cost ratios for the five tests are provided in the “Stakeholders Perspective’s and Tests” section of the output sheet. The section “Utility Savings and Costs” provides the annual and lifetime costs and savings from the utility perspective. Assumptions used to obtain the results are provided in the “Financial Data” section of the output sheet.

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Residential Lighting NPC

2020	Total Budget (all categories included)	Utility Admin & M&V	Implementation Costs	Incentives	Rebates	Number of Units	Annual Savings (kWh/unit)	Total Annual Savings (kWh/Year)	Effective Useful Life***	Incremental Measure Cost per Unit	Net-to-Gross
Measures	\$1,694,000	\$584,332	\$ 502,258	\$ 610,410							
General Service LED					\$0	321,946	26	8,486,502	14.6	\$3.69	60.0%
Reflector LED					\$0	144,232	33	4,713,498	20.0	\$1.40	60.0%
Total					\$0	466,178		13,200,000		\$5.09	

*Incremental measure cost is the difference between the cost of the LED and the baseline measure reduced for the payment to manufacturer

**Denotes payments made to manufacturers

***Effective Useful Life takes into account the dual baseline methodology over the baseline measure life

Name:	2020 Residential Lighting	Last Updated:	6/18/2019 9:51
Customer Sector:	Residential	Avg Measure Life:	16.56
Region :	Vegas	Energy Savings Curve:	Residential_Lighting
Start Year:	2020	Model File Name:	DSM_PortPro_April2019_AY.xlsm
End Year:	2020	CAD File Name:	Vegas_CAD_April2019_AY.xlsx.xls
Notes:		Program DB Name:	PD_Vegas_April2019_AY.xlsx

<u>Stakeholder Perspectives & Tests</u>	<u>Benefits (PV)</u>	<u>Costs (PV)</u>	<u>Net Benefits (PV)</u>	<u>B/C Ratio</u>	<u>Cost of Conserved Energy (\$/kWh)</u>
NEB Total Resource Cost (NTRC)	\$4,930,071	\$2,527,943	\$2,402,128	1.95	\$0.032
Total Resource Cost (TRC)	\$4,213,736	\$2,527,943	\$1,685,793	1.67	\$0.032
Utility Cost Test (UCT)	\$4,213,736	\$1,694,000	\$2,519,736	2.49	\$0.021
Participant Cost Test (PCT)	\$14,587,852	\$1,389,906	\$13,197,947	10.50	\$0.011
Ratepayer Impact (RIM)	\$4,213,736	\$10,080,465	(\$5,866,729)	0.42	\$0.127
Societal Cost (SCT)	\$5,231,852	\$2,527,943	\$2,703,909	2.07	\$0.032

*Includes rebates paid to freeriders

<u>Utility Savings & Costs*</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>Total Project</u>
Total Utility Investment (\$)	\$1,694,000	\$0	\$0	\$1,694,000
Electric Benefits (\$)	\$297,643	\$0	\$0	\$4,213,736
Gas Benefits (\$)	\$0	\$0	\$0	\$0
Incremental Energy & Demand Savings:				
Electric Savings (kWh)	8,190,926	0	0	135,621,055
Critical Peak Hour Demand (kW)	807	0	0	807
Gas Savings (therms)	0	0	0	0
Total On Peak Hours (kWh)	630,217	0	0	10,421,439
Total On Peak Hours (%)				7.68%

*Savings in this section are adjusted for line loss and net-to-gross

<u>Financial Data</u>		<u>Secondary Benefits</u>	
Discount Rate:	7.95%	Other Savings	\$0
Rate Escalator:	0.00%		
Inflation Rate (T&D):	2.00%	<u>Scenarios:</u>	
Line Loss (Energy):	3.82%	Measure Life	100%
Line Loss (Demand):	7.60%	Energy Savings	100%
Avoided T&D Capacity \$/MW:	\$53,812	Avoided Energy Cost	100%
Environmental Adder (SCT only)	10.00%	Avoided Capacity Cost	100%
Non-Energy Benefit Adder (NTRC and SCT)	17%	Incremental Measure Cost	100%
Electric Retail Rate (\$/KWh):	\$0.11		
Gas Retail Rate (\$/therm)	\$0.54		
Net-To-Gross Ratio	60.0%		

APPENDIX I

2020 Plan Retail Lighting Measures	Quantity	Measure Life	Incentive	EE: Gross Annual kWh Saved	Net to Gross
LED Bulb	2,574,279	5	\$2.63	38.6	30.0%
LED Bulb (Specialty)	414,899	5	\$3.00	42.6	40.0%
LED Bulb (Reflectors)	942,485	5	\$7.50	52.1	40.0%
LED Bulb (Hard to Reach)	369,105	5	\$3.33	38.6	30.0%
LED Bulb, Food Pantries	11,750	5	\$1.46	36.2	100.0%
LED Bulb (School Fundraiser)	6,059	5	\$4.79	36.2	30.0%
LED Bulb (Linear LED)	9,900	10	\$12.00	11.9	40.0%
LED Fixture	796,637	5	\$8.70	38.6	40.0%

2017 Report Retail Lighting Measures	Quantity	Measure Life	Incentive	Gross Annual kWh Saved	Net to Gross
LED Bulb	1,827,760	7	\$3.49	39.1	80%
LED Bulb 15k Lifetime	1,726,723	7	\$2.11	39.1	80%
LED Bulb (Specialty)	117,125	7	\$3.97	44.8	80%
LED Bulb (Specialty) 15k Lifetime	398,904	7	\$3.11	44.8	80%
LED Bulb (Hard to Reach)	395,334	7	\$4.02	39.1	100%
LED Bulb (Hard to Reach, 15k Li	66,047	7	\$4.83	39.1	100%
LED Bulb (Food Pantries)	14,688	7	\$1.65	39.1	100%
LED Bulb (School Fundraiser)	6,733	7	\$5.28	34.7	80%
LED Bulb (Reflectors)	1,171,943	7	\$4.64	56.1	80%
LED Fixture	881,115	7	\$9.81	71.3	93%
CFL Bulb (Carryover)	93,195	5	\$1.22	50.4	54%

In-Service Rate	kWh Realization Rate	Net Savings/Lamp
89%	101%	10.42
91%	101%	15.66
91%	101%	19.14
89%	101%	10.42
50%	101%	18.28
50%	101%	5.48
97%	100%	4.61
100%	101%	15.61

In-Service Rate	kWh Realization Rate	Net Savings/Lamp
94%	100%	29.38
94%	100%	29.38
95%	100%	34.03
95%	100%	34.03
99%	100%	38.70
101%	100%	39.49
101%	100%	39.49
51%	100%	14.02
95%	100%	42.61
101%	100%	66.97
96%	100%	26.11