

# Memo



**To:** Energy Efficiency & Resource Management Council  
**From:** Sam Ross, Cliff McDonald / C-Team  
**CC:** Becca Trietch / OER  
**Date:** April 30, 2020  
**Subject:** National Grid Electric Rate and Bill Impacts from Efficiency

CONSULTANT TEAM

## INTRODUCTION

This memo summarizes the Energy Efficiency and Resource Management Council's (EERMC) Consultant Team (C-Team) review of National Grid Rhode Island's Electric Energy Rate and Bill Impacts model. The purposes of this review are two-fold. First, to assess the model's methodology for consistency with industry standard methodologies for assessing rate and bill impacts. Second, to estimate energy efficiency's net impact on different customer classes' rates and bills, based on historical rate and bill impact model results.

The Electric Energy Rate and Bill Impacts model has been used by National Grid for the past five annual planning cycles to estimate the impact of energy efficiency programs on electric customers' rates and bills. In this context, electric rates are the dollars paid per unit of energy purchased by customers, and are denominated in \$/kWh, while electric bills are the total dollars paid for all energy purchased by consumers, denominated in \$. This distinction is important in the context of efficiency, because bills can go down despite rate increases, if total usage goes down. For this analysis, we will be considering annual *bill impacts* throughout. These factors are related through the following equation:

### Equation 1. How Rates and Bills are Related

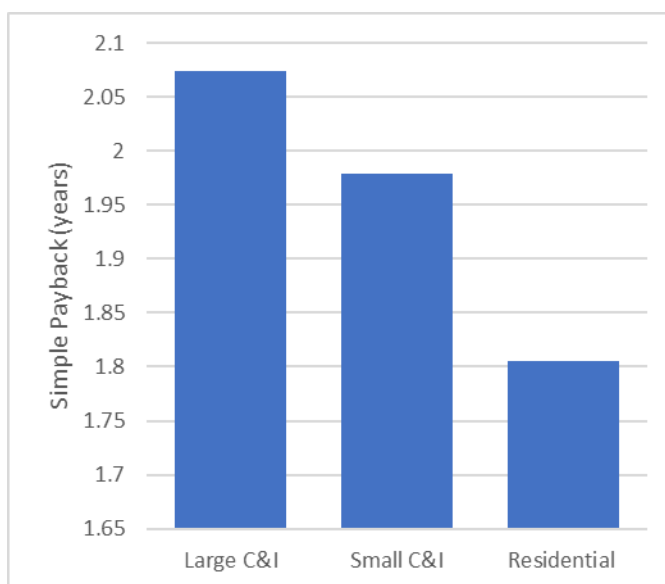
$$\text{Bill (\$)} = \text{Rate (\$/kWh)} * \text{Energy Consumption (kWh)}$$

Energy efficiency programs have three different types of impacts on rates and bills. First, the programs use a System Benefit Charge (SBC) to collect funds that directly support implementation costs of the efficiency programs, and in Rhode Island SBC dollars are collected in the program year in which the expenses are incurred. In Rhode Island, this charge is the same for all customer classes, and is an adder to electric rates (\$/kWh). Second, efficiency program participants save energy, which means their energy consumption is reduced. Customers who do not participate in programs do not receive this benefit. Third, efficiency programs reduce the overall energy consumed on the grid, which affects energy, transmission, and distribution prices during the year in which measures are installed as well into the future, since efficiency measures typically produce savings over multiple years. Monthly electric bills are calculated with distribution and transmission rates, electricity supply rates, and other adders such as the SBC. This means that, even though the SBC for a specific year is 'added on top' of existing rates, those distribution, transmission and supply rates have already been pushed downward due to the savings that are still accruing from prior energy efficiency program years. The benefits of this type of impact accrue to all customers, regardless of whether they participate in efficiency programs, such that in some sectors even non-participating customers experience bill savings from efficiency programs.

## KEY TAKEAWAYS

- National Grid’s electric rate and bill impacts **model uses standard, sound methods**.
- Each year of efficiency programming results in somewhat higher rates in year 1, but **puts downward pressure on rates in future years**. By way of example, large commercial non-participants’ lifetime rate impacts are often negative.
- Efficiency programs result in **significant lifetime bill savings** for average customers<sup>1</sup>, especially for program participants. In 2020, it is expected that all residential customers will participate in at least one efficiency program.
- Even **non-participants can see bill savings, especially in the medium and large C&I customer classes**. It is modeled that large commercial non-participants will see almost \$24,000 in lifetime savings from the 2020 efficiency program, despite higher bills in year one as they contribute to the SBC.
- After direct program costs are paid in year one, rate impacts for residential and small commercial customers are negligible. Large commercial customers see moderately lower rates.
- Small commercial and residential non-participants typically see slight bill increases over the lifetime of the efficiency measures.
- Figure 1 illustrates that, for program year 2020, **simple payback for the average customer in each sector was roughly 2 years**.

Figure 1. Sector-level simple payback for average customers for Program Year 2020



*Note: Simple payback occurs at the point where total bill savings outweigh initial costs.*

<sup>1</sup> Throughout this document, the term ‘average customer’ reflect a weighted average across program participants and non-participants, unless otherwise specified.

## BILL IMPACTS

Arguably the most important outcome from the Rate and Bill Impacts model are estimates of customer bill impacts. This is because, as illustrated by Equation 1 above, bills represent what customers actually have to pay for electricity. For each program year, costs are fully covered in the first year through the SBC, but the measures installed largely continue producing savings for multiple years. Consequently, it is critical to look at bill impacts over the lifetime of installed measures. Table 1 uses program year 2020 as an example and shows clearly that typical lifetime bill savings (bottom row), are sizeable and positive for all sectors, even though they are negative in the first year (top row).

**Table 1. Average Customer Annual and Cumulative Bill Savings by Sector, Program Year 2020**

Year	Large C&I Annual Savings	Large C&I Cumulative Savings	Small C&I Annual Savings	Small C&I Cumulative Savings	Residential Annual Savings	Residential Cumulative Savings
<b>2020</b>	(\$13,946)	(\$13,946)	(\$207)	(\$207)	(\$38)	(\$38)
<b>2021</b>	\$13,088	(\$858)	\$211	\$4	\$46	\$8
<b>2022</b>	\$11,683	\$10,825	\$188	\$192	\$41	\$49
<b>2023</b>	\$11,035	\$21,860	\$178	\$370	\$40	\$89
<b>2024</b>	\$11,241	\$33,101	\$182	\$552	\$8	\$97
<b>2025</b>	\$11,261	\$44,362	\$182	\$734	\$8	\$105
<b>2026</b>	\$11,735	\$56,097	\$189	\$923	\$9	\$114
<b>2027</b>	\$11,470	\$67,567	\$191	\$1,114	\$7	\$121
<b>2028</b>	\$11,241	\$78,808	\$188	\$1,302	\$6	\$127
<b>2029</b>	\$9,516	\$88,324	\$162	\$1,464	\$ -	
<b>2030</b>	\$9,238	\$97,562	\$158	\$1,622	\$ -	

Note: **Bold** cells indicate the year in which simple payback is achieved for each sector.

**Figure 2. Average Customer Cumulative Bill Savings, Program Year 2020 (% of Year 1 Costs)**

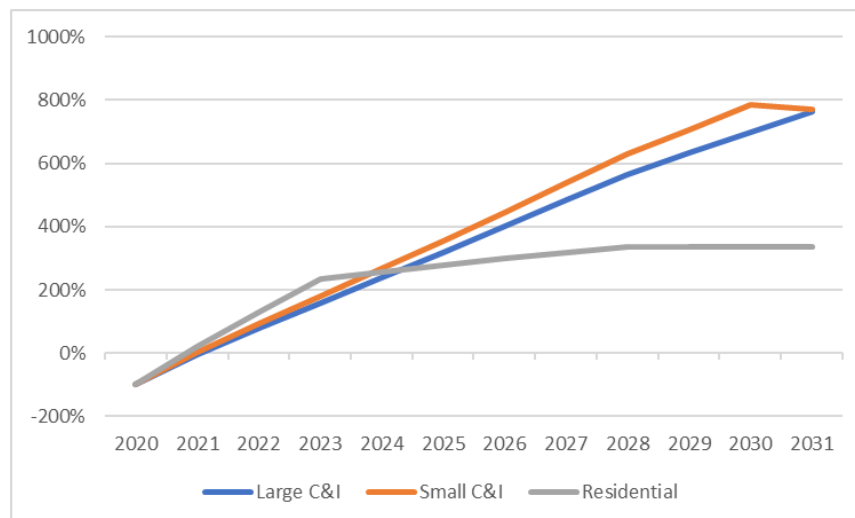


Figure 2 makes a similar point, showing that the simple payback (the point where each line crosses the x-axis) was expected to happen by around the end of the second year (2021).

This data includes both customers who participate in the efficiency programs as well as customers who do not participate. In general, participants will see higher savings, while non-participants will see modest lifetime bill increases (except for large C&I non-participants who will still see lower lifetime bills). However, it is important to note that most electric consumers in Rhode Island participate. For example, in 2019 it was expected that 96% of residential customers, 9% of small C&I customers, 17% of medium C&I customers, and 57% of large C&I customers would participate in at least one efficiency program. This suggests that over time, most customers will participate, even if though they may not do so in every program year.

In summary, efficiency programs lead to large bill savings for participants as well as on average, and in recent years, even non-participating medium and large C&I customers have seen lifetime bill savings.

## RATE IMPACTS

### a. Methodological Review

The Electric Rate and Bill Impacts model takes the approach of separately estimating impacts on the range of different components that contribute to rates, and which have the potential to be affected by efficiency programs. The key components, and the likely impacts from EE programs, are defined below:

- A) *System Benefit Charge (SBC)*: Funding collection mechanism for efficiency programs, size determined by program budget. Increases rates in year one for all sectors. Does not directly affect rates after that, though the efficiency programs themselves do.
- B) *Transmission, Distribution and Capacity Costs*: The costs to build and maintain T&D infrastructure and capacity are passed on to customers through rate charges. Efficiency programs can result in deferring or avoiding transmission and distribution infrastructure investments, including through reducing system peak. When that happens, these reduced costs are also passed on to customers, which puts downward pressure on rates.
- C) *Transmission and Distribution Lost Revenue Recovery*: When efficiency programs reduce energy consumption, utilities' transmission and distribution revenue is also impacted, because their transmission and distribution charge is collected over fewer kWh of sales<sup>2</sup>. To ensure utilities are 'made whole', this revenue can be recovered through lost revenue recovery charges on customers bills. This puts upward pressure on rates.
- D) *Energy and Capacity Price Suppression*: Energy generation and capacity costs are also part of customers' rates. When efficiency programs reduce energy consumption (reducing demand) and provide capacity services to the market (increasing supply), the economics of supply and demand indicate that the prices of energy and capacity should both be pushed downward. This generates

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<sup>2</sup> Note that this applies to T&D only, because direct revenue from kWh energy sales volume is already decoupled in Rhode Island.

savings on *all* units of energy (in addition to the direct savings from the reduced energy consumption). These savings are passed on to customers, which puts downward pressure on rates.

The Consultant Team's review finds that National Grid's electric rate and bill impacts model uses methodology consistent with industry standard practices. In particular, the model appropriately develops a counterfactual scenario without energy efficiency, against which to compare the expected impacts of an additional efficiency program year. The model correctly uses expected program savings and system avoided costs to estimate Transmission, Distribution and Capacity Cost savings (B), and uses expected program savings and market price sensitivity to estimate Energy & Capacity Price Suppression (D). In addition, the model estimates Transmission and Distribution Lost Revenue Recovery (C) by calculating what revenues would have been with and without EE, and dividing the difference in revenues by the estimated sales with EE.<sup>3</sup> The SBC (A) is an input to the model, since this is determined during the program planning & budget-setting process.

In addition to confirming that these calculations are implemented correctly, the Consultant Team also verified that appropriate data inputs were used for each program year considered. It was identified that some of the avoided costs used in the Electric Rate and Bill Impacts model did not match values from National Grid's Benefit-Cost model for the same years. This has already been discussed with National Grid staff, who plan to ensure these values are more closely aligned for future program years. In addition, for program year 2019, a typo was identified for the SBC for one sector. This issue appears to have been corrected in the 2020 model and was corrected in the analyses presented below.

## **b. Cumulative Rate Impacts**

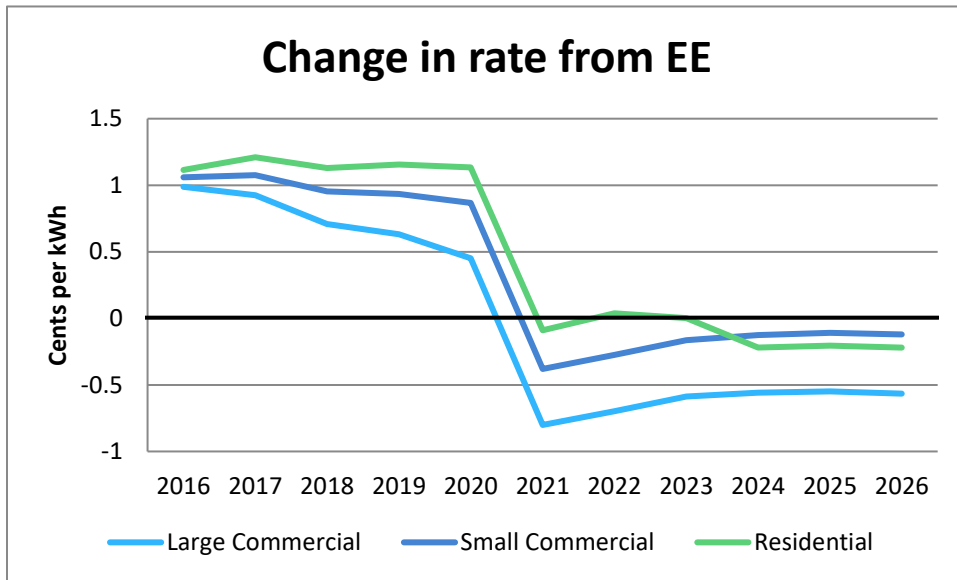
As part of our investigation into the methodology, we took a high-level look at the cumulative impact of the 2016-2020 EE programs on rates. The graph below shows rate impacts by sector over the course of those five years and projected into the future (assuming EE programs ended in 2020)<sup>4</sup>. As expected, since there is no system benefit charge after 2020, the rate impacts become negative beginning in 2021. This means that setting aside the SBC, programs are creating lasting downward pressure on rates. In some sectors, like large commercial, the sum of these persistent rate decreases is often greater than the SBC. This is the mechanism by which non-participants can still receive bill savings from efficiency programs. The modeling expects these bill savings for large commercial sector non-participants in 2020, though they are expected to save only about 13% as much as participants.

**Figure 2. Cumulative Electric Rate Impacts, Program Years 2016-2020**

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<sup>3</sup> It is worth noting that transmission and distribution price suppression are not explicitly included because they are captured as part of the calculation of lost T&D revenues.

<sup>4</sup> The avoided costs used in the rate and bill impact models were updated each year, so that, for example, the 2019 avoided cost predicted for the 2016 program year will not be the same as the 2019 avoided cost predicted in the 2019 program year. This is to be expected, as each model used the best data available at time of assembly.



*Note: In 2018, the models started separately looking at rate impacts from mid-sized commercial customers separately from large and small commercial customers. This sector was examined, and included in the 2020 bill impacts analysis above, but omitted here for historical comparability.*

## CONCLUSIONS

In summary, electric energy efficiency rate and bill impacts have been modeled according to accepted industry standards in recent years. The results of these models affirm that efficiency programs provide significant bill savings for the average utility customer in all sectors. For residential and small commercial customers, non-participants see slightly higher bills, although in 2020 alone it is expected that 100% of residential customers will participate. For large commercial customers, even non-participants save money over the lifetime of each program year’s impacts.