

## 2022 Bill and Rate Impacts

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### Table of Contents

1	Summary .....	1
2	Key Findings .....	1
3	Electric Bill Impacts .....	2
3.1	Methodology.....	2
3.2	Discussion and Interpretation of Electric Results .....	3
4	Gas Bill and Rate Impacts.....	11
4.1	Model Background.....	11
4.2	Model Inputs .....	12
4.3	Summary of Results .....	13
4.3.1	Residential.....	16
4.3.2	Income Eligible .....	19
4.3.3	Small Commercial and Industrial .....	21
4.3.4	Large Commercial and Industrial .....	22
4.4	Discussion and Interpretation of Natural Gas Results .....	25

## 1 Summary

National Grid has performed analyses of the electric and gas bill impacts resulting from the proposed 2022 Energy Efficiency Program Plan pursuant to the updated Least Cost Procurement Standards approved by the RI PUC in Docket 5015. Bill impacts are distinct from rate impacts because they model the effects of efficiency programs on annual customer bills by aggregating rate and consumption changes. In the electric and gas bill impact analysis, rate changes are modeled by mapping energy efficiency (EE) programs to groupings of customers approximating rate classes and estimating changes in both delivery service rates and supply costs due to the EE program charge proposed in the Plan. Consumption impacts are predicted from proposed participation and energy efficiency savings. In the both models, other effects of energy efficiency beyond direct energy savings such as price suppression (both) and avoided infrastructure investments (electric) are also included.

The gas bill and rate impact analysis use a model that was developed by Synapse Energy Economics (Synapse), first used for the 2021 EE Plan, which uses a similar approach as the electric model to estimate the long-term impacts to rates and average bills due to the presence of energy efficiency in one year compared to a counterfactual with no efficiency programs. The gas model is capable of outputting a comparable set of long-term rate and bill impacts as included in the electric modeling in this year and in prior years and is described further in Section 4.

## 2 Key Findings

In this 2022 analysis, National Grid used the same methods as those employed in 2021 for the natural gas analysis. On the other hand, the electric analysis methodology was adjusted which resulted in notable differences in findings – especially in participant bill savings. The key takeaways of the bill impact analyses are:

- Most customers are participating in an EE program, this is partially attributable to the wide reach of the residential home energy reports program that reaches nearly all gas and electric residential customers.
- In the electric portfolio, high participation means that over the lifetimes of the programs proposed for 2022, the average Rhode Island customer's (participants and non-participants combined) bill will be less than or equal to a scenario with no programs. Overall, rates may increase, but energy savings from participation in electric EE programs results in bill savings that offset the costs of the EE program charge and revenue recovery.

In the gas portfolio, the analysis shows slight long-term average rate increases of between 0.33% and 0.77% depending on sector due to the 2022 annual plan. Participants in all programs and customer segment groupings see reductions in their long-term bills due to their 2022 participation.

## 3 Electric Bill Impacts

### 3.1 Methodology

The electric bill impact models used to generate the electric results were adapted from models originally built by Synapse Energy Economics on behalf of the Division of Public Utilities and Carriers in 2013. These models are distinct from the traditional electric bill impacts models the Company presented in Rates proceedings before the PUC. The models analyze two cases: the fulfillment of the 2022 Plan and the absence of an efficiency plan in 2022. This comparison isolates the effects of the proposed 2022 EE program charge and Fully Reconciling Funding Mechanism. It assumes energy efficiency plans have been implemented before 2022 but will not be offered starting in 2022. The analysis also incorporates how system-wide reduction in energy consumption affects the different elements of rates such as transmission, distribution, and commodity charges.

In the 2021 plan, five separate electric models were developed, one for each of the main customer segments: residential, income eligible, small commercial, medium commercial, and large commercial and industrial. In the 2022 plan, both the residential and income eligible models were split into all programs, all programs without Home Energy Reports (HERs), and HERs only. Therefore, the 2022 plan has a total of nine separate electric models. For all models, the key inputs are the net planned participation and savings numbers from Table E-7 in Attachment 5.<sup>1</sup> The models combine these data with rate class information to determine the benefits to customer bills from program participation. Table 1 below shows the mapping of efficiency programs to rate classes for the five models.<sup>2</sup> The diversity seen within the commercial customer profile indicates that customers from multiple rate classes can participate in any commercial program. Assumptions for these rate classes were made based on historical program participation data.<sup>3</sup>

In the 2021 plan, annual net energy savings and annual net participants were assumed constant until the lifetime net energy savings were reached. In the 2022 plan, annual savings and participants reflect the phasing-out of individual programs. For example, HERs is a one-year program that only covers 2022. Now, the savings and participants attributed to HERs are removed from annual savings and participants calculations starting in 2023.

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<sup>1</sup> The 2022 Annual Plan analysis maintains the approach of modeling five rate class groupings as used in the last year's annual plan to allow for a more realistic depiction of bill impacts because there is a wide array of usage among commercial customers and having more groupings helps illustrate typical impacts.

<sup>2</sup> Delivery service rate tariffs is R.I.P.U.C. Tariff No. 2095 for rates A-16 (basic residential rate), A-60 (low-income residential rate), C-06 (small C&I rate), G-02 (medium C&I rate), G-32 (large C&I rate). Standard Offer Service rates used in the analysis are R.I.P.U.C. No. 2096 and R.I.P.U.C. No. 4809 A-16 & A-60 total commodity charge for standard and low income residential rate group, C-06 total commodity charge for small C&I rate group, G-02 total commodity charge for medium C&I rate group and G-32 total commodity charge for large C&I rate group.

<sup>3</sup> Savings and participation modeled by C&I rate classes is partitioned and estimated based on historical data.

In the 2021 plan, long-term average changes in rates and bills were calculated by averaging all non-zero annual values in the study period (2021-2040). In the 2022 plan, these averages now include zero and non-zero values in the study period (2022-2041).

*Table 1. Electric Rate and Program Mapping*

Electric Bill Impact Model	Rate Class(es)	Efficiency Programs
Residential Electric	A-16	Home Energy Reports
		EnergyStar HVAC
		EnergyWise Multifamily
		Residential Consumer Products
Income Eligible Electric	A-60	Income Eligible Single Family
		Income Eligible Multifamily
		Home Energy Reports
Small Commercial	C-06	Small Business Direct Install
		Large Commercial New Construction
		Large Commercial Retrofit
Medium Commercial	G-02	Small Business Direct Install
		Large Commercial New Construction
		Large Commercial Retrofit
Large Commercial	G-32, G-62	Small Business Direct Install
		Large Commercial New Construction
		Large Commercial Retrofit

### 3.2 Discussion and Interpretation of Electric Results

The results of the models are shown in Tables 2 through 10, and general highlights are presented after. The columns in the tables are as follows:

- Long-term rate impacts, defined as the percentage change in average rates from 2022 to 2041
- Typical energy savings, which refer to the average percentage of energy savings to total annual consumption from 2022 to 2041 (negative numbers indicate electricity consumption reduction)
- Typical bill savings, defined as the percentage change in average customer bills from 2022 to 2041 (negative numbers indicate electricity bill reduction)

Long-term rate impacts, typical energy savings, and typical bill savings are shown for average participants in energy efficiency programs, non-participants, and average customers within each of the five main customer segments.<sup>4</sup> Average customers combine the bill impacts of EE participants and non-EE

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<sup>4</sup> As alluded to in section 3.1, residential and income eligible results are split into all programs, all programs without HERs, and HERs only.

customers to show the impacts of all customers combined. For the 2022 Bill Impact analysis, the key finding is that over the proposed lifetimes of 2022 programs, the average participant’s bill and the average customer’s bill will not be higher than a scenario with no programs.

*Table 2. Residential All Programs – Rate and Bill Impact Analysis – A-16 (2022 EE Plan vs. No EE)*

Residential (All Programs)	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.32%	-5.79%	-5.47%
Non-Participant	0.32%	0.00%	0.32%
Average Customer	0.32%	-0.31%	0.00%

*Table 3. Residential All Programs w/o HERs – Rate and Bill Impact Analysis – A-16 (2022 EE Plan vs. No EE)*

Residential (All Programs w/o HERs)	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.32%	-5.90%	-5.60%
Non-Participant	0.32%	0.00%	0.32%
Average Customer	0.32%	-0.27%	0.05%

*Table 4. Residential All Programs – Rate and Bill Impact Analysis – A-16 (2022 EE Plan vs. No EE)*

Residential (HERs Only)	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.01%	-0.06%	-0.05%
Non-Participant	0.01%	0.00%	0.01%
Average Customer	0.01%	-0.05%	-0.03%

Table 5. Income-Eligible All Programs – Rate and Bill Impact Analysis – A-60 (2022 EE Plan vs. No EE)<sup>5</sup>

Income-Eligible (All Programs)	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.59%	-7.29%	-6.74%
Non-Participant	0.59%	0.00%	0.59%
Average Customer	0.59%	-1.54%	-0.97%

Table 6. Income-Eligible All Programs w/o HERs – Rate and Bill Impact Analysis – A-60 (2022 EE Plan vs. No EE)

Income-Eligible (All Programs w/o HERs)	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.54%	-7.65%	-7.17%
Non-Participant	0.54%	0.00%	0.54%
Average Customer	0.54%	-1.49%	-0.96%

Table 7. Income-Eligible HERs Only – Rate and Bill Impact Analysis – A-60 (2022 EE Plan vs. No EE)

Income-Eligible (HERs Only)	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.01%	-0.06%	-0.05%
Non-Participant	0.01%	0.00%	0.01%
Average Customer	0.01%	-0.05%	-0.04%

Table 8. Small Commercial – Rate and Bill Impact Analysis – C-06 (2022 EE Plan vs. No EE)<sup>6</sup>

Small Commercial	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.41%	-8.91%	-8.57%
Non-Participant	0.41%	0.00%	0.41%
Average Customer	0.41%	-0.83%	-0.42%

<sup>5</sup> HERs participation and savings are split between standard residential and income-eligible customers, since this measure reaches all residential customers. For analysis purposes, HERs participation and savings are allocated based on the percent of residential customers in standard income and income-eligible rates. Income-eligible customers account for 7.7% of participation and 7.7% of savings the program.

<sup>6</sup> For 2022, as in the 2021 Plan analysis, the small business (C-06 rate) customer count has been refined to better estimate customers. The number of accounts on the C-06 rate is greater than the number of customers, for example there are many accounts for cell towers, pumps, etc. that belong to one customer. This is an estimate based on the best data currently available to the Company.

Table 9. Medium Commercial – Rate and Bill Impact Analysis – G-02 (2022 EE Plan vs. No EE)

Medium Commercial	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.28%	-5.27%	-5.01%
Non-Participant	0.28%	0.00%	0.28%
Average Customer	0.28%	-0.81%	-0.53%

Table 10. Large C&I – Rate and Bill Impact Analysis – G-32, G-62 (2022 EE Plan vs. No EE)

Large Commercial	Long-Term Rate Impacts	Typical Energy Savings	Typical Bill Savings
	(% of Total Rate)	(% per Participant)	(% of Total Bill)
Average Participant	0.21%	-2.77%	-2.57%
Non-Participant	0.21%	0.00%	0.21%
Average Customer	0.21%	-1.20%	-1.00%

For all residential and income eligible customers, rates and non-participant bills increase while participant bills decrease. For residential customers, average customer bills are flat for all programs, slightly increase for all programs without HERs, and slightly decrease for HERs only. For income eligible customers, average customer bills decrease in all three models.

For all commercial customers, long-term rates and non-participant bills increase while participant and average customer bills decrease. The consistent reduction in average customer bills demonstrates that the energy savings associated with participation in EE programs outweighs the incremental costs required for implementation.

- *Residential long-term rate impact:* EE programs bring system benefits by way of avoided infrastructure investment in generation, transmission, and distribution. These avoided investments will ultimately flow through rates and offset the short-term contribution of the 2022 EE program charge. Long-term rates will drop over time to the values shown in tables 2-7.
- *Small, medium, and large commercial long-term rate impact:* Avoided infrastructure costs flow through rates and offset the 2022 EE program charge, leading to long-term rate increases of 0.41%, 0.28%, and 0.21% for small, medium, and large commercial customers respectively.
- *Average participant bill savings:* The proposed EE programs will provide bill savings to participants in all rate groups.
- For the 2022 Bill Impact Analysis, commercial participation by rate class is assumed to be similar to historical participation from calendar year 2019.
- *Average customer typical bill savings:* The proposed EE programs will provide bill savings to participants in all rate groups except residential all programs (0.00% change) and residential all

programs without HERs (0.05% change). For the majority of customers, the proposed EE programs will provide positive net benefits (Tables 2-10).

**Error! Reference source not found.** through **Error! Reference source not found.** show examples of electric bill reduction for average residential, income-eligible, small C&I, medium C&I and large C&I customers and participants. Bills are calculated based on average annual consumption of a typical customer in Rhode Island in each class, using the values in Table 11.

*Table 11. Average Annual Consumption per Customer in Modeled Customer Classes<sup>7</sup>*

<b>Modeled Customer Class</b>	<b>Average Annual Per-Customer Consumption (kWh/year)</b>
Residential (A-16) All Programs	6,412
Income Eligible (A-60) All Programs	6,377
Small C&I (C-06)	38,362
Medium C&I (G-02)	157,523
Large C&I (G-32 and G-62)	2,281,966

In the figures below, the rates are the same as rates used in the bill impact analysis above. This illustration is different from traditional incremental bill impacts because it shows the long-term bill impact of the proposed EE programs and accounts for the measure life of the energy efficiency measures.

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<sup>7</sup> Average per-customer annual consumption is calculated based on the forecast electric consumption for each rate class for 2021 and the latest customer counts, for all classes except small business C-06. The small business (C-06 rate) average customer consumption has been refined to better estimate customers based on best data currently available to the Company for both count of customers and their annual consumption. The number of accounts on the C-06 rate is greater than the number of customers, for example there are many accounts for cell towers, pumps, etc. that belong to one customer.



Figure 1. Example of Typical Residential (A-16) Participant and Customer Annual Electric Bill Impact (2022 EE Plan vs. No EE)

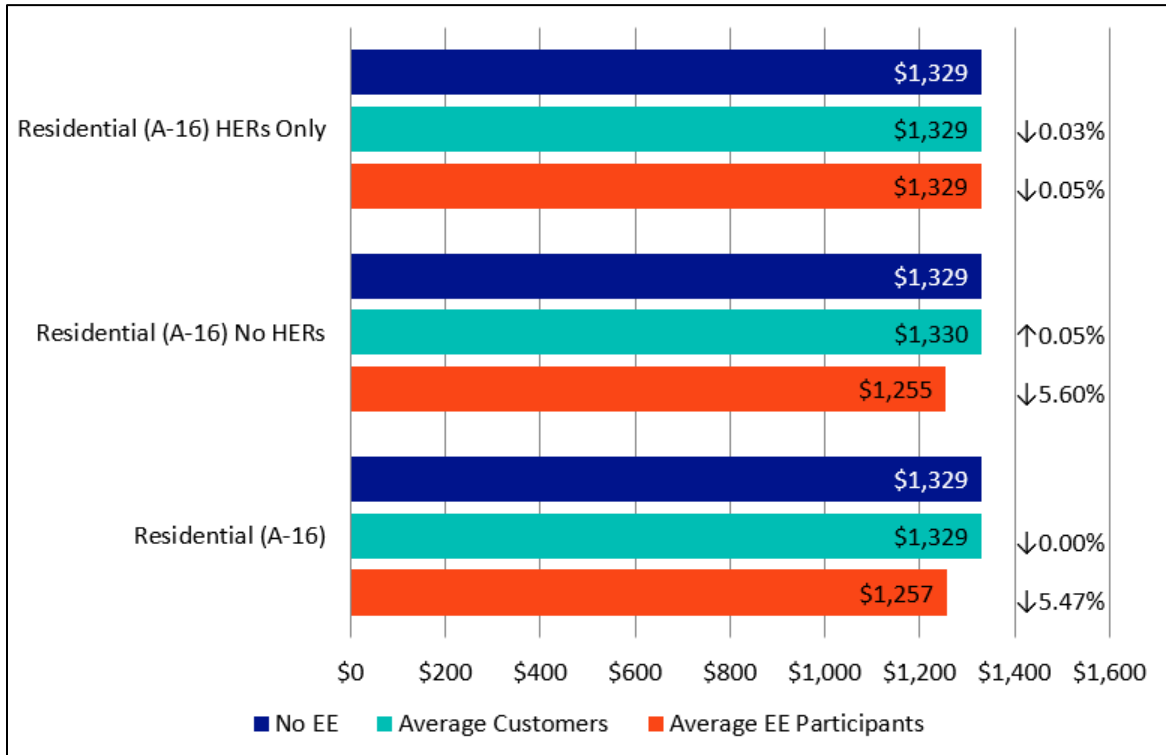


Figure 2. Example of Typical Income Eligible (A-60) Participant and Customer Annual Electric Bill Impact (2022 EE Plan vs. No EE)

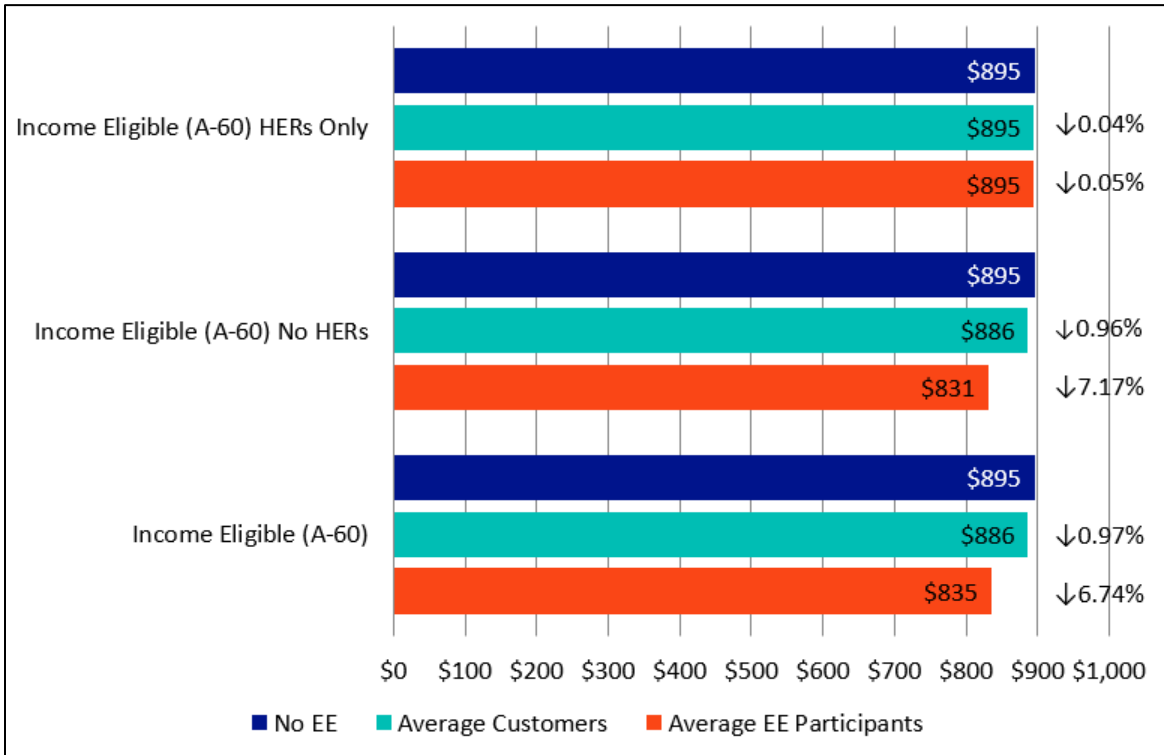


Figure 3. Example of Typical Small C&I (C-06) Participant and Customer Annual Electric Bill Impact (2022 EE Plan vs. No EE)

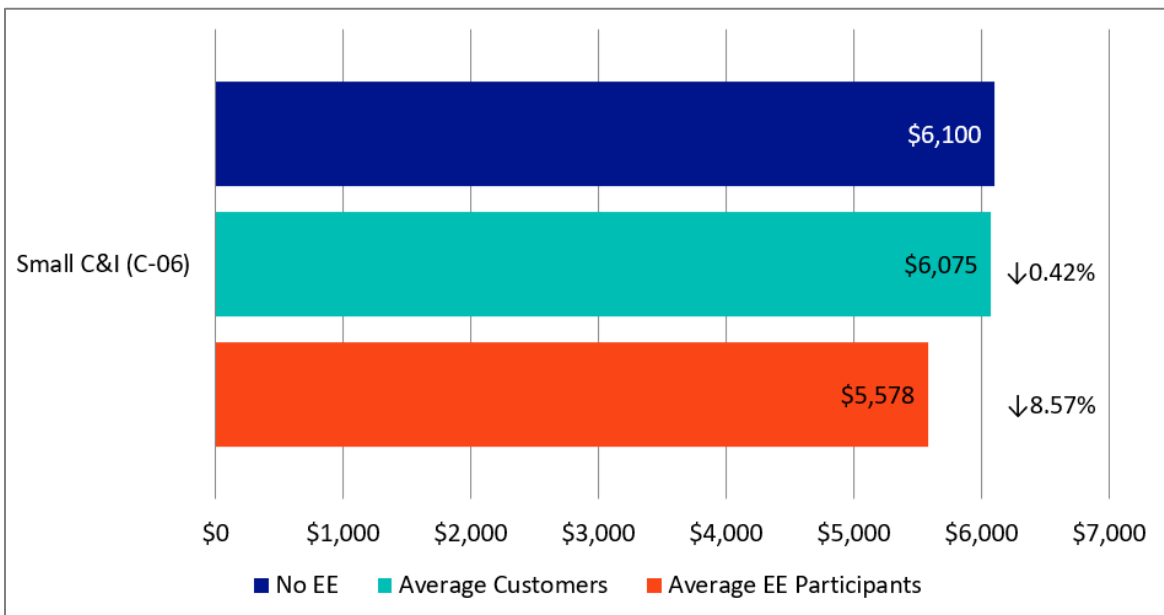


Figure 4. Example of Typical Medium C&I (G-02) Participant and Customer Annual Electric Bill Impact (2022 EE Plan vs. No EE)

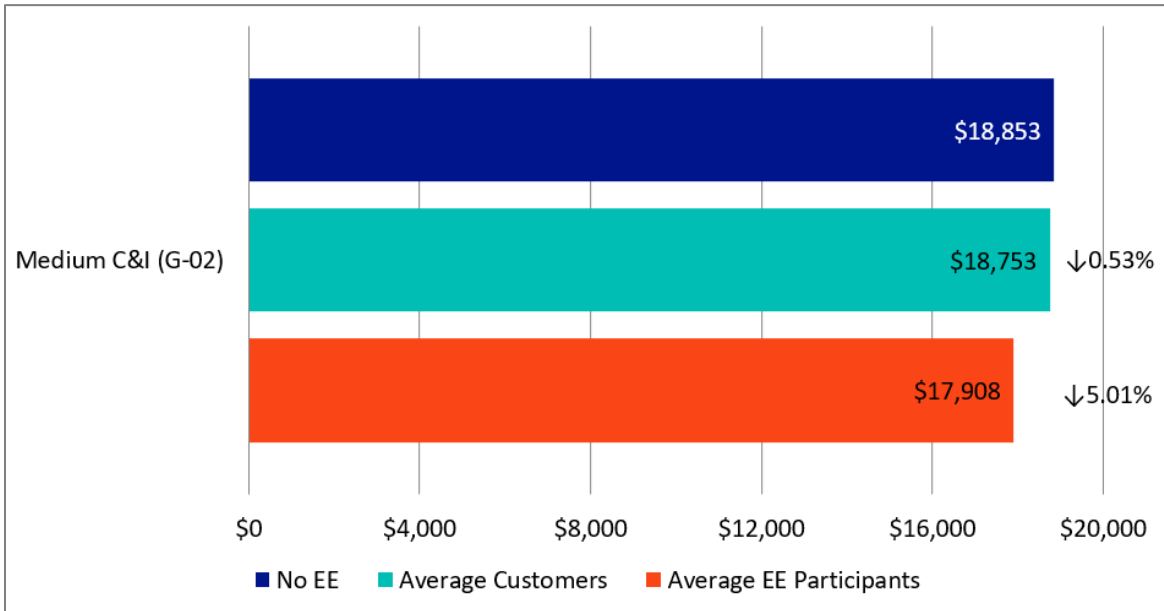
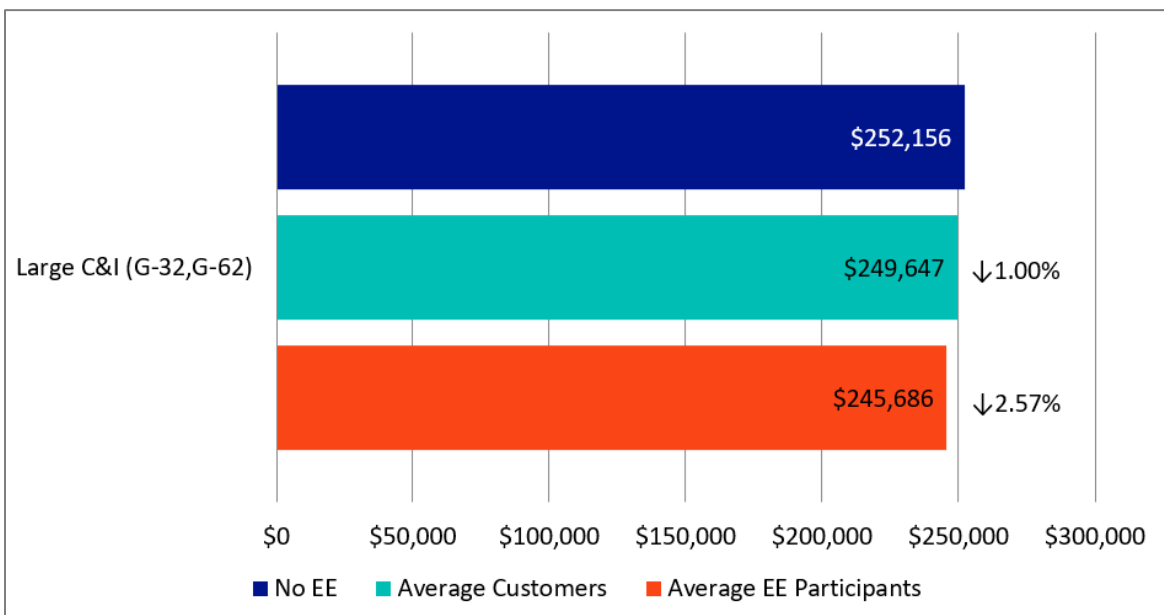


Figure 5. Example of Typical Large C&I (G-32, G-62) Participant and Customer Annual Electric Bill Impact (2022 EE Plan vs. No EE)



## 4 Gas Bill and Rate Impacts

### 4.1 Model Background

The modeling tool developed by Synapse is designed to analyze long-term rate and bill impacts from energy efficiency programs implemented over a course of three years, or one year.<sup>8</sup> The model used in this plan provides a long-term perspective on the impact of one year of gas energy efficiency programs compared to a counterfactual where there is no energy efficiency program in that year. The model considers the upward pressure on rates and bills due to the energy efficiency surcharge in the first year, the upward pressure of lost revenue collection in the first year and future years in which energy efficiency measures create savings, and the downward pressure on rates and bills due to the avoided costs generated by those savings as they persist into the future.

For the analysis presented in this plan and section, the 2022 proposed programs are analyzed. The model assesses four categories of customers. These categories include all the programs offered in the gas portfolio:

- Residential
  - EnergyWise
  - EnergyStar HVAC
  - EnergyWise Multi-family
  - Home Energy Reports
  - Residential New Construction
- Income Eligible
  - Single Family
  - Multi-family
- Small Commercial and Industrial
  - Small Business Direct Install
- Large Commercial and Industrial
  - Commercial New Construction
  - Commercial Retrofit
  - Commercial Multi-family

The model outputs of interest are the forecast changes in rates and the forecast changes in bills due to the proposed energy efficiency investments. The model compares two scenarios: (1) a scenario in which

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<sup>8</sup> The Synapse study introducing this modeling tool is filed in [Docket 5076](http://www.ripuc.ri.gov/eventsactions/docket/5076%20National%20Grid%20EEP%20&%203-Yr%20EEP/1%20Synapse%20RI%20Gas%20RBI%20Report%2010_2_20.pdf): [http://www.ripuc.ri.gov/eventsactions/docket/5076%20National%20Grid%20EEP%20&%203-Yr%20EEP/1%20Synapse%20RI%20Gas%20RBI%20Report%2010\\_2\\_20.pdf](http://www.ripuc.ri.gov/eventsactions/docket/5076%20National%20Grid%20EEP%20&%203-Yr%20EEP/1%20Synapse%20RI%20Gas%20RBI%20Report%2010_2_20.pdf)

no efficiency resources are implemented over the next three years, and (2) a scenario that reflects the proposed investments in efficiency over the same period.

- *Rate impacts* indicate the extent to which rates change for all customers due to utility energy efficiency programs. This includes upward pressure on rates from program cost and lost revenue recovery, as well as downward pressure on rates from avoided utility system costs.
  - *Long-term rate impacts.* The model includes all avoided costs that might exert downward pressure on rates, as well as any factors that might exert upward pressure on rates. It estimates rate impacts over the long-term to capture the full period over which the efficiency savings occur. The resulting impacts are provided in terms of annual net change in rates in dollars per therm, annual percent change in rates, and long-term net change in levelized rates over a 24 year period.
- *Bill impacts* indicate the extent to which customer bills might be reduced for those customers that participate in efficiency programs and how bills will be impacted for non-participating customers.
  - *Typical bill impacts.* The model calculates average annual bill impacts for program participants, all customers, and non-participants. It considers the long-term rate impacts and energy savings for each program and the four customer types. The resulting bill impacts are shown in terms of levelized long-term average dollar change in bills, net-present value of long-term dollar change in bills, and long-term average percent change in bills.

## 4.2 Model Inputs

The model takes as input the following categories of information:

- Energy Efficiency Program Savings (MMBTU). The model takes as input the planned savings for each program in both annual and lifetime savings.
- Participation (#). National Grid projects participation for each program across each year of the plan.
- Avoided Costs (\$). The model takes as input the avoided cost of natural gas and natural gas demand reduction induced price effect (DRIPE) due to gas energy efficiency.
  - The portion of the natural gas avoided cost that impacts rates is limited to the avoided retail margin costs, and price suppression benefits (DRIPE).
  - The model has the capability to be further refined in the future if other components of avoided costs are quantified and monetized, such as gas transmission and distribution values. Those types of costs are included in the electric bill and rate impact but are not included in the gas analysis.

- Programmatic Costs (\$). The costs planned for each program are input to the model on an annual basis based on National Grid's budget and benefit cost analysis models. Sector or portfolio levels costs are also included and allocated to customer groupings proportionally to program specific costs.
- Rates (\$/Therm): Natural Gas rates for customer classes modeled: residential, income eligible, small C&I and large C&I. The rates are averaged from the prevailing rates on September 1, 2020, November 1, 2020, January 1, 2021, April 1, 2021, and May 1, 2021 to capture variability in rates throughout the year.
  - Residential: Rate 12
  - Income Eligible: Rate 13
  - Small Commercial and Industrial: Rate 21
  - Large Commercial and Industrial
    - Large C&I: Weighted average of Rates 22,33,23,34,24. Weighted by program participation in the Large C&I programs for 2018-2019.
    - C&I Multi-family: Rate 22
- Customer Count (#). The latest gas customer counts as of June 2021 by sector are included in the model. These customer counts are escalated out into the future based on projected growth rates.
- Sales Forecast (\$, %). A sales forecast that omits future natural gas energy efficiency savings is utilized in the model to properly characterize the counterfactual state of the world with no energy efficiency programs.

### 4.3 Summary of Results

The following subsections summarize the results of the rate and bill impact modeling for each of the four modeled customer segments. The overall results for the 2022 plan at the sector level are presented in the table below with additional detail provided in subsections and figures below. This analysis projects that each modeled customer sector will see a levelized net change in long term rates of between 0.33% and 0.77% due to the 2022 energy efficiency programs. The first-year cost of the programs combined with the recovery of lost revenue put upward pressure on rates, while avoided costs as detailed earlier generate downward pressure on rates.

The 2022 gas portfolio will result in long term average bill decreases for program participants in the income eligible, small C&I, and large C&I sectors of between 2.61% and 23.55%.

The residential sector is unique in that it includes the Home Energy Report (HER) program. This behavioral program provides recommendations for residential customers to save energy by taking actions in their home, rather than by installing more-efficient equipment. This results in the program having a measure life of only one year, as the evaluated results show that behavioral efficiency of this type has relatively short persistence compared to other residential programs that install longer-lived

measures. The HER program also reaches nearly all residential customers through either mail or email, meaning that nearly all residential customers are participants.<sup>9</sup>

It is therefore instructive to view the rate and bill impacts for the residential sector in three separate modeling analyses:

- 1) Results of the HER program in isolation
- 2) Results of all other residential programs together (EnergyWise, EnergyStar HVAC, EnergyWise Multi-family, Residential New Construction)
- 3) Results with HER and all other residential programs

It is important to note that each of these three parts of the residential sector analysis has been developed using a separate instance of the gas rate and bill impacts model. In the model, the period covered by the analysis is determined by the average measure life of the longest program included which equates to 24 years due to EnergyWise's 23-year measure life and the inclusion of an additional buffer year. The same value of 24 years is applied to each sector and each program within a sector. This is not to suggest that all measures have a measure life of 24 years. Each measure has its own measure life assumption. However, as the study period assumption is applied to all programs, a period is selected that is long enough to capture all the savings from all measures in all sectors. Consequently, the model instance analyzing the Home Energy Report program in isolation models savings only over one year (a much shorter period compared to the other two model instances as mentioned earlier). Therefore, the three instances are not directly comparable, and the first two model instances do not additively result in the third instance.

Additionally, in the model instance that assesses all programs together, HER participants incur costs associated with the non-HER programs, such as lost revenue recovery. These costs are not captured in the model instance analyzing the Home Energy Report program in isolation.

The HER program in isolation shows essentially no change in bills for participants (-0.01%), average customers (0.00%) or non-participants (0.02%). This is to be expected because the number of participants is high enough that the per-participant savings is less than 1 net MMBtu per participant, resulting in minimal change to bills. Taken at the individual level, the savings results are modest, however in aggregate the HER program generates significant net annual savings by reaching most residential customers and doing so at relatively low cost.

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<sup>9</sup> Customers who are not served by the HER program are only excluded due to reasons of evaluability, that is, to assess the savings in a statistically valid way, a control group of sufficient size is required.

When the remaining four residential programs are assessed together, the results show that participants see an average reduction of 4.72% on their bills over the long term, while average customers see a 0.26% increase, and non-participants see an increase of 0.46%. The EnergyWise, EnergyStar HVAC, EnergyWise Multi-family, and Residential New Construction programs have fewer participants than the HERs program, have longer-lived average measure lives (between 17 and 23 years), and generate deeper savings per participant than the HER program, all resulting in deeper bill savings for participants.

Lastly, when all residential programs are modeled together (HER, EnergyWise, EnergyStar HVAC, EnergyWise Multi-family, Residential New Construction), the modeling shows a counterintuitive result of participants realizing a slight increase (0.15%) in their long-term bills. This result is a byproduct of the way that the model considers participants for the residential sector when all residential programs are considered together. To calculate impacts for total participants, the model considers the count of participants in the first year, which involves including the large pool of HER participants, through the duration of the modeling period (24 years). The savings for all the residential programs are therefore spread across a large group of participants, minimizing their impact, and resulting in a conservative assessment of participants' bill impacts.<sup>10</sup>

Because of the truly unique nature of the HER program in terms of its measure life, distribution to most customers, and relatively small per-customer savings relative to other residential programs, the Company believes that in the context of this analysis it is also appropriate to consider the results of the HER program in isolation from the remaining four residential programs. Therefore, the residential programs are modeled with three separate modeling instances as shown below.

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<sup>10</sup> As a sensitivity test, the model was adjusted to allow the count of participants vary by year, depending on when the savings, and consequently participants, drop off from programs due to measure lives. This sensitivity analysis shows the average participant's long-term average change in bills to be -6.54%.



Table 12. Summary of Rate and Bill Changes due to the 2022 Proposed Natural Gas Energy Efficiency Portfolio<sup>11</sup>

Sector	Levelized net change in rates due to 2022 Programs	Long Term Average Change in Bills		
		Non-Participants	Average Customer	Average Participant
Residential (Model 1: HERs only)	0.02%	0.02%	0.00%	-0.01%
Residential (Model 2: All Programs Except HERs)	0.47%	0.46%	0.26%	-4.72%
Residential (Model 3: All Programs)	0.49%	0.48%	0.25%	0.15%
Income Eligible	0.77%	0.77%	-0.17%	-4.28%
Small C&I	0.33%	0.32%	0.19%	-23.55%
Large C&I	0.48%	0.47%	0.02%	-2.61%

Further detail is provided for each sector in the subsections below.

#### 4.3.1 Residential

The Income Eligible sector is modeled using rates from Rate Class 12, Residential Heating. The rate and bill impacts for this sector are modeled for five programs, EnergyWise, EnergyStar HVAC, EnergyWise Multi-family, Home Energy Reports, and Residential New Construction. The residential sector is modeled using an annual consumption figure of 845 therms per year, of which 699 therms are winter usage and 146 therms are summer usage determined by dividing sales for the sector by meter counts. The customer population is modeled using latest customer counts as of June 2021, 210,641 accounts, and projected forward based on observed compound annual growth rate of customers in this rate class between 2016 and 2021.

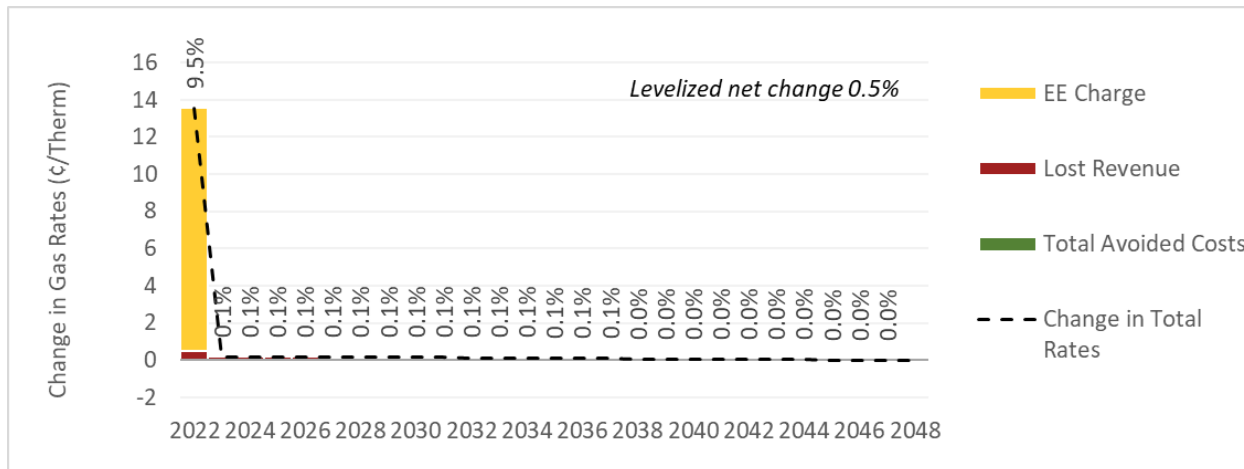
##### 4.3.1.1 Residential Rates

For the residential sector the 2022 Plan creates a levelized net change in rates of 0.5% (Figure 6) compared to the counterfactual with no energy efficiency.

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<sup>11</sup> Rate impact is the same as the non-participant bill impact, since non-participants have no savings to offset the change in rates. Some values for these two categories differ slightly due to rounding in the model.

Figure 6. Change in Rates: Proposed EE vs No EE for the 2022 Plan - Residential



#### 4.3.1.2 Residential Bills

As discussed in the Summary of Results (Section 4.3), the residential programs should be considered in three distinct modeling iterations. First the HER program is assessed in isolation, then the four remaining programs are considered together, and finally all programs are combined in a single analysis. For purposes of characterizing the bill impacts from the residential programs, the results of the first model illustrate that for the HER program in isolation, there is minimal change in long-term average bills, with only a 0.01% reduction for participants. This result is reasonable given the short duration of savings for the HERs program and the small per-participant savings generated by this program.

Figure 7. 2022 Long-Term Levelized Average Change in Annual Bills – Residential, HER Program Only

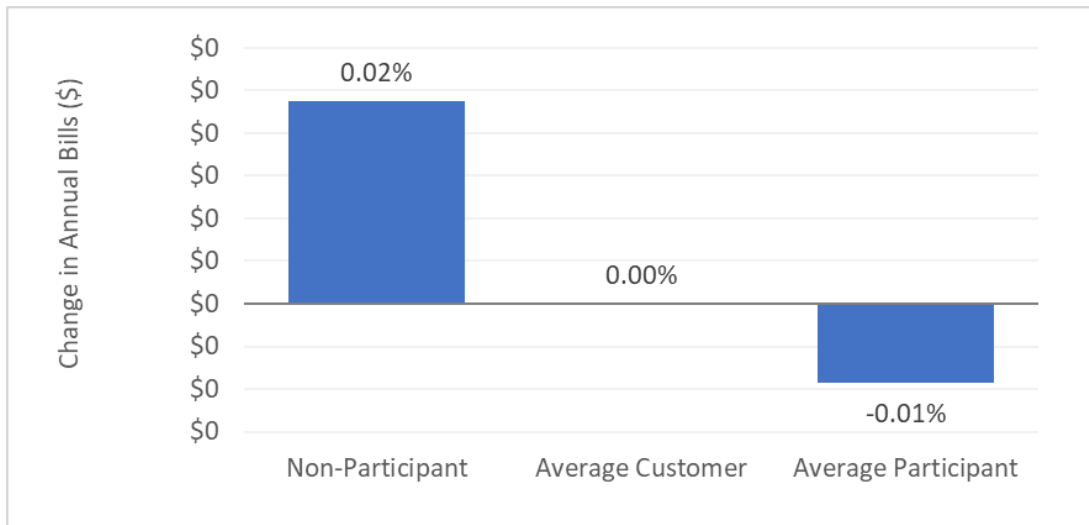
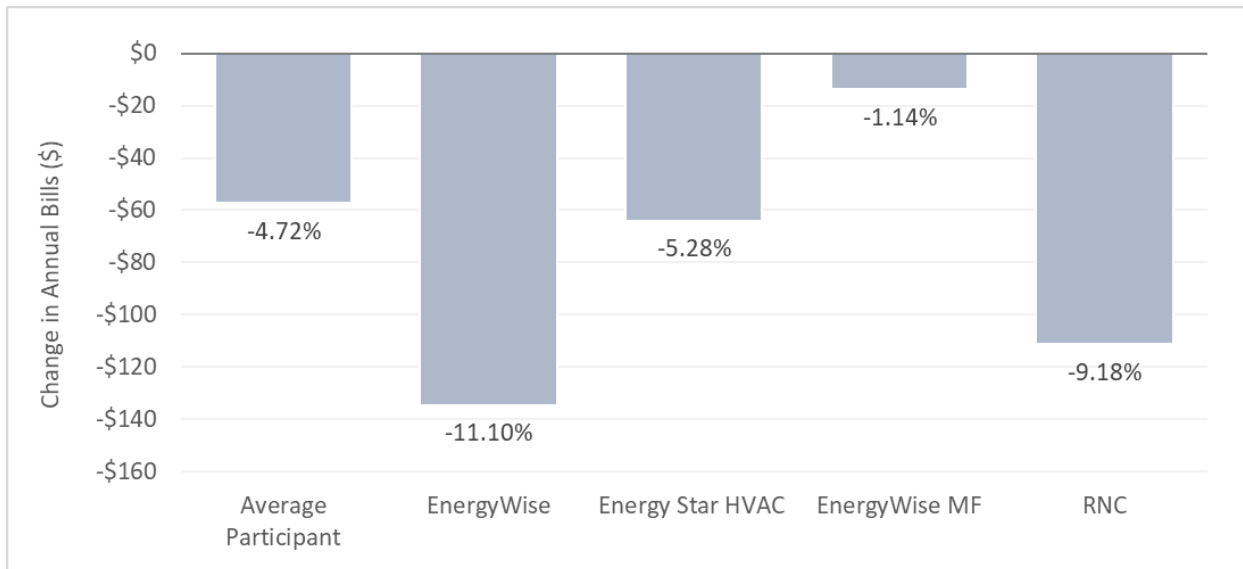


Figure 8 shows the long-term average bill change for program participants in the EnergyWise, Energy Star HVAC, EnergyWise Multi-family, and Residential New Construction programs. The average bill savings range from 1.14% to 11.10% among these programs.

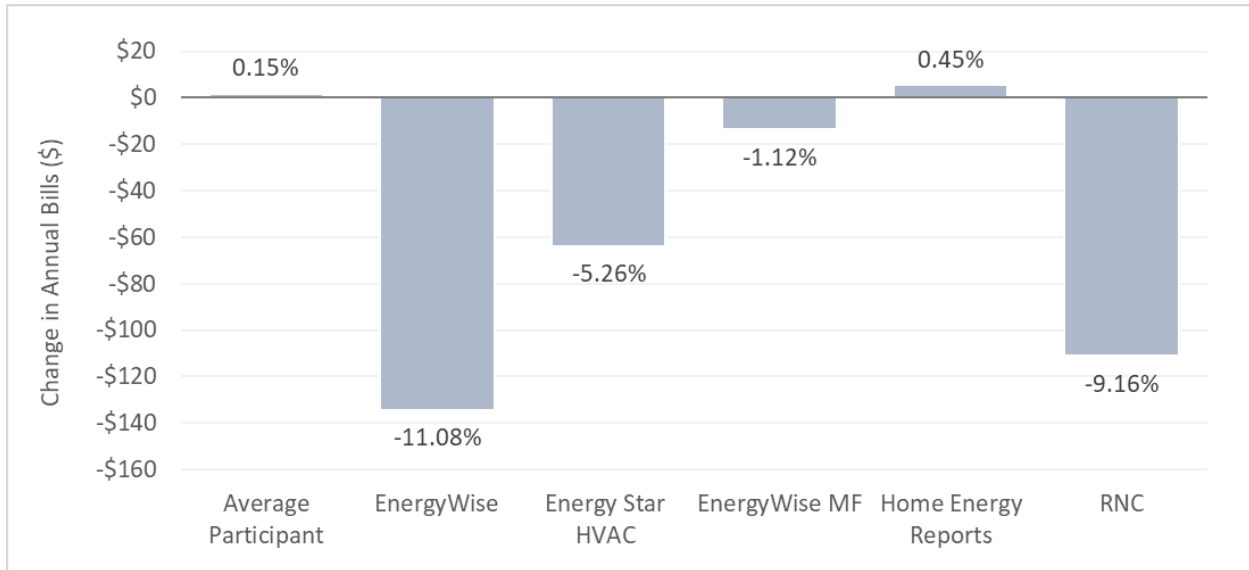
Figure 8. 2022 Long-Term Levelized Average Change in Annual Bills by Program Participants –Residential, HER Excluded



Lastly, Figure 9 shows the impacts for all residential programs together. As discussed previously, these results should not be indicative of a true increase in bills among program participants, but rather result

from the combination of the disparate nature of the programs included in this model scenario and how their respective inputs interact in the model.

Figure 9. 2022 Long-Term Levelized Average Change in Annual Bills by Program Participants – All Residential



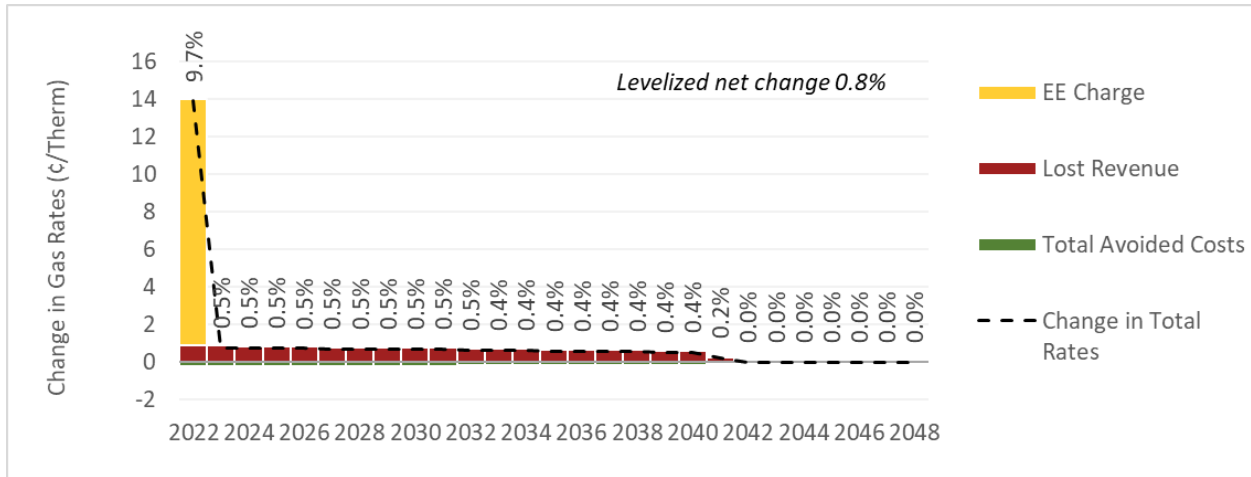
#### 4.3.2 Income Eligible

The Income Eligible sector is modeled using rates from Rate Class 13, low income residential heating. The rate and bill impacts for this sector are modeled for two primary programs, the income eligible single family and income eligible multifamily programs. Income eligible customers also participate in the home energy reports program that is modeled as part of the residential sector in this analysis. The income eligible sector is modeled using an annual consumption figure of 841 therms per year, of which 690 therms are winter usage and 151 therms are summer usage determined by dividing sales for the sector by meter counts. The customer population is modeled using latest customer counts as of June 2021, 19,978 accounts, and projected forward based on observed compound annual growth rate of customers in this rate class between 2016 and 2021.

##### 4.3.2.1 Income Eligible Rates

The 2022 programs addressing the income eligible market are projected to result in a 0.8% levelized increase in rates for the income eligible sector (Figure 10). Compared to the residential sector, which has similar usage as the income eligible sector, the relative impact to rates is larger for this customer group partially because the energy efficiency charge represents a larger portion of the overall per-therm cost because distribution adjustment charges (DAC) are lower for income eligible customers than residential customers.

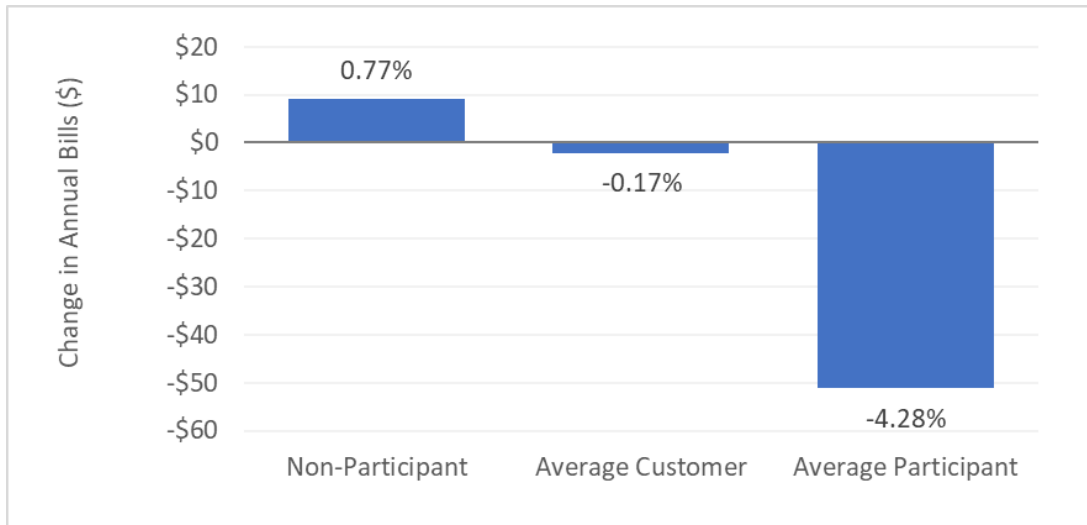
Figure 10. Change in Rates: Proposed EE vs No EE for the 2022 Plan – Income Eligible



4.3.2.2 Income eligible Bills

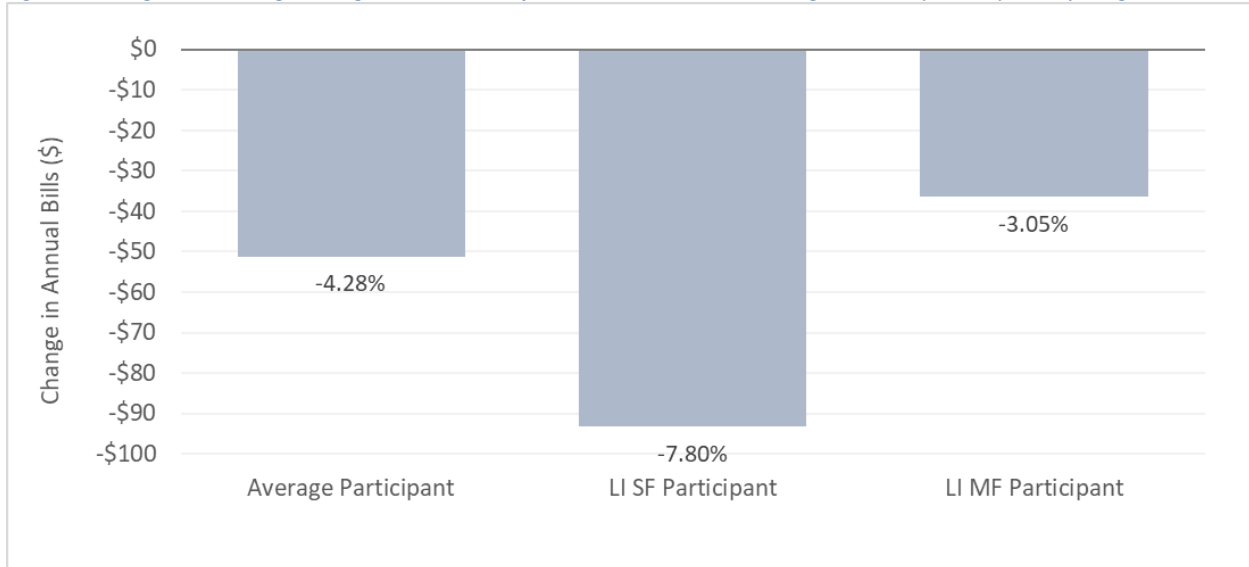
The income eligible programs planned in the 2022 plan will result in a long-term average reduction in bills for participating customers of 4.28% on average. Average customers will see a 0.17% reduction in annual bills and non-participants will see a 0.77% increase in bills.

Figure 11. Long-Term Average Change in Annual Bills for the 2022 Plan– Income eligible Customer Group



Analyzing each program individually, participants in the single-family income eligible program will see an average of 7.80% reduction in annual bills due to their 2022 participation, while multi-family income eligible participants will see an average 3.05% reduction in annual bills over the long-term.

Figure 12. Long-Term Average Change in Annual Bills for the 2022 Plan– Income Eligible Participant Impacts by Program



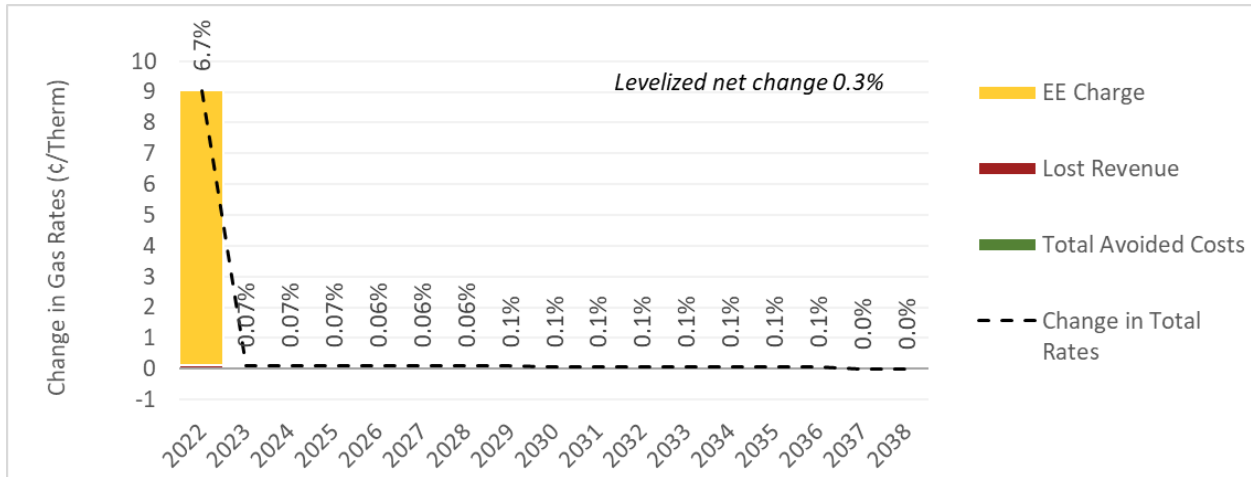
#### 4.3.3 Small Commercial and Industrial

The Small Commercial and Industrial sector is modeled using rates from Rate Class 21, Small (< 5,000/yr). The rate and bill impacts for this sector are modeled for the Small Business Direct Install program. The Small Commercial and Industrial sector is modeled using an annual consumption figure of 1,270 therms per year, of which 1,062 therms are winter usage and 208 therms are summer usage determined by dividing sales for the sector by meter counts. The customer population is modeled using latest customer counts as of June 2021, 19,091 accounts, and projected forward based on observed compound annual growth rate of customers in this rate class between 2016 and 2021.

##### 4.3.3.1 Small Commercial and Industrial Rates

The 2022 program addressing the small C&I market are projected to result in a 0.3% levelized increase in rates for the commercial and industrial sector (Figure 13).

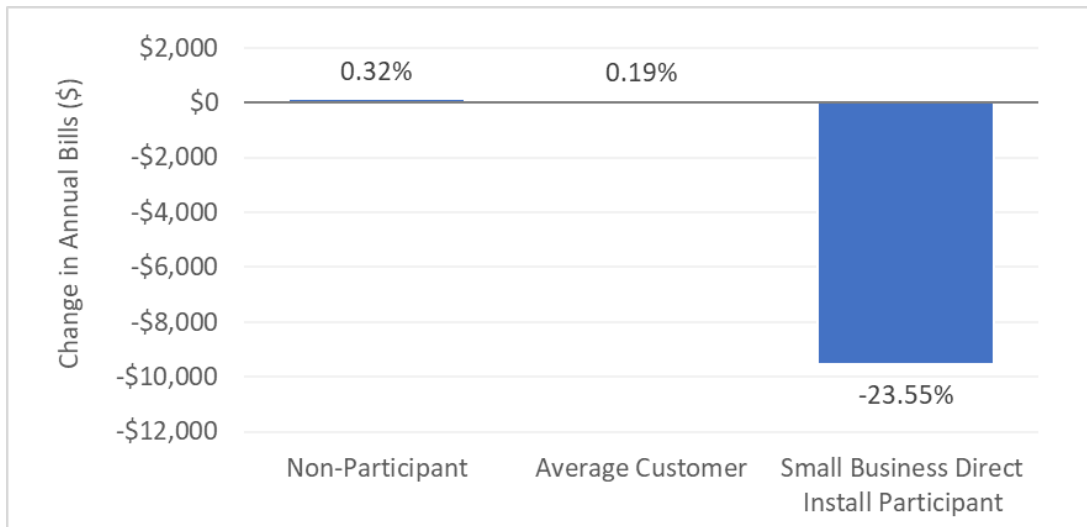
Figure 13. Change in Rates: Proposed EE vs No EE for the 2022 Plan – Small Commercial and Industrial



#### 4.3.3.2 Small Commercial and Industrial Bills

The Small Commercial and Industrial program will result in an average annual bill reduction of 23.55% for participants in the Small Business Direct Install program (Figure 14).

Figure 14. Long-Term Average Change in Annual Bills for the 2022 Plan– Small Commercial and Industrial



#### 4.3.4 Large Commercial and Industrial

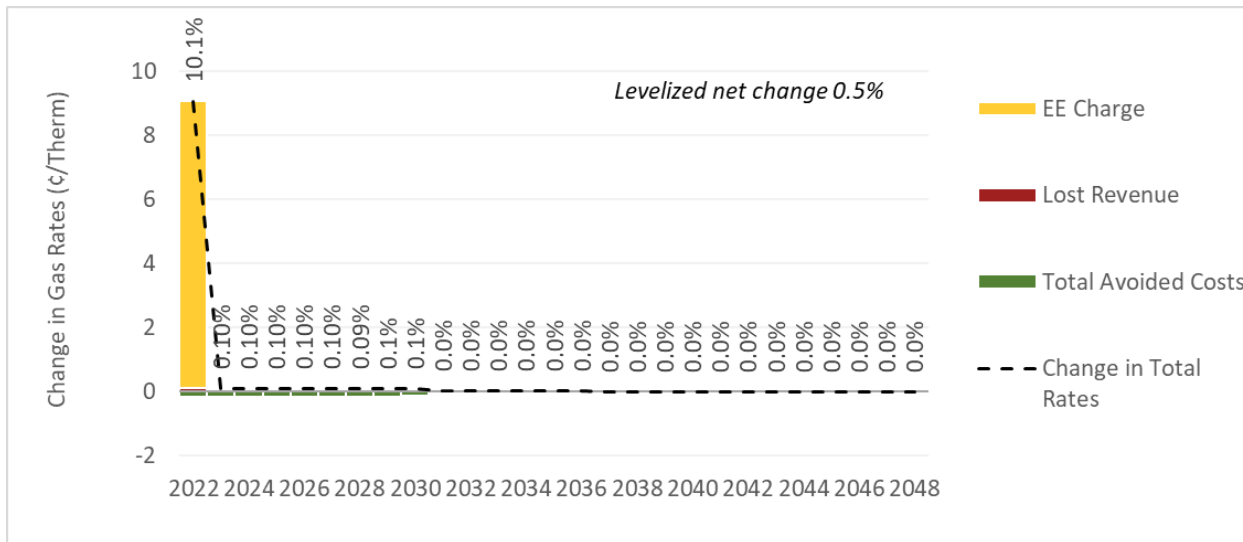
The Large Commercial and Industrial sector is modeled using rates from Rate Classes 22, 33, 23, 34, and 24. The rate and bill impacts for this sector are modeled for the Commercial New Construction, Commercial Retrofit, and Commercial Multi-family programs. The Large Commercial and Industrial sector is modeled using an annual consumption figure of 544,429 therms per year, of which 300,304

therms are winter usage and 244,125 therms are summer usage determined by dividing sales for the sector by meter counts. The customer population is modeled using latest customer counts as of June 2021, 5,879 accounts, and projected forward based on observed compound annual growth rate of customers in this rate class between 2016 and 2021. Consumption among participants is modeled using usage observed among the large C&I program participants in the 2018 and 2019 programs and for the medium C&I class for C&I multifamily participants.

4.3.4.1 Large Commercial and Industrial Rates

The 2022 programs addressing the large C&I market are projected to result in a 0.5% levelized increase in rates for the commercial and industrial sector.

Figure 15. Change in Rates: Proposed EE vs No EE for the 2022 Plan – Large Commercial and Industrial

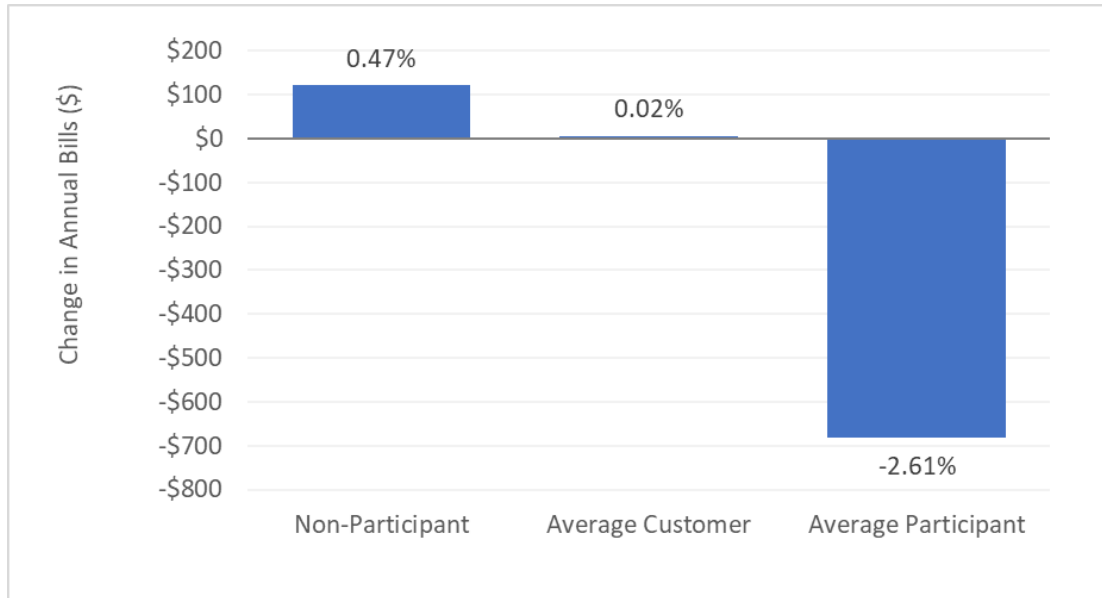


4.3.4.2 Large Commercial and Industrial Bills

The large commercial and industrial programs will result in an average annual bill reduction of 2.61% for participants.

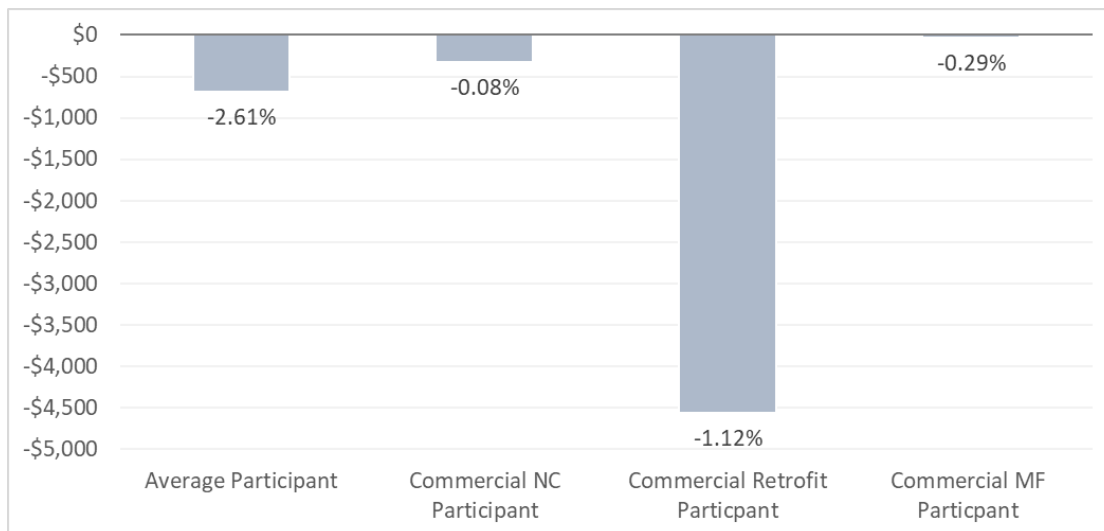


Figure 16. Long-Term Average Change in Annual Bills for the 2022 Plan– Large Commercial and Industrial Group



Analyzing each program individually, commercial retrofit participants will see a reduction of 1.12%, while participants in the commercial new construction program and the commercial multi-family programs will see smaller reductions in their bills with changes of 0.08% and 0.29%, respectively.

Figure 17. Long-Term Average Change in Annual Bills for the 2022 Plan– Large Commercial and Industrial Participant Impacts by Program



#### 4.4 Discussion and Interpretation of Natural Gas Results

While this analysis indicates that for the proposed natural gas efficiency investments there is slight upward movement of rates, as with most customer segments in the electric portfolio, the results should not be viewed in isolation and are one component that the Company considers in its proposed energy efficiency plan. For each customer segment the modeling shows reductions in long-term bills due to customer participation in the programs. In addition to the rate and bill impacts, the Company considers both the benefit cost results and the cost of supply in developing its proposal. The portfolio of programs is highly cost effective per the RI Test analysis and less than the cost of supply. The 2022 gas portfolio overall has a BC ratio of 2.74 under the RI Test and cost of supply analysis shows that the cost of energy efficiency is \$18.9 Million less than the cost of alternative gas supply.

Note that the RBI model excludes several key benefits of energy efficiency. For example, the price of carbon is not fully accounted for in National Grid's natural gas rates. Efficiency programs reduce carbon and other greenhouse gas emissions, which is not accounted in this model but is accounted for in the BCA as a non-embedded benefit. Likewise, the gas efficiency programs create non-energy benefits that are not accounted for in this model but are included in the BCA.

As noted earlier, a key distinction between the gas model and the related electric model is the limited set of gas avoided costs. The portion of the natural gas avoided cost that impacts rates is limited to the avoided retail margin costs, and price suppression benefits (Demand Reduction Induced Price Effects or "DRIPE"). In contrast, in the electric model there are embedded RGGI costs in rates and the electric model also accounts for T&D avoided costs. The gas model has the capability to incorporate a T&D avoided cost in the future should one be developed in the future, but it is not currently accounted for in the calculation of long-term rates in the present analysis.

The Company will reassess the inputs and assumptions in this analysis for each subsequent annual efficiency plan filing and make updates to the analysis and model as appropriate to continue to incorporate latest information and understanding of the impacts of the gas programs on long-term energy costs and customer bills.