Appendix A: Modeling of Decarbonization Actions

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

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Avangrid

A member of the Iberdrola Group

CONTENTS

Appendix A: Modeling of Decarbonization Actions

I. Overview

This appendix begins with a description of the "global assumptions" that apply to the modelling of all decarbonization actions (Section II), followed by a detailed discussion of the modeling of each decarbonization action (Sections III-XII). The modeling of each decarbonization action requires several assumptions related to per unit costs and per unit changes in gas and electric use, as well as inputs related to when the decarbonization action begins (i.e., start year) and the adoption rates over the 20-year LTP period. Certain assumptions vary by scenario, as discussed for each decarbonization action. The outputs for each decarbonization action include incremental installation and/or implementation costs, gas usage reductions and associated gas bill savings, electric usage increases and associated electric bill increases, and GHG emission reductions. The modeling outputs for the scenarios defined by the Companies and CRA/Stakeholders and the LTP are provided in Appendix D.

II. Global Assumptions

A. System Assumptions

As presented in Table A-1:

- Shrinkage refers to the difference between the amount of gas received by NYSEG and RG&E's distribution systems at its citygates and the amount of gas delivered through its customer meters.
- Gas heating value refers to the heat content of gas per volume. It allows for conversion between volumetric measurements (e.g., Mcf) and heat content measurements (e.g., MMBtu).

Table A-1
System Assumptions

	NYSEG	RG&E
Shrinkage Rate	0.01%	0.51%
Gas Heating Value (MMBtu/Mcf)	1.03	1.03

B. Inflation Rate

Table A-2 presents the annual inflation rate sourced from Blue Chip Economic Indicators as well as the cumulative factor from a base of 2022.

Table A-2
NYSEG and RG&E Inflation Forecast

Inflation	GDP Chained Price Index (Q2 to Q2) [1]	Inflation Adj Factor (Cumulative from 2022)
2024	2.60%	106%
2025	2.10%	109%
2026	2.10%	111%
2027	2.20%	113%
2028	2.10%	116%
2029	2.10%	118%
2030	2.10%	121%
2031	2.10%	123%
2032	2.10%	126%
2033	2.10%	128%
2034	2.10%	131%
2035	2.10%	134%
2036	2.10%	137%
2037	2.10%	139%
2038	2.10%	142%
2039	2.10%	145%
2040	2.10%	148%
2041	2.10%	152%
2042	2.10%	155%
2043	2.10%	158%

(1) Source: Blue Chip Economic Indicators, March 10, 2023, p. 14 and Blue Chip Economic Indicators, July 10, 2023, p. 5.

C. Cost of Capital

The cost of capital assumption in Table A-3 is based on the Joint Proposal in NYSEG/RG&E's current rate case.

Table A-3
Cost of Capital (Weighted)

	NYSEG	RG&E
WACC	**6.58%**	**6.80%**

Source: NY PSC Case 22-E-0317 Order Adopting Joint Proposal, October 12, 2023. Rate Year 3.

D. Electric Generation Emission Rates

Forecasted electric generation emission rates assumed for all NYSEG and RG&E scenarios and LTP are provided in Table A-4. These composite emission rates are based on EPA's eGrid emissions rates by fuel

stock[1] applied to EIA's 2023 AEO reference case forecasted generation mix. Linear interpolation is used to estimate the composite emissions rate between 2025 and 2040, when it is assumed the CLCPA target of zero-emission generation is achieved.

Table A-4
Forecasted Electric Generation Emission Rates, lb/MWh

	CO2	CH4	N2O	CO2e
2024	252.10	0.5000	0.0025	294.76
2025	236.34	0.4688	0.0023	276.34
2026	220.58	0.4375	0.0022	257.91
2027	204.83	0.4063	0.0020	239.49
2028	189.07	0.3750	0.0019	221.07
2029	173.32	0.3438	0.0017	202.65
2030	157.56	0.3125	0.0016	184.22
2031	141.80	0.2813	0.0014	165.80
2032	126.05	0.2500	0.0012	147.38
2033	110.29	0.2188	0.0011	128.96
2034	94.54	0.1875	0.0009	110.53
2035	78.78	0.1563	0.0008	92.11
2036	63.02	0.1250	0.0006	73.69
2037	47.27	0.0938	0.0005	55.27
2038	31.51	0.0625	0.0003	36.84
2039	15.76	0.0313	0.0002	18.42
2040	-	-	-	-
2041	-	-	-	-
2042	-	-	-	-
2043	-	-	-	-

III. Weatherization

A. Residential Weatherization

1. Methodology

The modeling of residential weatherization involves upgrades to a home's building envelope. Total installation costs and anticipated gas savings are dependent on assumed participation rates. All scenarios defined by the Companies and CRA/Stakeholders, with the exception of the Companies' Delayed Achievement scenarios, assume residential weatherization participation starts in 2027 at 1% and ramps up at a rate of 0.25%/year resulting in cumulative weatherization of 51% of existing homes through 2043. This accelerating participation rate is adequate to add insulation to approximately the proportion of

[1] United States Environmental Protection Agency. Emissions & Generation Resource Integrated Database (eGrid), NPCC Upstate NY subregion year 2021 data (SRL21).

homes in NYSEG and RG&E's service areas that the Companies have identified as needing additional insulation. The Delayed Achievement scenarios assume residential customers will participate in weatherization at half the rate of the other scenarios.

2. Assumptions, Inputs, Sources

Assumptions for per home installation costs, reduction in gas usage, and annual participation rates were sourced from NYSEG and RG&E's Energy Efficiency Portfolio Proposal 2026-2030 as well as insights from the Companies' subject matter experts.[2] Costs associated with the programs are presented on a cost per natural gas savings ($/MMBtu) basis, and have been grossed up to reflect 100% of the program cost, as opposed to just the utility cost share that is present in the Companies' proposal. The resulting 2030 weatherization cost estimates are escalated by the Companies' inflation forecast through 2043. NYSEG and RG&E's cost and gas usage reduction assumptions are presented in Tables A-5 and A-6, respectively.

Table A-5
NYSEG Cost of Weatherization

	2026	2027	2028	2029	2030
Cost per Gas Savings ($/MMBtu)	$60.24	$61.44	$62.66	$63.90	$65.17

Table A-6
RG&E Cost of Weatherization

	2026	2027	2028	2029	2030
Cost per Gas Savings ($/MMBtu)	$72.48	$73.92	$75.39	$76.88	$78.41

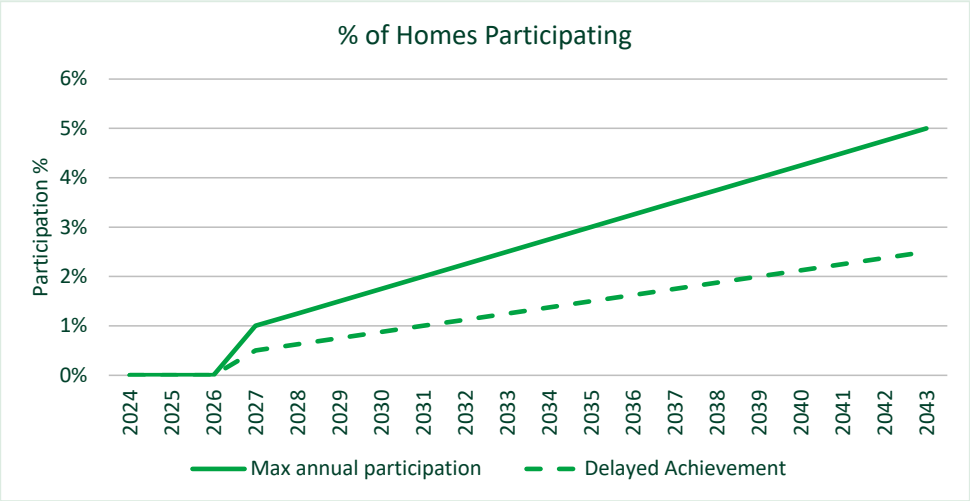
Table A-7
NYSEG and RG&E Weatherization Per Home Natural Gas Savings

Natural Gas Saving per Home (MMBtu)	21.25

Figure A-1 depicts the annual participation rate assumptions for the residential weatherization program for both NYSEG and RG&E. The maximum participation rate results in 51% of existing homes being weatherized by 2043, which is approximately the proportion of homes that require improved insulation in NYSEG and RGE service territories. The maximum participation rate is used for the LTP, and all scenarios defined by the Companies and CRA/Stakeholders, but for the Companies' Delayed Achievement scenarios. The Delayed Achievement scenarios assume residential customers will participate in weatherization at levels equal to half the maximum participation rate.

[2] Case 18-M-0084, *In the Matter of a Comprehensive Energy Efficiency Initiative,* Energy Efficiency Portfolio Proposal, January 16, 2024.

Figure A-1
Residential Weatherization Annual Customer Participation Rate



3. Scenario and LTP Inputs

The modeling of the residential weatherization program differs with respect to customer participation levels. All scenarios and the LTP start in 2027.

- The residential weatherization decarbonization action in the **CLCPA scenarios** and the **CRA/Stakeholder scenarios** assumes 1% of homes weatherize in year 2027 with subsequent participation rates increasing by 0.25% per year.
- The residential weatherization decarbonization action in the **Delayed Achievement scenarios** assumes 0.5% of homes weatherize in year 2027 with subsequent participation rates increasing by 0.125% per year.
- The residential weatherization decarbonization action in the **LTP** assumes 1% of homes weatherize in year 2027 with subsequent participation rates increasing by 0.25% per year.

4. Residential Weatherization Federal Incentives and Rebates

Participating residential customers are assumed to receive income level dependent weatherization High Efficiency Electric Home Rebate Act ("HEEHRA") point-of-sale rebates and tax credits from the 2022 Inflation Reduction Act ("IRA"). These federal rebate and tax credit programs are assumed to be not limited by annual budgets and extended through 2043.

To calculate incentive and credit amounts, the model first estimates the total number of homes participating in weatherization each year and allocates the number of participating homes by income level based on the percentages shown in Table A-8 below.

Table A-8
% of Households by Income Level

Income Level	NYSEG	RG&E
Low Income	44%	48%
Moderate Income	27%	28%
Non-LMI	29%	24%

Source: Interpolated from NYSEG and RG&E's 2022 Natural Gas and Grid Modernization Study, Appendix N Special Study #5. Exhibit 181: Household Annual Income in 2020 from American Community Survey. (May 16, 2022)

Consistent with federal programs, low income households are defined as households with income levels equal to 80% or below of New York State's median household income level. Moderate income households are defined as households with income levels greater than 80% but no more than 150% of NYS medium income level.

The model then calculates the amounts of weatherization HEEHRA rebates and IRA credits shown in Table A-9 by household income level.

Table A-9
Residential Weatherization – HEEHRA Rebates and IRA Credits

Income Level	Rebate/Credit % of Cost	Maximum Rebate/Credit	Federal Program
Low Income[(1)]	100%	$1,600	HEEHRA
Moderate Income[(1)]	50%	$1,600	HEEHRA
Non-LMI[(2)]	30%	$1,200	IRA

(1) Source: HEEHRA Rebates 2024-2025: Get up to $14,000 in government funds for upgrading the energy efficiency of your homes' central air and appliances, AC direct, November 13, 2023.
(2) Source: Making Our Homes More Efficient: Clean Energy Tax Credits for Consumers, U.S. Department of Energy, December 21, 2022.

5. Residential Weatherization Utility/NYSERDA Incentives and Rebates

Participating residential customers are assumed to receive rebates for 80% of weatherization costs from either utility or NYSERDA sponsored programs. This percentage of rebate is consistent with the Companies' current Energy Efficiency Portfolio Proposal but assumes utility and NYSERDA programs are extended indefinitely and will not be limited by annual budgets.

B. Commercial and Municipal Weatherization

1. Methodology

The modeling of commercial and municipal weatherization programs is based on high-level assumptions regarding cost per unit of natural gas usage reduction because these classes of customers are more diverse than residential customers and there is limited data on the costs and savings associated with commercial and municipal weatherization programs. Weatherization upgrades to a building envelope reduce energy use for both heating and cooling. Estimated reductions in air conditioning load are computed by applying the gas usage reduction to the estimated air conditioning electric load.

2. Assumptions, Inputs, Sources

The estimated weatherization costs on a cost per gas savings basis, which are used for both NYSEG and RG&E, are shown in Table A-10. Participating commercial and municipal customers are assumed to receive utility or NYSERDA sponsored incentives that cover 70% of weatherization costs.

Table A-10
Commercial and Municipal Weatherization Cost

Existing Building Envelope Renovation	Commercial	Municipal
Renovation Cost, $2023/MCF	$ 279.57	$ 279.57

Sources: National Grid – NY Total Building Comfort Program Incentive $19/therm, up to 70% of cost of building envelope improvements

3. Scenario and LTP Inputs

The modeling of the commercial and municipal weatherization programs differ with respect to assumed gas savings per year, as summarized in Table A-11. All scenarios and the LTP start in 2027.

Table A-11
Commercial and Municipal Weatherization Assumed Load Reduction

CLCPA Scenarios, CRA/Stakeholder Scenarios and LTP	Delayed Achievement Scenarios
• **Commercial**: 0.5% heat load reduction/year • **Municipal**: 1% heat load reduction/year	• **Commercial**: 0.25% heat load reduction/year • **Municipal**: 0.5% heat load reduction/year

IV. Electrification – Generic Assumptions (Applicable to All Classes)

A. Overview

Electrification is the process of replacing existing gas-powered equipment with electric equipment. Electrification options are modeled separately for NYSEG and RG&E's residential, commercial, municipal, and industrial customer segments. The overall approach to modeling electrification for existing buildings involves assumptions for (1) the pace at which conversions occur, (2) the type of gas-fired equipment replaced, and (3) the type of electric equipment installed. This section describes the generic assumptions that are used across all electrification models. The customer segment-specific electrification modeling details are described in Sections V through VII of this Appendix.

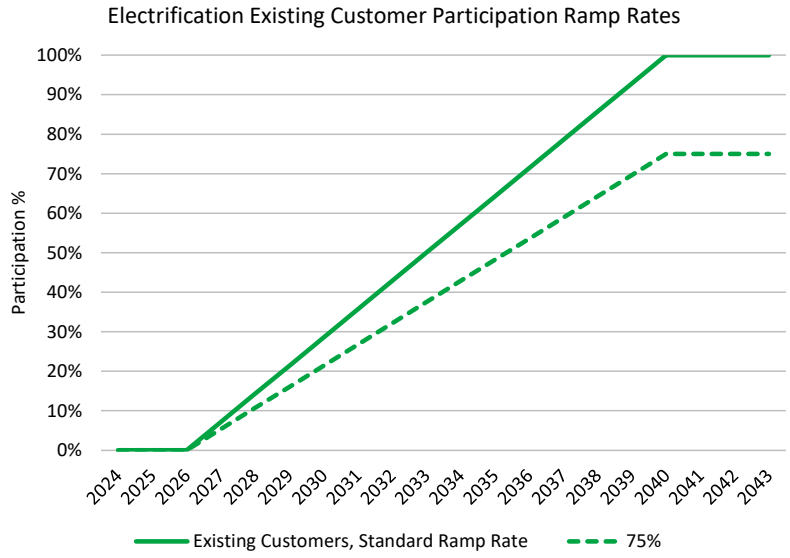
B. Pace of Conversion

Electrification conversions of heating systems are assumed to occur at the end of the expected life of existing central air conditioning equipment and heating systems. It is assumed that the pace of

conversions at equipment failure starts modestly in 2027, increases linearly over time as customer acceptance of electrification grows, and achieves maximum conversions for the last four years of the study (2040-2043).[3] This standard adoption rate curve is illustrated in Figure A-2 (solid line). This curve is shifted as necessary to achieve the GHG emissions savings indicated by the scenario, or as specified for the LTP. For example, the LTP assumes that residential customers will achieve a maximum participation rate of 75%, so each point of the standard adoption rate curve in Figure A-2 is multiplied by 75% for the LTP (as shown by the dotted line).

This standard ramp rate curve, as shifted for the maximum participation rate, is generally used in the electrification modeling for existing residential, commercial, municipal, and industrial buildings for the Companies' scenarios and the LTP. However, RG&E's CLCPA Hybrid Heating and Delayed Achievement Hybrid Heating scenarios require a faster ramp rate that reaches maximum participation in 2031 to achieve the GHG emissions reductions goals for the scenario. This accelerated ramp rate was also applied to NYSEG's residential electrification for the CLCPA Hybrid Heating and Delayed Achievement Hybrid Heating scenarios. CRA/Stakeholder scenario CRA 6 requires an even more accelerated ramp rate that reaches maximum participation in 2029 to meet CLCPA GHG emission reduction targets.

Figure A-2
Electrification Existing Customer Participation Ramp Rates



[3] The CRA/Stakeholder scenarios assume that participation rates continue to increase linearly for the entire modeling period and do not level off at a maximum conversion rate.

C. Electrification Equipment Modeled

Gas-fired furnaces, boilers, water heaters, cooking equipment, and clothes dryers are potential equipment that could be electrified in the model. Standard air-source heat pumps ("ASHP"), cold climate ASHP ("ccASHP"), ductless mini-split heat pumps, ground source heat pumps ("GSHP") electric water heaters, electric stoves, and electric clothes dryers could replace gas-fired equipment in the model. The residential electrification modelling allows for the electrification of space heating and conversion of gas appliances including cooking ranges, dryers, and water heaters. Electrification for commercial, municipal, and industrial segments is restricted to full and hybrid electrification of heating load only. All modeled options are detailed in Table A-12.

Table A-12
Electrification Conversion Options

Natural Gas Appliance Type	Residential	Commercial, Municipal, Industrial
Forced Air Furnace, Heaters[4]	Full electrification w/ 4-ton ccASHP or GSHP	Full electrification w/ ccASHP
	Hybrid 3-ton standard ASHP w/ gas furnace Hybrid 3-ton ccASHP w/ gas furnace	Hybrid ccASHP w/ gas furnace
Boiler	Full electrification w/4-ton mini-splits Hybrid 3-ton mini-splits w/ gas boiler	Full electrification w/mini-splits Hybrid mini-splits w/ gas boiler
Water Heating w/ Tank	Gas Tankless	
	ASHP w/ tank	
Tankless Water Heater	ASHP w/ tank only for old homes	
Clothes Dryers	Convert to electric	
Gas Range	Convert to electric	

Equipment and installation costs are assumed to increase by inflation through the 20-year forecast period for the Companies' scenarios and the LTP. The Stakeholder/CRA scenarios assume that all heat pump costs decline by 1%/year (nominal).

D. General Modeling Approach

The general approach to modeling electrification for all customer segments involves identifying the net installed costs as well as the net ongoing energy costs given the equipment that is electrified.

Net installed costs are calculated as the costs to purchase and install new equipment minus the replacement cost of retired equipment. For example, if a residential customer who has central air conditioning is converting their existing furnace to a ccASHP when their furnace reaches end-of-life, the

[4] Non-residential heaters include space heating furnaces, unit heaters, infra-red heaters, make-up air heaters and rooftop heaters.

net installed costs will be the cost to purchase and install the ccASHP minus the cost to purchase and install a gas furnace, minus half the cost to purchase and install central air conditioning.[5]

Ongoing net energy costs account for the increase in the participant's electric bill resulting from increased electric use and the reduction in their gas bill resulting from decreased gas use due to electrification.

1. Seasonal Electric and Gas Usage

As shown in Appendix B, gas and electric prices change seasonally. Therefore, it is important to capture the change in electric and gas usage due to electrification by season to quantify the change more accurately in energy costs. Net changes in annual electric and gas usage are allocated to winter, shoulder, and summer seasons based on normal year weather patterns as measured by heating degree days ("HDDs") and cooling degree days ("CDDs").[6] All cooling load is assumed to occur in the summer.

Heating load is allocated between winter and shoulder periods based on the HDD associated with "cold days" and "moderately cold days," respectively. Cold days are considered winter days and are assumed to be days with at least 35 HDD. Moderately cold days are considered shoulder days and are assumed to be days with between 0 and 35 HDD. Using this approach, NYSEG electric and gas heating load is split 50/50 between winter and shoulder periods and RG&E electric and gas heating load is assumed to be split 41/59 between winter and shoulder periods, as summarized in Table A-13.

Table A-13
Heating and Cooling Seasonal Definitions and Allocations

Heating/Cooling Season	Load Type	Definition	NYSEG Allocation	RG&E Allocation
Winter	Heating	HDD >= 35	50%	41%
Shoulder	Heating	HDD < 35	50%	59%
Total Heating	Heating	HDD>0	100%	100%
Summer	Cooling	CDD > 5	100%	100%

[5] Heat pumps provide both heating and air conditioning, so the net installed costs must also account for the avoided cost of replacing the air conditioning system. The ½ factor is used as a proxy to represent the average remaining life of the central air conditioning system when the heating system reaches end-of-life (i.e., it is unlikely that heating systems and conditioning systems will reach end-of-life at the same time).

[6] HDD is a unit of measure used to relate a day's temperature to the energy consumption associated with space heating. HDD = 65 minus average daily temperature. Days with average daily temperatures above 65 degrees have HDD of 0 (i.e., HDD does not go negative). Similarly, CDD is a unit of measure used to relate a day's temperature to the energy consumption associated with cooling. CDD = average daily temperature minus 65. Days with average daily temperatures below 65 degrees have CDD of 0 (i.e., CDD does not go negative).

2. Winter and Summer Peak kW Demand

As discussed in detail in Appendix B, the electric price forecast is adjusted for additional power system investments required to meet winter peak kW demand growth associated with electrification of gas loads. Net change in winter peak electric kW demand associated with heating conversions is calculated by dividing the winter kwh by the number of winter hours (i.e., the number of winter days times 24 hours).[7] The number of winter days is equal to the number of "cold days" (i.e., days with at least 35 HDD) used to allocate heating load between winter and shoulder periods discussed above. NYSEG and RG&E have 85 and 65 winter days, respectively. Electric water heaters, dryers and cooking ranges are assumed to run year-round with peak winter and summer kW demand contributions equal to their annual kWh usage divided by 8760 hours in a year. Electric fans and pumps are assumed to run at constant level throughout all heating and cooling days.

Net change in summer peak electric kW demand associated with cooling is calculated by dividing cooling kWh by the number of summer hours (i.e., number of summer days times 24 hours). Summer days are considered days with greater than 5 CDD. NYSEG and RG&E have 21 and 56 summer cooling days, respectively.

V. Electrification – Residential

A. Methodology

The residential electrification model includes electrification of space heating and conversion of gas appliances including cooking ranges, dryers, and water heaters. The approach to residential electrification differentiates among several residential subgroups including typical homes (less than 80 years old) and older homes (80+ years old) and furnace versus boiler heating systems. Residential electrification options are specified independently for typical homes or old homes (e.g., gas clothes dryers in typical homes could be assumed to converted to electric while clothes dryers in old homes might not be converted). In addition, electrification of each appliance type can be specified independently (e.g., boilers could be kept as gas while furnaces are converted to electric). This flexibility enables the analysis of full electrification vs. hybrid heating systems.

The residential electrification model starts with the residential customer count forecast. Appliance-specific market saturation percentages and assumed equipment lifespans are applied to estimate annual potential conversions at time of equipment failure. An assumed ramp rate schedule is applied to annual potential conversions, resulting in number of conversions, from which net installed cost, natural gas use, electricity use and GHG emission reductions are computed using assumptions discussed below.

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[6] This approach was not used for residential hating conversions. Net change in winter peak electric kW demand associated with residential heating conversions is based on data from Case 22-G-0610, National Fuel Final Long-Term Plan, Appendix A, and calibrated to NYSEG and RG&E average use per residential customer and annual heating degree days.

As discussed, electrification conversions of heating systems are assumed to occur at the end of the expected life of existing central air conditioning equipment and heating systems. Therefore, residential electrification participants with air conditioning equipment are assumed to also avoid the cost of replacing their central air conditioning ("AC") or window AC units. Avoided costs are assumed to include half of the cost of any furnaces or central air equipment that is replaced early due to the end of life of the other HVAC component. Participant window AC units are assumed to reach end-of-life concurrent with furnace and/or boiler conversions.

B. Assumptions, Inputs, Sources

Residential appliance cost, appliance life, and energy use assumptions for each pre-conversion and conversion equipment type are presented in Tables A-14 through A-17, below. Two furnace and boiler conversion options are evaluated for residential homes: (1) 100% electrification with ccASHP, mini-splits, or GSHP that rely on electricity for heating on all days and (2) hybrid heating systems that rely on a gas furnace or boiler on colder days and a ASHP or mini-split on less cold days. For hybrid ASHP/gas furnace systems, the model evaluates economics of both a standard ASHP and a ccASHP.[8] Additional costs required to fully electrify an 80+ year-old home due to prevalence of knob-and-tube wiring are shown in Table A-18.

Table A-14
Residential Pre-Conversion Natural Gas and Air Conditioning Equipment Assumptions

Load Type	Pre-Conversion Equipment	Appliance Life Expectancy			Replacement Cost ($2022)(2)	NYSEG Annual(2)		RG&E Annual(2)	
		Min Life(1)	Max Life(1)	Modeled		ccf	kWh	ccf	kWh
Space Heating	Gas Furnace	16	27	22	$5,000	679		679	
Space Heating	Gas Boiler(3)	20	30	25	$5,800	746		746	
Space Cooling	Central AC	11	25	18	$3,500		780		1,263
Space Cooling	Window AC			n/a	$500		624		1,010
Fans & Pumps	Fans			n/a	Incl above		458		457
Water Heating	Gas Storage Tank	6	20	13	$2,101	200		200	
Water Heating	Gas Tankless	6	20	13	$4,000	148		148	
Cooking	Gas Range	9	15	12	$1,000	35		35	
Clothes Drying	Gas Dryer	8	18	13	$920	35		35	

(1) Source: U.S. Energy Information Administration, Assumptions to the Annual Energy Outlook 2023: Residential Demand Module. Table 5. Minimum and maximum life expectancies of equipment in years. March 2023.
(2) Source: Case 22-G-0610 National Fuel Final Long-Term Plan Appendix A. Energy usages calibrated to NYSEG and RG&E' average heating use per residential customer and annual heating degree days. Gas heating usages shown are 2024 average heat use per residential customer values for NYSEG and RG&E. However, in the LTP model, the baseline reference case heating gas usage per heating appliance decreases with the reference case use per customer forecast.
(3) Boiler replacement cost estimate from NFG LTP 2023, based on HomeAdvisor (December 12, 2022).

[8] The Companies' Hybrid Heating scenarios and LTP assume a 35 HDD setpoint for switching between a gas furnace and standard ASHP heat source and a 45 HDD setpoint for switching between a boiler and cold climate mini-splits. The CRA/Stakeholder scenarios assume a 45 HDD setpoint for switching between both (i) a gas furnace and ccASHP; and (b) a gas boiler and cold climate mini-splits.

Table A-15
Residential Gas Furnace – 100% Electrification Conversion: Cost and Usage

NYSEG

Gas Furnace – 100% Electrification Conversion: 4-ton ccASHP or GSHP					
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual kWh**
Space Heating	Cold Climate ASHP	Electric	($2023)	$24,247	8,732
Space Cooling	Cold Climate ASHP	Electric		incl above	563
Space Heating	GSHP	Electric	($2023)	$30,000	4,803
Space Cooling	GSHP	Electric		incl above	310
Fans & Pumps	Fans	Electric		incl above	399
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500	1,077
Cooking	Electric Range	Electric	($2022)	$750	821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770	821

RG&E

Gas Furnace – 100% Electrification Conversion: 4-ton ccASHP or GSHP					
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual kWh**
Space Heating	Cold Climate ASHP	Electric	($2023)	$24,247	8,724
Space Cooling	Cold Climate ASHP	Electric		incl above	913
Space Heating	GSHP	Electric	($2023)	$30,000	4,798
Space Cooling	GSHP	Electric		incl above	502
Fans & Pumps	Fans	Electric		incl above	414
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500	1,077
Cooking	Electric Range	Electric	($2022)	$750	821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770	821

Notes: Energy usage and non-heating appliance cost information from Case 22-G-0610 National Fuel Final Long-Term Plan Appendix A. Annual heating and cooling kWh usage estimates are calibrated to NYSEG and RG&E average heating use per residential customer and annual heating and cooling degree days. Residential heating load estimated assuming average of July and August load is non-heating, using data provided in NY PSC Case 22-E-0317 Order Adopting Joint Proposal (October 12, 2023), Appendix EE, Schedule B-2 page 2 and Appendix FF, page 10.

Cold Climate ASHP cost estimate of $24,247 is average project cost for single-family gas furnace to 4-ton ccASHP conversion projects installed April 2020 through October 2023 in NYSEG and RG&E's NYS Clean Heat database.

CRA/Stakeholder Scenario CRA 4 assumes ccASHP initial cost of $15,378 ($2023) based on data for a 3.5-ton residential ccASHP from a Public Service Company of Colorado study.

Table A-16
Residential Gas Furnace – Hybrid Heating System Conversions: Cost and Usage

NYSEG

Gas Furnace Hybrid Conversion Option 1: Hybrid 3-ton Standard ASHP w/ Furnace @ 30°F and colder						
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual ccf**	**Annual kWh**
Space Heating	Furnace	Gas	($2022)	$5,000	364	
Space Heating	Standard ASHP & Fans	Electric	($2022)	$6,000		2,996
Space Cooling	Standard ASHP	Electric		incl above		780
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500		1,077
Cooking	Electric Range	Electric	($2022)	$750		821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770		821

Gas Furnace Hybrid Conversion Option 2: Hybrid 3-ton ccASHP w/ Furnace @ 20°F and colder						
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual ccf**	**Annual kWh**
Space Heating	Furnace	Gas	($2022)	$5,000	194	
Space Heating	ccASHP & Fans	Electric	($2023)	$16,445		5,875
Space Cooling	ccASHP	Electric		incl above		563
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500		1,077
Cooking	Electric Range	Electric	($2022)	$750		821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770		821

RG&E

Gas Furnace Hybrid Conversion Option 1: Hybrid 3-ton Standard ASHP w/ Furnace @ 30°F and colder						
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual ccf**	**Annual kWh**
Space Heating	Furnace	Gas	($2022)	$5,000	293	
Space Heating	Standard ASHP & Fans	Electric	($2022)	$6,000		3,577
Space Cooling	Standard ASHP	Electric		incl above		1,263
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500		1,077
Cooking	Electric Range	Electric	($2022)	$750		821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770		821

Gas Furnace Hybrid Conversion Option 2: Hybrid 3-ton ccASHP w/ Furnace @ 20°F and colder						
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual ccf**	**Annual kWh**
Space Heating	Furnace	Gas	($2022)	$5,000	157	
Space Heating	ccASHP & Fans	Electric	($2023)	$16,445		5,911
Space Cooling	ccASHP	Electric		incl above		913
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500		1,077
Cooking	Electric Range	Electric	($2022)	$750		821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770		821

Notes: Energy usage, standard ASHP cost and non-heating appliance cost information from Case 22-G-0610 National Fuel Final Long-Term Plan Appendix A and Appendix G. Annual heating and cooling kWh usage estimates are calibrated to NYSEG and RG&E average heating use per residential customer and annual heating and cooling degree days. Residential heating load estimated assuming average of July and August load is non-heating, using data provided in NY PSC Case 22-E-0317 Order Adopting Joint Proposal (October 12, 2023), Appendix EE, Schedule B-2 page 2 and Appendix FF, page 10. Cold Climate ASHP cost estimate of $16,445 is average project cost for single-family gas furnace to 3-ton ccASHP conversion projects installed April 2020 through October 2023 in NYSEG and RG&E's NYS Clean Heat database.

Furnace gas heating usages shown are 2024 average heating use per residential customer values for NYSEG and RG&E. However, in the LTP model, the baseline reference case heating gas usage per heating appliance decreases with the reference case use per customer forecast.

Table A-17
Residential Boiler Conversions, Typical Home: Ductless Mini-split ASHP

NYSEG

Gas Boiler Full Electrification Conversion: 4-ton Cold Climate Mini-Split ASHP					
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual kWh**
Space Heating	Ductless Mini-Split ASHP	Electric	($2023)	$23,745	9,142
Space Cooling	Ductless Mini-Split ASHP	Electric		incl above	780
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500	1,077
Cooking	Electric Range	Electric	($2022)	$750	821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770	821

Gas Boiler Hybrid Conversion Option: 3-ton Cold Climate Min-Split ASHP w/ boiler @ 20°F						
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual ccf**	**Annual kWh**
Space Heating	Boiler	Gas	($2022)	$5,800	213	
Space Heating	Ductless Mini-Split ASHP	Electric	($2023)	$17,711		6,151
Space Cooling	Ductless Mini-Split ASHP	Electric		incl above		780
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500		1,077
Cooking	Electric Range	Electric	($2022)	$750		821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770		821

RG&E

Gas Boiler Full Electrification Conversion: 4-ton Cold Climate Mini-Split ASHP					
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual kWh**
Space Heating	Ductless Mini-Split ASHP	Electric	($2023)	$23,745	9,133
Space Cooling	Ductless Mini-Split ASHP	Electric		incl above	1,268
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500	1,077
Cooking	Electric Range	Electric	($2022)	$750	821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770	821

Gas Boiler Hybrid Conversion Option: 3-ton Cold Climate Min-Split ASHP w/ boiler @ 20°F						
Load Type	**Conversion Equipment**	**Energy Type**	**First Cost**		**Annual ccf**	**Annual kWh**
Space Heating	Boiler	Gas	($2022)	$5,800	172	
Space Heating	Ductless Mini-Split ASHP	Electric	($2023)	$17,711		6,189
Space Cooling	Ductless Mini-Split ASHP	Electric		incl above		1,263
Water Heating	ASHP Storage Tank	Electric	($2022)	$3,500		1,077
Cooking	Electric Range	Electric	($2022)	$750		821
Clothes Dryer	Electric Dryer	Electric	($2022)	$770		821

Notes: Full electrification 4-ton mini-split energy usage and non-heating appliance cost information are from Case 22-G-0610 National Fuel Final Long-Term Plan Appendix A. Annual heating and cooling kWh usage estimates are calibrated to NYSEG and RG&E average heating use per residential customer and annual heating and cooling degree days. Residential heating load estimated assuming average of July and August load is non-heating, using data provided in NY PSC Case 22-E-0317 Order Adopting Joint Proposal (October 12, 2023), Appendix EE, Schedule B-2 page 2 and Appendix FF, page 10. Energy usage for a hybrid boiler w/3-ton mini-split system is based on ratio of energy usage for hybrid furnace w/ 3-ton ccASHP system versus full electrification 4-ton ccASHP system applied to the energy usage for full boiler electrification assuming a 4-ton cold climate mini-split system energy.
Cold Climate mini-split ASHP cost estimates are the average project cost for single-family gas boiler to cold climate mini-split conversion projects installed April 2020 through October 2023 in NYSEG and RG&E's NYS Clean Heat database, excluding uninsulated brick homes build before 1945. Averages are calculated separately for 4-ton and 3-ton mini-split heating systems.

CRA/Stakeholder Scenario CRA 4 assumes ccASHP initial cost of $15,378 ($2023) based on data for a 3.5-ton residential ccASHP from a Public Service Company of Colorado study.
Boiler gas heating usages shown are 2024 average heating use per residential customer values for NYSEG and RG&E. However, in the LTP model, the baseline reference case heating gas usage per heating appliance decreases with the reference case use per customer forecast.

Table A-18
Additional Cost to Electrify an 80+ Year-Old Home

Category	Item	Cost ($2022)
Electrical Service	Upgraded 200 Amp Service	$4,500
	New Lines Throughout House	$14,000
	Plaster Patching	$1,000
Heating / Cooling	Ductless Mini-splits 4-6 units	$19,000
Water Heating	Heat Pump Water Heater	$3,900
	220 Elec Line from Panel	$300
Cooking	220 Elec Line from Panel	$800
	Electric Range	$750
Clothes Drying	220 Elec Line from Panel	$600
	Electric Dryer	$770

Source: Case 22-G-0610 National Fuel Final Long-Term Plan Appendix A

Participating residential customers are assumed to receive income level dependent electrification HEEHRA point-of-sale rebates and tax credits from the 2022 IRA. These federal rebate and tax credit programs are assumed to be not limited by annual budgets and extended through 2043. To calculate incentive and credit amounts, the model first estimates the total number of conversions by appliance type for each year and allocates the number of appliance conversions by income level based on the percentages shown in Table A-8. above.

The model applies the amounts of electrification HEEHRA rebates and IRA credits shown in Table A-19 below by household income level.

Table A-19
Residential Electrification
HEEHRA Rebates and IRA Credits by Household Income

Household Income Level>>>>	Low Income[1]	Moderate Income[1]	Non-LMI[2]
Rebate/Credit, % of Installed Cost	100%	50%	30%
Federal Program	HEEHRA	HEEHRA	IRA
Maximum $ Rebate/Credit by Appliance / Project Type			
Appliance / Equipment Type	**Low Income[1]**	**Moderate Income[1]**	**Non-LMI[2]**
ASHP (incl. ductless mini-split)	$8,000	$8,000	$2,000
Electrical Wiring	$2,500	$2,500	$600
Circuit Breaker Panel	$3,500	$3,500	$600
Heat Pump Water Heater	$1,750	$1,750	$2,000
Electric Range	$840	$840	$0

(1) Source: HEEHRA Rebates 2024-2025: Get up to $14,000 in government funds for upgrading the energy efficiency of your homes' central air and appliances, AC direct, November 13, 2023.

(2) Source: Making Our Homes More Efficient: Clean Energy Tax Credits for Consumers, U.S. Department of Energy, December 21, 2022.

Residential participants converting to GSHPs are assumed to receive both a federal tax credit equal to 30% of installed cost and a New York State tax credit of 25% of installed cost up to maximum rebate of $5,000, in addition to utility rebate of $5,400.

Participating residential customers converting to ASHPs are assumed to receive utility/NYSERDA sponsored incentives that cover 20% of $2024 installation costs in addition to the federal incentives discussed above. Market saturations for each pre-conversion gas heating equipment type are shown in Table A-20, below. Boilers are assumed to be allocated on equal percentage basis to houses built prior to 1939 versus houses built between 1940 and 1969. Houses built prior to 1939 are assumed to require significant electrical upgrades as shown in Table A-18, above.

Table A-20
NYSEG and RG&E Residential Customer Market Saturation by Appliance

Residential	Existing Stock as of 2024	New Construction 2025
Natural Gas Forced Air Furnace	59%	100%
Natural Gas Boiler	41%	0%
Natural Gas Water Heater w/ Tank	69%	69%
Natural Gas Tankless Water Heater	9%	9%
Natural Gas Clothes Dryer	55%	55%
Natural Gas Range	56%	56%

Existing Stock Sources:

Furnaces and Boilers: NYSERDA 2019 Single-Family Building Assessment Residential Building Stock Assessment, page 18 for Climate zone 4 .

Other Appliances: Case 22-G-0610 National Fuel Final Long-Term Plan Appendix H.

Percentages of homes by year built are shown in Table A-21, below.

Table A-21
Age of Homes Built in 1969 or Earlier [1]

Age of Home	% of Homes NYSEG	% of Homes RG&E
Built prior to 1939 [2]	49%	50%
Built between 1940 and 1969 [3]	51%	50%
Subtotal	100%	100%

(1) Source: Natural Gas and Grid Modernization Study Appendix N Special Study #5
(2) Assumes prevalence of knob-and-tube electrical wiring in homes built prior to 1940.
(3) Residential furnace systems became more prevalent than boiler systems starting in the 1970s.

The estimated percentage of homes with air conditioning are shown in Table A-22 by pre-conversion heating equipment. This information is needed to estimate net installed costs for heat pump conversion participants, which are assumed to avoid the cost of replacing their central air conditioning (AC) or window AC units as heat pumps provide both heating and cooling.

Table A-22
Percentage of Homes with Air Conditioning [1]

Residential	Existing Stock as of 2024	New Construction 2025
% of Accounts heated with gas furnaces with Central Air (Electric)	76%	77%
% of Accounts heated with gas furnaces with Window AC (Electric)	18%	11%
% of Accounts heated with gas boilers with Window AC (Electric)	73%	48%

Source: NYSERDA 2019 HVAC Market Characterization, Residential Building Stock Assessment. Table 7.

C. Scenario and LTP Residential Electrification Inputs

All scenarios and the LTP assume that residential electrification starts in 2027 with existing equipment being converted at end-of-life. For CLCPA and Delayed Achievement scenarios, the model solves for the maximum residential participation rate required to meet 2043 CO2e reduction targets from 1990 levels of 65% and 50%, respectively.

- The **CLCPA Full Electrification scenario** assumes existing gas furnace, boiler conversions and other non-heating gas appliance conversions ramp up over time to maximum participation rate of 66% for NYSEG and 94% for RG&E. Furnaces are converted to 4-ton ccASHPs; boilers are converted to 4-ton ductless mini-split ASHPs. Old homes are assumed to be electrified.
- The **CLCPA Hybrid Heating scenario** assumes existing gas furnaces and boilers convert to hybrid heating systems with 3-ton standard ASHPs and 3-ton ductless mini-split ASHPs, respectively with gas furnace/boiler backup and other non-heating gas appliance conversions ramp up over time to maximum participation rate of 81% for NYSEG and 99% for RG&E. It is assumed that customers in old homes do not electrify.
- The **Delayed Achievement Full Electrification scenario** assumes existing gas furnace, boiler conversions and other non-heating gas appliance conversions ramp up over time to maximum

participation rate of 39% for NYSEG and 65% for RG&E. Furnaces are converted to 4-ton ccASHPs; boilers are converted to 4-ton ductless mini-split ASHPs. Old homes are assumed to be electrified.

- The **Delayed Achievement Hybrid Heating scenario** assumes existing gas furnaces convert to hybrid heating systems and other non-heating gas appliance conversions ramp up over time to maximum participation rate of 76% for NYSEG and 99% for RG&E. It is assumed that customers in old homes or heating with boilers do not electrify.
- The **CRA/Stakeholder CRA1, CRA2 and CRA3 scenarios** assume that existing gas furnaces, boiler and non-heating gas appliance conversions ramp up at 5.4% per year without being capped by a maximum participation rate. Old homes are assumed to be electrified. Starting in 2028, also assumes that 0.5% of existing customer conversions of furnace systems adopt GSHP, increasing 0.5% annually.
    - **CRA1 (Mix)**: homes heating with gas furnaces are assumed to fully electrify with ccASHP supplemented with electric resistance heat. Customers with boilers are assumed to install mini-splits with a gas boiler for backup.
    - **CRA2 (Hybrid**): gas furnaces are assumed to install ccASHP supplemented with gas furnaces for cold days. Customers with boilers are assumed to install mini-splits with a gas boiler for backup.
    - **CRA3 (Full):** Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs.
- The **CRA/Stakeholder CRA4 and CRA5 scenarios** assume that existing gas furnaces, boiler and non-heating gas appliance conversions ramp up at same pace as the CLCPA Full Electrification Scenario without being capped by a maximum participation rate. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs. Starting in 2028, also assumes that 0.5% of existing customer conversions of furnace systems adopt GSHP, increasing 0.5% annually. Old homes are assumed to be electrified.
- The **CRA/Stakeholder CRA6 scenario** assumes that existing gas furnaces, boiler and non-heating gas appliance conversions ramp up over time to achieve 65% CO2e reduction in 2043 from 1990 levels, which results in maximum a participation rate of 95% for both NYSEG and RG&E. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs. Starting in 2028, also assumes that 0.5% of 2043. Old homes are assumed to be electrified.
- The **LTP** assumes existing gas furnaces convert to hybrid heating systems and other non-heating gas appliance conversions ramping up over time to maximum participation rate of 75% for both NYSEG and RG&E. Customers in old homes or heating with boilers do not electrify.

The resulting percentage of appliances converted by 2043 is shown in Table A-23.

Table A-23
Percentage of Residential Appliances Converted to Electric by 2043

NYSEG

Electrification Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	42%	66%	28%	63%	46%	46%	46%	43%	43%	78%	46%
Gas Boiler	28%	25%	17%	0%	33%	33%	33%	29%	29%	62%	0%
Gas Water Heating w/ Tank	51%	70%	31%	79%	60%	60%	60%	53%	53%	96%	58%
Gas Tankless Water Heater	51%	84%	31%	79%	60%	60%	60%	53%	53%	96%	58%
Gas Clothes Dryer	51%	66%	31%	79%	60%	60%	60%	53%	53%	96%	58%
Gas Range	54%	68%	33%	80%	63%	63%	63%	56%	56%	97%	61%

RG&E

Electrification Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	53%	74%	41%	75%	46%	46%	46%	54%	54%	78%	46%
Gas Boiler	39%	30%	27%	0%	33%	33%	33%	40%	40%	62%	0%
Gas Water Heating w/ Tank	71%	82%	50%	99%	60%	60%	60%	72%	72%	96%	58%
Gas Tankless Water Heater	71%	99%	50%	99%	60%	60%	60%	72%	72%	96%	58%
Gas Clothes Dryer	71%	77%	50%	99%	60%	60%	60%	72%	72%	96%	58%
Gas Range	74%	79%	53%	100%	63%	63%	63%	75%	75%	97%	61%

Note: Full electric conversions are assumed for gas boilers, water heaters, clothes dryers, and ranges for all scenarios.

VI. Electrification – Commercial and Municipal

A. Methodology

The commercial and municipal electrification models assume that existing commercial and municipal gas furnaces are converted to ASHPs, while gas boilers are replaced with ductless mini-split ASHPs.

Similar to the residential electrification, the commercial and municipal electrification models start with the customer count forecast and then applies appliance-specific market saturation percentages and assumed equipment lifespans to estimate annual potential conversions at time of equipment failure. An assumed maximum annual participation rate and conversion ramp rate schedule are applied to annual potential conversions, resulting in number of conversions, from which net installed cost, natural gas use, electricity use and GHG emission reductions are computed using assumptions discussed below.

Heating load is separated from processing load for commercial, municipal, and industrial segments based on ratios reported in NYSEG and RG&E's 2020 Energy Efficiency Study.[9]

[9] NYSEG and RG&E Energy Efficiency Potential Study: 2018 to 2027, April 2020.

As discussed, electrification conversions of heating systems are assumed to occur at the end of the expected life of existing central air conditioning equipment and heating systems. Therefore, commercial and municipal electrification participants with air conditioning equipment are assumed to also avoid the cost of replacing their central AC or window AC units. Avoided costs are assumed to include half of the cost of any furnaces or central air equipment that is replaced early due to the end of life of the other HVAC component. Participant window AC units are assumed to reach end-of-life concurrent with furnace and/or boiler conversions.

B. Assumptions, Inputs, Sources

Cost estimates for commercial furnaces, boilers and ASHPs are calculated using $/sq-ft cost estimates reported in the New York State Climate Action Council Scoping Plan Analysis and applying to NYSEG and RG&E's average square footage per commercial customer from the Companies' 2020 Energy Efficiency Report.[10]

Existing commercial furnace and boiler annual gas usage estimates for an average commercial customer are calculated by using equipment coefficient of performance ("COP") and 2019 statewide percentage stock estimates provided in the New York State Climate Action Council Scoping Plan Analysis.[11] The 2019 statewide weighted average heating equipment COP of 0.85 is applied to the average gas heating usage per commercial customer from NYSEG and RG&E's 2020 Energy Efficiency Report to produce an average estimate of gas MMBTU heating output requirement per commercial customer of 370 MMBtu and 458 MMBTU for NYSEG and RG&E, respectively. The resulting heat output MMBTU requirement is held constant across all technology types and converted to a comparable kWh input requirement assuming full electrification conversion to an ASHP with a COP of 3, consistent with the New York State Climate Action Council Scoping Plan Analysis estimate for 2024.

Existing commercial air conditioning kWh usage is based on data from the NYSEG and RG&E's 2020 Energy Efficiency Report and used to estimate average kWh required for cooling from pre-conversion ducted and non-ducted systems and efficient full electrification commercial AHSP replacements by applying the New York State Climate Action Council Scoping Plan Analysis' year 2020 COPs for cooling equipment and 2019 percentage cooling equipment stock estimates.

Commercial ductless mini-split costs and performance estimates were not provided in the New York State Climate Action Council Scoping Plan Analysis. Ductless min-split installed cost and heating kWh requirements are calculated by applying ratios developed using data provided in National Grid's 2021 Long-Term Capacity Report for cost and kwh requirement differentials between a small commercial

[10] DNV GL, Energy Efficiency Potential Study: 2018 to 2027. NYSEG and RG&E. April 2020. Table 4-1 and Figure 4-7.

[11] New York State Climate Action Council Scoping Plan, Integrated Analysis Technical Supplement, Section 1. Annex 1: Inputs and Assumptions.

ductless mini-split versus a central heat pump.[12] An average commercial hybrid ASHP/furnace heating system installed cost is estimated by excluding the avoided replacement cost of an average commercial furnace and reducing cost of the average commercial ASHP under full electrification by cost ratio of residential hybrid ASHP/furnace system[13] to full electrification ccASHP system. Commercial hybrid ASHP/furnace energy use is similarly scaled from commercial baseline furnace gas use and full electrification ASHP electric use using ratio of energy use under the residential hybrid ASHP/furnace conversion compared to full electrification ccASHP and the baseline furnace. An average commercial hybrid mini-split/boiler heating system installed cost is estimated by excluding the avoided replacement cost of an average commercial boiler and reducing the cost of the average commercial mini-split under full electrification by cost ratio of residential hybrid mini-split/boiler system to full electrification mini-split system. Commercial hybrid mini-split/boiler energy use is similarly scaled from commercial baseline boiler gas use and full electrification ASHP electric use using ratio of energy use under the residential hybrid mini-split/boiler conversion compared to full electrification ccASHP and the baseline furnace.

Commercial appliance cost, appliance life, and energy use assumptions for each pre-conversion and conversion equipment type are presented in Tables A-24 through A-26, below.

Table A-24
Commercial Pre-Conversion Natural Gas and Air Conditioning Equipment

NYSEG

Load Type	Equipment	Appliance Lifetime, Years(1)	Replacement Cost ($2022)(1)	Annual Usage(2)	
				ccf	kWh
Space Heating	Gas Furnace	16	$9,014	4,223	0
Space Heating	Gas Boiler	16	$55,346	4,223	0
Space Cooling	Air Conditioning – Ducted	16	$64,261		2,903
Space Cooling	Air Conditioning – Non-Ducted	n/a	$29,629		3,811

RG&E

Load Type	Equipment	Appliance Lifetime, Years(1)	Replacement Cost ($2022)(1)	Annual Usage(2)	
				ccf	kWh
Space Heating	Gas Furnace	16	$8,237	5,226	0
Space Heating	Gas Boiler	16	$50,576	5,226	0
Space Cooling	Air Conditioning – Ducted	16	$58,722		5,009
Space Cooling	Air Conditioning – Non-Ducted	n/a	$27,075		6,575

(1) Source: New York State Climate Action Council Scoping Plan.
(2) Source: Average sq ft/customer and heating load from NYSEG RGE Energy Efficiency Potential Study: 2018 to 2027, April 2020, DNV GL. Energy usage profiles for heating and cooling for each appliance based on comparison of COP to average 2019 stock COP from the New Yor State Climate Action Council Scoping Plan Analysis, applied to average NYSEG, RGE heating load.

12 National Grid. Natural Gas Long-Term Capacity Second Supplemental Report for Brooklyn, Queens, Staten Island and Long Island ("Downstate NY"), Appendix, June 2021.

13 Includes both ccASHP and standard ASHP.

Table A-25
Commercial Gas Furnace Conversions: ASHP Cost and Usage

NYSEG

Gas Furnace Full Electrification Conversion: ccASHP				
Load Type	Conversion Equipment	Energy Type	First Cost [1] ($2022)	Annual Usage[2] (kWh)
Space Heating	ASHP	Electric	$330,494	36,096
Space Cooling	ASHP	Electric	incl above	2,061

Gas Furnace Hybrid Conversion Option 1: Standard ASHP w/ Furnace @ 30°F and colder					
Load Type	Conversion Equipment	Energy Type	First Cost ($2022)	Annual ccf	Annual kWh
Space Heating	Gas Furnace	Electric	$9,014	2,260	
Space Heating	ASHP	Electric	$81,782		11,843
Space Cooling	ASHP	Electric	incl above		2,852

Gas Furnace Hybrid Conversion Option 2: ccASHP w/ Furnace @ 20°F and colder					
Load Type	Conversion Equipment	Energy Type	First Cost ($2022)	Annual ccf	Annual kWh
Space Heating	Gas Furnace	Electric	$9,014	1,208	
Space Heating	ASHP	Electric	$224,150		23,223
Space Cooling	ASHP	Electric	incl above		2,061

RG&E

Gas Furnace Full Electrification Conversion: ccASHP				
Load Type	Conversion Equipment	Energy Type	First Cost [1] ($2022)	Annual Usage[2] (kWh)
Space Heating	ASHP	Electric	$302,008	44,667
Space Cooling	ASHP	Electric	incl above	3,556

Gas Furnace Hybrid Conversion Option 1: Standard ASHP w/ Furnace @ 30°F and colder					
Load Type	Conversion Equipment	Energy Type	First Cost ($2022)	Annual ccf	Annual kWh
Space Heating	Gas Furnace	Electric	$8,237	2,256	
Space Heating	ASHP	Electric	$74,733		17,483
Space Cooling	ASHP	Electric	incl above		4,922

Gas Furnace Hybrid Conversion Option 2: ccASHP w/ Furnace @ 20°F and colder					
Load Type	Conversion Equipment	Energy Type	First Cost ($2022)	Annual ccf	Annual kWh
Space Heating	Gas Furnace	Electric	$8,237	1,205	
Space Heating	ASHP	Electric	$204,830		28,894
Space Cooling	ASHP	Electric	incl above		3,556

(1) Source: New York State Climate Action Council Scoping Plan.

(2) Source: Average sqft/customer and heating load from NYSEG RGE Energy Efficiency Potential Study: 2018 to 2027, April 2020, DNV GL. Energy usage profiles for heating and cooling for each appliance based on comparison of COP to average 2019 stock COP from the New Yor State Climate Action Council Scoping Plan Analysis, applied to average NYSEG, RGE heating load.

Table A-26
Commercial Boiler Conversions: Ductless Mini-split ASHP Cost and Usage

NYSEG

Gas Boiler Full Electrification Conversion: Ductless Mini-Split ccASHP				
Load Type	Conversion Equipment	Energy Type	First Cost [1] ($2022)	Annual Usage[2] (kWh)
Space Heating	Ductless Mini-Split ASHP	Electric	$524,948	33,497
Space Cooling	Ductless Mini-Split ASHP	Electric	incl above	3,811

Gas Boiler Hybrid Conversion: Ductless Mini-Split ASHP w/ Boiler @ 20°F and colder					
Load Type	Conversion Equipment	Energy Type	First Cost ($2022)	Annual ccf	Annual kWh
Space Heating	Gas Boiler	Electric	$55,346	1,208	
Space Heating	Ductless Mini-Split ASHP	Electric	$391,550		22,537
Space Cooling	Ductless Mini-Split ASHP	Electric	incl above		3,811

RG&E

Gas Boiler Full Electrification Conversion: Ductless Mini-Split ccASHP				
Load Type	Conversion Equipment	Energy Type	First Cost [1] ($2022)	Annual Usage[2] (kWh)
Space Heating	Ductless Mini-Split ASHP	Electric	$479,702	41,451
Space Cooling	Ductless Mini-Split ASHP	Electric	incl above	6,575

Gas Boiler Hybrid Conversion: Ductless Mini-Split ccASHP w/ Boiler @ 20°F and colder					
Load Type	Conversion Equipment	Energy Type	First Cost ($2022)	Annual ccf	Annual kWh
Space Heating	Gas Boiler	Electric	$50,576	1,205	
Space Heating	Ductless Mini-Split ASHP	Electric	$357,801		28,087
Space Cooling	Ductless Mini-Split ASHP	Electric	incl above		6,575

(1) Source: New York State Climate Action Council Scoping Plan.
(2) Ductless installed cost and heating kWh calculated by applying ratio of Small Commercial Ductless to Central HP costs and kWh from National Grid's Downstate 2021 Long Term Capacity Report. Ductless Min-Split ASHP cooling kwh requirements assumed to be the same as pre-conversion non-ducted air conditioning.

Municipal equipment costs and energy usage profiles are calculated by multiplying the commercial estimates provided above by the ratio of 2024 heating loads for average municipal customer versus average commercial customer, which is equal to 3.67 for NYSEG and 3.17 for RG&E.

Participating commercial and municipal customers are assumed to receive utility/NYSERDA sponsored incentives that cover 20% of $2024 heat pump installation costs. In addition, commercial participants installing GSHP are assumed to receive a federal tax credit equal to 40% of installed cost.

As shown in Table A-27, space heating market saturation for NYSEG and RG&E's commercial and municipal segments is assumed to be 64% gas furnace and 36% natural gas boiler, based on statewide data from NYSERDA's 2019 Commercial Baseline Study.[14]

[14] NYSERDA 2019 Commercial Baseline Study Volume 1. Page 16, Table 1. Assumes furnaces includes infrared heaters and unit heaters.

Table A-27
Commercial and Municipal Market Saturation by Appliance

Appliance	Existing Stock as of 2024	New Construction 2025-2028
Natural Gas Forced Air Furnace	64%	64%
Natural Gas Boiler	36%	36%

Source: NYSERDA 2019 Commercial Baseline Study Volume 1.

The estimated percentage of businesses with air conditioning are shown in Table A-28 by existing heating equipment. This information is needed to estimate net installed costs for heat pump conversion participants, which are assumed to avoid the cost of replacing their central AC or window AC units as heat pumps provide both heating and cooling.

Table A-28
Commercial and Municipal Air Conditioning Market Saturation

Assumed % of Businesses with Air Conditioning (Electric)	Existing Stock as of 2024	New Construction 2025-2028
% Businesses heated with gas furnaces / heaters with Central Air[2]	68%	68%
% Businesses heated with gas furnaces / heaters with Room AC	29%	29%
% Businesses heated with gas boilers with Room AC	29%	29%

Source: NYSERDA 2019 Commercial Baseline Study Volume 1.

C. Scenario and LTP Commercial and Municipal Electrification Inputs

All scenarios and the LTP assume that commercial electrification starts in 2027, that existing equipment is converted at end-of-life.

- The **CLCPA Full Electrification scenario** assumes existing gas furnace, boiler conversions ramp up over time to maximum commercial participation rate of 30% for NYSEG and 40% for RG&E. Assumes municipal conversions ramp up over time to maximum participation rate of 50% for both NYSEG and RG&E. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs.
- The **CLCPA Hybrid Heating scenario** assumes existing gas furnaces and boilers convert to hybrid heating systems with standard ASHPs and ductless mini-split ASHPs with gas furnace/boiler backup with commercial conversions ramping up over time to maximum participation rate of 65% for NYSEG and 80% for RG&E. Assumes municipal conversions ramp up over time to maximum participation rate of 81% for NYSEG and 99% for RG&E.
- The **Delayed Achievement Full Electrification scenario** assumes existing gas furnace and boiler conversions ramp up over time to maximum commercial participation rate of 25% for NYSEG and RG&E. Assumes municipal conversions ramp up over time to maximum participation rate of 39%

for NYSEG and 65% for RG&E. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs.

- The **Delayed Achievement Hybrid Heating scenario** assumes existing gas furnaces convert to hybrid heating systems with standard ASHPs with gas furnace backup with commercial conversions ramping up over time to maximum participation rate of 50% for NYSEG and RG&E. Assumes municipal conversions ramp up over time to maximum participation rate of 76% for NYSEG and 99% for RG&E. It is assumed that customers heating with boilers do not electrify.
- The **CRA/Stakeholder CRA1, CRA2 and CRA3 scenarios** assume that existing gas furnaces and boilers ramp up conversions increasing by 2.1% per year without being capped by a maximum participation rate. Starting in 2028, also assumes that 0.5% of existing commercial and municipal customer conversions of furnace systems adopt GSHP, increasing 0.5% annually.
    - **CRA1 (Mix)**: businesses heating with gas furnaces are assumed to fully electrify with ccASHP supplemented with electric resistance heat. Customers with boilers are assumed to install mini-splits with a gas boiler for backup.
    - **CRA2 (Hybrid**): gas furnaces are assumed to install ccASHP supplemented with gas furnaces for cold days. Customers with boilers are assumed to install mini-splits with a gas boiler for backup.
    - **CRA3 (Full):** Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs.
- The **CRA/Stakeholder CRA4 and CRA5 scenarios** assume that existing gas furnaces and boiler conversions ramp up at same pace as the CLCPA Full Electrification Scenario without being capped by a maximum participation rate. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs. Starting in 2028, also assumes that 0.5% of existing commercial and municipal customer conversions of furnace systems adopt GSHP, increasing 0.5% annually.
- The **CRA/Stakeholder CRA6 scenario** assumes that existing commercial and municipal gas furnaces and boiler conversions ramp up with maximum participation rate of 60% for NYSEG and 65% for RG&E. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs. Starting in 2028, also assumes that 0.5% of existing commercial and municipal customer conversions of furnace systems adopt GSHP, increasing 0.5% annually.
- The **LTP** assumes existing gas furnaces convert to hybrid standard AHSPs supplemented by gas furnaces on cold days with commercial conversions ramping up over time by 2.1% per year to a maximum commercial participation rate of 30% for both NYSEG and RG&E. Assumes municipal conversions ramp up over time to maximum participation rate of 50% for both NYSEG and RG&E. It is assumed that customers heating with boilers do not electrify.

The resulting percentage of appliances converted by 2043 is shown in Table A-29.

Table A-29
Percentage of Commercial Appliances Converted to Electric by 2043

NYSEG

Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
Electrification Sub-Scenario	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	20%	57%	17%	47%	20%	20%	20%	20%	20%	59%	20%
Gas Boiler	20%	60%	16%	0%	20%	20%	20%	20%	20%	60%	0%

RG&E

Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
Electrification Sub-Scenario	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	25%	67%	17%	47%	20%	20%	20%	26%	20%	63%	20%
Gas Boiler	26%	74%	16%	0%	20%	20%	20%	27%	20%	65%	0%

Percentage of Municipal Heating Appliances Converted to Electric by 2043

NYSEG

Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
Electrification Sub-Scenario	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	31%	46%	25%	44%	31%	31%	31%	31%	31%	59%	31%
Gas Boiler	33%	53%	26%	0%	34%	34%	34%	34%	34%	60%	0%

RG&E

Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
Electrification Sub-Scenario	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	31%	78%	38%	78%	32%	32%	32%	32%	32%	63%	31%
Gas Boiler	33%	91%	43%	0%	34%	34%	34%	34%	34%	64%	0%

VII. Electrification –Industrial

A. Methodology

Electrification of space heating load associated with gas furnaces, heaters[15] and boilers are considered for industrial customers. The analysis assumes that existing gas furnaces and heaters are converted to ASHPs, while boilers are replaced with ductless mini-split ASHPs.

The industrial heating electrification models start by allocating total customer segment forecasted throughput between heating load and process load. Heating load is allocated to existing heating appliance types by applying appliance-specific market saturation percentages. Annual potential

[15] Heaters includes space heating furnaces, unit heaters, and infra-red heaters.

conversions at time of equipment failure are estimated by applying assumed equipment lifespans and assumed average appliance annual gas use. Larger industrial customers may have multiple heating units which are likely not retired at the same time. Therefore, electrification conversions are likely to occur in multiple phases as individual units reach end-of-life. An assumed annual conversion rate is applied to annual potential conversions, resulting in a number of conversions, from which net installed cost, natural gas use, electricity use and GHG emission reductions can be computed using assumptions discussed below.

B. Assumptions, Inputs, Sources

Heating load is separated from processing load for the industrial segments using heating load percentages reported in NYSEG and RG&E's 2020 Energy Efficiency Report specific to the Companies' industrial segment.[16] Industrial heating appliance stock percentage breakout between furnaces and boilers is assumed to be the same as the commercial segment shown in Table A-27, which is based on the NYSERDA 2019 Commercial Baseline Study. Multiplying the percentage of heating load by appliance stock percentages produces percent of load by appliance shown in Table A-30.

Table A-30
Industrial Heating Load as % of Customer Segment Throughput by Appliance

NYSEG

Pre-Conversion Gas Equipment	I
Forced Air Furnace and Heaters(1)	10%
Natural Gas Boiler, Ductless	6%

RG&E

Pre-Conversion Gas Equipment	
Forced Air Furnace and Heaters(1)	10%
Natural Gas Boiler, Ductless	5%

The estimated percentage of businesses with air conditioning by existing heating equipment are shown in Table A-31. This information is used to estimate net installed costs for heat pump conversion participants, which are assumed to avoid the cost of replacing their central AC or window AC units as heat pumps provide both heating and cooling.

[16] DNV GL, Energy Efficiency Potential Study: 2018 to 2027. NYSEG and RG&E. April 2020.

Table A-31
Industrial Air Conditioning Market Saturation

Pre-Conversion Gas Equipment	
% Businesses heated with gas furnaces / heaters with Central Air[2]	68%
% Businesses heated with gas furnaces / heaters with Room AC	29%
% Businesses heated with gas boilers with Room AC	29%

Note: Industrial air conditioning market saturation assumed the same as the commercial segment, which is based on the NYSERDA 2019 Commercial Baseline Study Volume 1.

Industrial heating equipment costs and energy usage estimates for both existing and conversion technologies use commercial estimates shown in Tables A-24 through A-26. As total existing appliance counts are based on heating load divided by assumed existing appliance annual gas use, heating equipment costs are scaled to maintain the commercial ratio of installed costs to energy usage. Participating industrial customers are assumed to receive utility/NYSERDA incentives that cover 20% of $2024 installation cost.

C. Scenario and LTP Inputs

All scenarios and the LTP assume that industrial space heating electrification starts in 2027, that existing equipment is converted at end-of-life.

- The **CLCPA Full Electrification scenario** assumes existing gas furnace and boiler conversions ramp up over time to maximum participation rate of 30% for NYSEG and 40% for RG&E. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs.
- The **CLCPA Hybrid Heating scenario** assumes existing gas furnaces convert to standard ASHP (with gas furnace as backup) and boilers convert to ductless mini-split ASHP (with gas boiler as backup) with industrial space heating conversions ramp up over time to a maximum participation rate of 65% for NYSEG and 80% for RG&E.
- The **Delayed Achievement Full Electrification scenario** assumes existing gas furnace and boiler industrial conversions ramp up over time to a maximum participation rate of 25% for both NYSEG and RG&E. Furnaces are converted to ccASHPs; boilers are converted to ductless mini-split ASHPs.
- The **Delayed Achievement Hybrid Heating scenario** assumes existing gas furnaceindustrial conversions ramp up over time to a maximum participation rate of 50% for both NYSEG and RG&E. Gas furnaces convert to standard ASHP with gas furnace as backup. It is assumed that customers heating with boilers do not electrify.
- The **CRA/Stakeholder CRA1, CRA2 and CRA3 scenarios** assume that existing industrial space heating gas furnaces and boilers ramp up conversions by 2.1% per year without being capped by a maximum participation rate.
    - **CRA1 (Mix)**: buildings heating with gas furnaces fully electrify with ccASHP supplemented with electric resistance heat. Customers with boilers are assumed to install mini-splits with a gas boiler for backup.

- **CRA2 (Hybrid)**: gas furnaces are assumed to install ccASHP supplemented with gas furnaces for cold days. Customers with boilers install mini-splits with a gas boiler for backup.
- **CRA3 (Full):** Furnaces convert to ccASHPs; boilers are converted to ductless mini-split ASHPs.

- The **CRA/Stakeholder CRA4 and CRA5 scenarios** assume that existing gas furnaces, boiler and non-heating gas appliance conversions ramp up at same pace as the CLCPA Full Electrification Scenario without being capped by a maximum participation rate. Furnaces convert to ccASHPs; boilers convert to ductless mini-split ASHPs.
- The **CRA/Stakeholder CRA6 scenario** assumes that existing gas furnaces, boiler and non-heating gas appliance conversions ramp up to maximum participation rate of 60% for NYSEG and 65% for RG&E. Furnaces convert to ccASHPs; boilers convert to ductless mini-split ASHPs.
- The **LTP** assumes existing NYSEG and RG&E gas furnaces convert to hybrid systems using standard ASHP with gas furnace as backup, ramping up over time to maximum participation rate of 30% for NYSEG and RG&E. It is assumed that customers heating with boilers do not electrify.

The resulting percentage of appliances converted by NYSEG and RG&E's industrial customers by 2043 is presented in Table A-32.

Table A-32
Percentage of Industrial Heating Appliances Converted to Electric by 2043

NYSEG

Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
Electrification Sub-Scenario	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	7%	14%	6%	11%	7%	7%	7%	7%	7%	20%	7%
Gas Boiler	7%	14%	6%	0%	7%	7%	7%	7%	7%	20%	0%

RG&E

Scenario	CLCPA Scenario		Delayed Achievement		CRA/Stakeholder Scenarios						
Electrification Sub-Scenario	Full	Hybrid	Full	Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
Gas Forced Air Furnace	7%	20%	4%	13%	6%	6%	6%	7%	6%	18%	5%
Gas Boiler	7%	20%	4%	0%	6%	6%	6%	7%	6%	18%	0%

VIII. Industrial – Process Energy Efficiency

A. Methodology

The modeling of industrial energy efficiency is based on high-level assumptions regarding cost per unit of natural gas usage reduction and assumed percentage of NYSEG and RG&E's industrial process load that can be reduced annually through participating customers' energy efficiency measures.

B. Assumptions, Inputs, Sources

Costs and savings are applied to industrial process load only. Industrial process load percentages are reported in NYSEG and RG&E's 2020 Energy Efficiency Report: industrial process load is 60% and 61% of total industrial load for NYSEG and RG&E, respectively. Industrial process load that is targeted for carbon capture (as discussed in the next section), is excluded from industrial process energy efficiency potential to avoid double counting of potential gas usage reductions.

The estimated energy efficiency cost per gas savings, which are used for both NYSEG and RG&E are shown in Table A-33. Participating industrial customers are assumed to receive utility/NYSERDA incentives that cover 20% of these energy efficiency installation costs.

Table A-33
Industrial Energy Efficiency Cost 2020-2050

Year	Annual Cost ($/MMBtu)
2020	$183
2030	$202
2040	$223
2050	$247

Source: National Fuel Final Long-Term Plan Appendix A, Table A-28

C. Scenario and LTP Inputs

The modeling of industrial process load energy efficiency programs differ with respect to assumed gas savings per year. All scenarios and the LTP start in 2027.

- The **CLCPA scenarios, CRA/Stakeholder scenarios** and the **LTP** assume an incremental 0.5% process load reduction/year.
- The **Delayed Achievement scenarios** assume an incremental 0.25% process load reduction/year.

IX. Industrial – Carbon Capture

A. Methodology

Carbon capture is the process by which end-use carbon emissions are removed from industrial point sources and sequestered permanently. For modeling purposes, NYSEG and RG&E assume the use of post-combustion technology, which captures CO2 from the flue gas stream exiting the combustion process. Carbon capture modeling focuses on NYSEG and RG&E's largest gas-using customers within the ethanol, cement, steel, and refinery industries. Ethanol, cement, steel, and refinery industrial customers account for 66.3% and 72.7% of NYSEG and RG&E's large industrial load, respectively. This includes process, heating, and miscellaneous loads.

NYSEG and RG&E assume a 100% capture rate,[17] meaning that 100% of carbon emissions from participating industrial customers will be captured and stored permanently in geological formations in and around New York State. The net GHG emissions reductions associated with carbon capture are quantified as captured carbon emissions minus the additional emissions incurred in the capture and storage processes. Carbon capture is limited to CO2 reductions, removal of CH4 or NO2 by carbon capture is not assumed to occur.

Carbon capture is modeled by specifying annual incremental adoption levels as a percentage of the total load of carbon capture industries and calculating the associated equipment, transportation, and storage costs.

B. Assumptions, Inputs, Sources

For modeling purposes, the carbon capture analysis is based on a cement plant with an assumed baseline CO2 avoidance plant cost provided in Table A-34. Plant costs include all CAPEX and O&M expenses, along with purchased power and natural gas costs. Transportation (e.g., round-trip transportation between the plant and the storage facility) and underground storage costs are shown in Table A-35.

Table A-34
CO2 Avoidance Cost for Carbon Capture at a Cement Plant

CO2 Avoidance Cost[18] ($ 2020/ton CO2 per year)	
Bundled Cement Plant	$114

Source: "NYSERDA Potential for Carbon Capture, Utilization, and Storage Technologies in New York State," Report Number 20-13, Table 8, pg. 48, July 2020.

Table A-35
Carbon Capture Transportation & Storage Cost

($ 2022/MT CO2 per year)	
Transportation & Storage	$15

Source: "Turning CCS Projects in Heavy Industry & Power into Blue Chip Financial Investments," Energy Futures Initiative, pg. 5, February 2023.

NYSEG and RG&E assume that captured CO2 from each industrial source will be trucked to an underground geological storage site.[19] The Newark Rift Basin, a DOE-supported carbon capture storage

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17 Based on a 2020 NYSERDA Study: Potential for Carbon Capture, Utilization, and Storage Technologies in New York State," Report Number 20-13, pg. 3, July 2020. NYSERDA predicts that most carbon capture technologies have a capture rate of 90%. The Companies use a 100% baseline efficiency level within the model.

18 Key financial assumptions used in these calculations include an economic lifetime of 25 years and a 10% discount rate.

19 Based on the 2020 NYSERDA Study referenced above, the use of CO2 pipelines is generally considered the most cost-effective transportation option, but CO2 pipelines have not been built to scale throughout the country, or in New York State. Therefore, NYSEG and RG&E assume the use of trucking when transporting CO2 from industrial point sources.

site, appears to be the closest site capable of accommodating substantial quantities of CO2.[20] The number of vehicle miles traveled associated with transporting captured carbon from industrial sources to the Newark Rift Basin is estimated based on the quantity of carbon captured, the average capacity of trucks used to transport carbon (26,349 lb CO2)[21] and the average roundtrip miles traveled between the Newark Rift Basin and the Companies' industrial sites (~537 miles and ~647 miles for NYSEG and RG&E, respectively).[22]

Participating industrial customers are assumed to receive utility/NYSERDA incentives that cover 20% of carbon capture costs.

GHG emissions impacts associated with the vehicle miles traveled to transport the carbon to the storage site are estimated based on the GHG emissions rates of medium and heavy-duty diesel trucks and a 20-year GWP, provided in Table A-36 below.[23]

Table A-36
Carbon Capture Emission Rates – 20-year GWP

Diesel - Medium & Heavy-Duty Trucks	g/CO2e per mile
CO2	10,210
CH4	0.798
N2O	11.38
CO2e	10,222

C. Scenario and LTP Inputs

The carbon capture model specifies industrial carbon capture rates as a percent load of all carbon capture candidates. The LTP and CLCPA scenarios both assume a 0.5% increase in carbon capture participation year starting in 2028. The Delayed Achievement scenarios assume a 0.25% increase per year starting in 2028. The CRA/Stakeholder scenarios assume no carbon capture.

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20 "Carbon Capture and Storage Database," National Energy Technology Laboratory, April 2018.

21 Data gathered from websites of: TOMCO2 Systems Transportation Equipment truck with a CO2 ISO container, the ASCO Carbon Dioxide Inc. CO2 TPU Transportable LCO2 Tank (212ft3), the ASCO TPU transportable LCO2 Tank (424ft3), and the ASCO CO2 Semi-Trailer (883ft3) PUR.

22 The roundtrip miles traveled for each Company was calculated by averaging the miles between each potential carbon capture participant and the Newark Rift Basin and multiplying this average by 2 to account for trucks' travel back to the industrial point source.

23 "2023 Default Emission Factors," The Climate Registry (TCR), Table 2.1 & 2.4, June 2023.

X. Utility Thermal Energy Networks

A. Methodology

Modeling of Utility Thermal Energy Networks ("UTENs") focused on installing district geothermal systems to convert residential and non-residential customers in existing neighborhoods from gas heat to UTENs GSHP equipment. A district geothermal system consists of geothermal resources that are interconnected to a distribution system which brings thermal energy to GSHPs that heat and cool buildings. While a hypothetical UTEN project is specified for modeling purposes, the details of these projects are incredibly site specific. The number of homes and businesses involved, their associated energy usage, and cost estimates for a hypothetical UTEN project are specified based on averages from two current NYSEG and RG&E UTEN pilot projects in Ithaca and Rochester. Emissions reduction estimates are based on GSHP electric usage and average building gas consumption. GSHP and network costs are used to calculate an average cost per building.

B. Assumptions, Inputs, Sources

A hypothetical existing neighborhood project is defined using averages of the data from the two current UTENs pilot projects. The hypothetical project is a 24-home residential neighborhood and eight non-residential businesses. Table A-37 provides a description and costs associated with a hypothetical UTEN project.

Table A-37
Utility Thermal Energy Network Potential - Existing Neighborhood
Average of UTEN Pilots: Ithaca and Rochester

Utility Thermal Energy Network Project Assumptions	
Average Number of Homes per Project	24
Average Number of Non-Residential Businesses	8
Capital Costs per Project	
Capital Cost ($2023) per Project	$39,635,000
Annual O&M Cost ($2022) per Project	
Annual Pumping Energy Costs & Repairs	$ 35,000
Maintenance Personnel Annual Cost	$ 240,000
Total Net Annual Cost	$ 275,000

Source: Case 22-M-0429, NYSEG and RG&E's Proposals for Thermal Energy Network Pilots, December 15, 2023

UTENs capital costs and annual O&M are escalated by the Companies' inflation forecast through 2043 and included in the Companies' gas revenue requirement.

Table A-38 shows monthly usage for gas and electric loads before and after a UTEN project, based on average data presented for the two existing UTENs pilot projects. Table A-39 presents the changes to the gas and electric peak days before and after a geothermal conversion.

Table A-38
2022 Monthly Gas and Electric Usage Comparison
Average of UTENs Pilots: Ithaca and Rochester

	2022 Monthly Comparison					
	Current NG (MCF)	Proposed NG (MCF)	Change (MCF)	Current Electric (kWh)	Proposed Electric (kWh)	Change (kWh)
Jan	2,533	685	-1,848	226,935	327,636	100,701
Feb	1,714	435	-1,279	199,636	272,762	73,126
Mar	1,676	407	-1,269	217,440	290,143	72,703
Apr	1,168	320	-848	205,012	257,052	52,040
May	446	143	-302	230,916	249,762	18,846
Jun	267	135	-132	225,561	234,443	8,882
Jul	201	138	-63	262,782	259,701	-3,081
Aug	196	138	-59	256,619	255,199	-1,419
Sep	282	135	-147	228,947	238,111	9,164
Oct	746	209	-537	220,838	256,042	35,205
Nov	1,445	395	-1,050	213,678	275,737	62,058
Dec	1,800	446	-1,354	221,242	298,042	76,800

Source: NYSEG and RG&E Special Studies Geothermal Energy System Study Report filed in Cases 19-E-0378 et. Al., May 2022, updated for December 2023 filing, and Case 22-M-0429, NYSEG and RG&E's Proposals for Thermal Energy Network Pilots, December 15, 2023.

Table A-39
Peak Day Pre- and Post-Conversion
Average of UTENs Pilots: Ithaca and Rochester

Average of Pilots: Ithaca and Rochester	Pre Conversion	Post Conversion	Net Change
January Peak Day, MCF	156	49	(106)
January Peak Day, Peak kW	336	547	211
August Peak Day, Peak kW	708	634	(73)

Source: NYSEG and RG&E Special Studies Geothermal Energy System Study Report filed in Cases 19-E-0378 et. Al., May 2022 updated for December 2023 filing and Case 22-M-0429, NYSEG and RG&E's Proposals for Thermal Energy Network Pilots, December 15, 2023.

C. Scenario and LTP Inputs

- The **CLCPA scenarios** assume that one hypothetical UTEN project will be put into service per year starting in 2035.
- The **Delayed Achievement scenarios,** all **CRA/Stakeholder scenarios** and the **LTP** assume that one hypothetical neighborhood UTEN project will be put in service every other year, starting in 2035.

XI. Renewable Natural Gas

A. Methodology

Renewable Natural Gas ("RNG") is biogas that has been converted to pipeline-quality gas. The RNG model focuses on the anerobic digestion-based production of RNG from animal manure, food waste, landfill gas and wastewater feedstocks within NYSEG and RG&E's service territories and its injection into the Companies' distribution systems. The Companies also consider supplemental anerobic digestion based RNG production from Pennsylvania and Ohio available through the Companies' firm capacity on upstream pipelines. The model includes all costs to produce and interconnect RNG to the Companies' distribution systems or upstream transportation pipelines and assumes the RNG is delivered for use by NYSEG and RG&E customers. The model allows for specification of different timeline estimates of RNG supply availability and analyzes the resulting production cost premium and GHG emissions reductions as compared to the natural gas it displaces.

B. Assumptions, Inputs, Sources

RNG production costs are site-specific, dependent on production facility size, gas conditioning, upgrade costs, compression, and interconnection for pipeline injection costs. The following assumed RNG production costs shown in Table A-40 represent the weighted average cost in New York State for each RNG feedstock and technology as reported by NYSERDA.

Table A-40
RNG Production Cost

Process	Feedstock	Production Cost $2022/ MMBtu
Anaerobic Digestion	Landfill Gas	$11.29
	Animal Manure	$34.56
	Food Waste	$23.86
	Wastewater	$27.68

Source: "Potential of Renewable Natural Gas in New York State prepared for New York State Energy Research and Development Authority", ICF Resources, April 2022. NYSERDA Report Number 21-34, ("ICF NYSERDA RNG Study,") p 44. Production cost adjusted for inflation in modeling.

Emissions impacts related to the use of RNG sourced both in-state and out-of-state are captured on a life-cycle basis and are estimated based on a 20-year GWP, consistent with CLCPA requirements. The GHG emission factors used for each RNG feedstock are provided in Table A-41. RNG sourced from out-of-state is assumed to have higher emissions than RNG sourced from within the Companies' service territories due to the added use of upstream transportation to deliver the out-of-state RNG. The emission adder associated with upstream transportation for out-of-state RNG is also shown in Table A-41.

Table A-41
GHG Emission Factors – 20-Year GWP

RNG Feedstock	Emission Rate (lb/Mcf)				Upstream Transportation Adder (lb/Mcf)
	CH4	CO2	N2O	20-yr GWP CO2e	20-yr GWP CO2e
Landfill Gas	0.35	11.93	0.00	41.22	25.94
Animal Manure	(2.74)	(51.24)	0.00	(281.80)	
Food Waste	(0.22)	(4.09)	0.00	(22.50)	
Wastewater	0.37	6.86	0.00	37.73	

Source: "National Fuel Final Long Term Plan Appendix A", National Fuel, July 17, 2023. Table A-34.

RNG technical potential estimates by feedstock are calculated based on the total available landfill gas, animal manure, food waste, and wastewater in NYSEG and RG&E's service territories.

1. **Landfill Gas:** The Companies have identified six existing landfill gas facilities within their service territories. Four of these six facilities (two in NYSEG and two in RG&E) have been identified as "Landfill Gas Recovery Facilities" by the New York State Department of Environmental Conservation.[24] Using 2021 reported emissions from EPA's Greenhouse Gas Reporting Program,[25] the Companies estimated the annual gas production at each of the Landfill Gas Recovery Facilities and in turn, the estimated technical potential for RNG from landfill gas in each service territory.
2. **Animal Waste:** The Companies estimated cattle headcount within their service territories by county based on a 2019 New York State Dairy Statistics Report.[26] Total annual biogas production is estimated by applying the average rate of biogas production from one cow in New York State to generate the Companies' technical potential for RNG from animal waste in each service territory.
3. **Food Waste:** RNG technical potential estimates from food waste are calculated based on NYSEG and RG&E's served populations as a percentage of New York State's total population.
4. **Wastewater:** The Companies identified the number of wastewater treatment plants ("WWTP") in their service territories along with each facility's average design hydraulic flow using data reported by the New York State Department of Environmental Conservation.[27] To estimate annual RNG potential from these WWTPs, an average energy yield of 7.003 MMBtu per million gallons of wastewater treated was assumed for different scenarios of various

[24] "Policy DMM-SW-04-16 Landfill Gas Collection and Treatment Systems," New York State Department of Environmental Conservation, February 11, 2004.

[25] "Greenhouse Gas Reporting Program (GHGRP) – Facility Level Information on GreenHouse gases Tool (FLIGHT)," U.S. Environmental Protection Agency Office of Atmospheric Protection, August 12, 2022.

[26] "2019 New York State Dairy Statistics Report," New York State Department of Agriculture and Markets, Table 3, 2019.

[27] "Wastewater Treatment Plants Dataset," New York State Department of Environmental Conservation, February 15, 2023.

WWTP participation levels, consistent with the ICF NYSERDA RNG Study.[28] Specifically, the following ICF NYSERDA RNG Study scenario assumptions were adopted related to WWTP:

- **Achievable Deployment Scenario:** assumption that RNG could be produced at 40% of the facilities with a capacity greater than 7.25 MGD.
- **Optimistic Growth Scenario:** assumption that RNG could be produced at 50% of the facilities with a capacity greater than 3.3 MGD.
- **Technical Potential Scenario:** assumption that RNG could be produced at 100% of all municipal WWTPs in New York State.

The Companies' estimated RNG technical potentials are presented in Table A-42 below.

Table A-42
NYSEG and RG&E Estimated Annual RNG Technical Potential by Feedstock (tBtu/yr)

	NYSEG	RG&E	New York State
Landfill Gas	2.9	6.1	50.5
Animal Manure	3.6	1.3	20.2
Food Waste	0.68	0.31	6.1
Wastewater	1.2	0.42	7.1

New York State's annual 2040 RNG production estimates are calculated as percentages of New York's total technical potential based on data published in the ICF NYSERDA RNG Study that reflects "achievable deployment" and "optimistic growth" levels. These percentages are then multiplied by the Companies' estimated total RNG technical potential by feedstock within its service territories to derive production levels for the two scenarios, with exception of WWTP potential discussed above. The resulting 2024-2043 timelines of annual RNG production supply projected to be available within the Companies' service territories are presented in Tables A-43 and A-44, followed by Figures A-3 and A-4.

[28] "Potential of Renewable Natural Gas in New York State," Prepared for NYSERDA by ICF, Final Report, Report Number 21-34, pg. 27, April 2022.

Table A-43
Available RNG Production in NYSEG's Service Territory

	Achievable Deployment (Mcf)				Optimistic Growth (Mcf)			
	Landfill Gas	Animal Manure	Food Waste	Wastewater	Landfill Gas	Animal Manure	Food Waste	Wastewater
2024	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-
2026	-	432,451	-	-	-	434,144	-	-
2027	-	508,954	-	-	-	514,031	-	-
2028	-	623,707	-	-	-	633,862	-	-
2029	1,112,896	700,210	380,136	60,490	1,430,042	753,694	480,761	60,314
2030	1,112,896	776,712	380,136	120,980	1,430,042	873,525	480,761	120,627
2031	1,112,896	853,215	380,136	181,470	1,430,042	993,356	480,761	180,941
2032	1,112,896	929,717	380,136	241,959	1,430,042	1,113,187	480,761	241,254
2033	1,112,896	1,006,219	380,136	302,449	1,430,042	1,233,018	480,761	301,568
2034	1,112,896	1,082,722	380,136	362,939	1,430,042	1,352,850	480,761	361,881
2035	1,112,896	1,159,224	380,136	423,429	1,430,042	1,472,681	480,761	422,195
2036	1,112,896	1,235,727	380,136	483,919	1,430,042	1,592,512	480,761	482,508
2037	1,112,896	1,312,229	380,136	514,164	1,430,042	1,712,343	480,761	542,822
2038	1,112,896	1,388,732	380,136	514,164	1,430,042	1,832,174	480,761	572,979
2039	1,112,896	1,465,234	380,136	514,164	1,430,042	1,952,006	480,761	572,979
2040	1,112,896	1,541,736	380,136	514,164	1,430,042	2,071,837	480,761	572,979
2041	1,112,896	1,618,239	380,136	514,164	1,430,042	2,151,724	480,761	572,979
2042	1,112,896	1,618,239	380,136	514,164	1,430,042	2,151,724	480,761	572,979
2043	1,112,896	1,618,239	380,136	514,164	1,430,042	2,151,724	480,761	572,979

Table A-44
Available RNG Production in RG&E's Service Territory

	Achievable Deployment (Mcf)				Optimistic Growth (Mcf)			
	Landfill Gas	Animal Manure	Food Waste	Wastewater	Landfill Gas	Animal Manure	Food Waste	Wastewater
2024	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-
2026	-	53,209	-	-	-	51,884	-	-
2027	-	159,627	-	-	-	155,651	-	-
2028	-	319,255	-	-	-	311,303	-	-
2029	2,347,658	372,464	172,789	3,387	3,016,679	363,186	218,528	16,796
2030	2,347,658	425,673	172,789	3,387	3,016,679	415,070	218,528	33,593
2031	2,347,658	478,882	172,789	3,387	3,016,679	466,954	218,528	50,389
2032	2,347,658	532,091	172,789	3,387	3,016,679	518,838	218,528	67,185
2033	2,347,658	585,300	172,789	3,387	3,016,679	570,721	218,528	83,981
2034	2,347,658	585,300	172,789	3,387	3,016,679	622,605	218,528	100,778
2035	2,347,658	585,300	172,789	3,387	3,016,679	674,489	218,528	117,574
2036	2,347,658	585,300	172,789	3,387	3,016,679	726,373	218,528	134,370
2037	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	151,166
2038	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	167,963
2039	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	184,759
2040	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	198,196
2041	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	198,196
2042	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	198,196
2043	2,347,658	585,300	172,789	3,387	3,016,679	778,256	218,528	198,196

Figure A-3
Available RNG Production in NYSEG's Service Territory

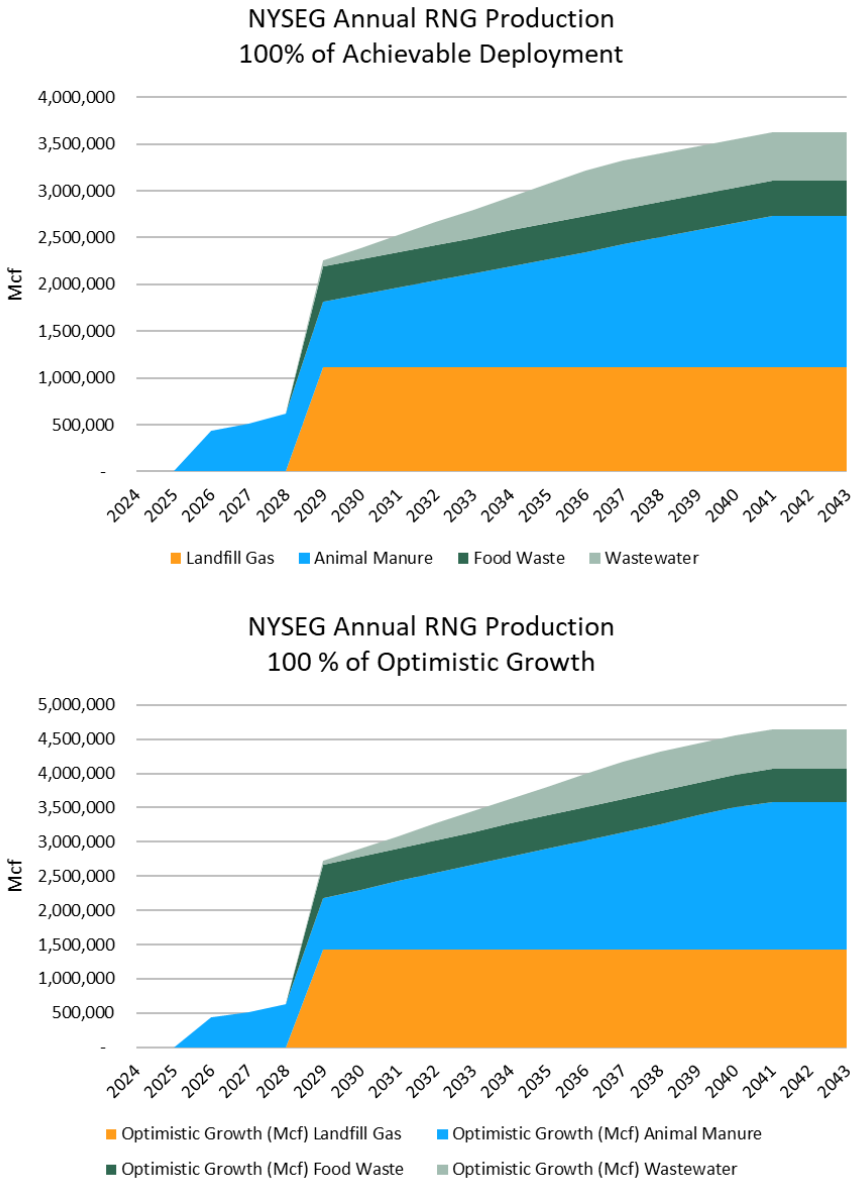
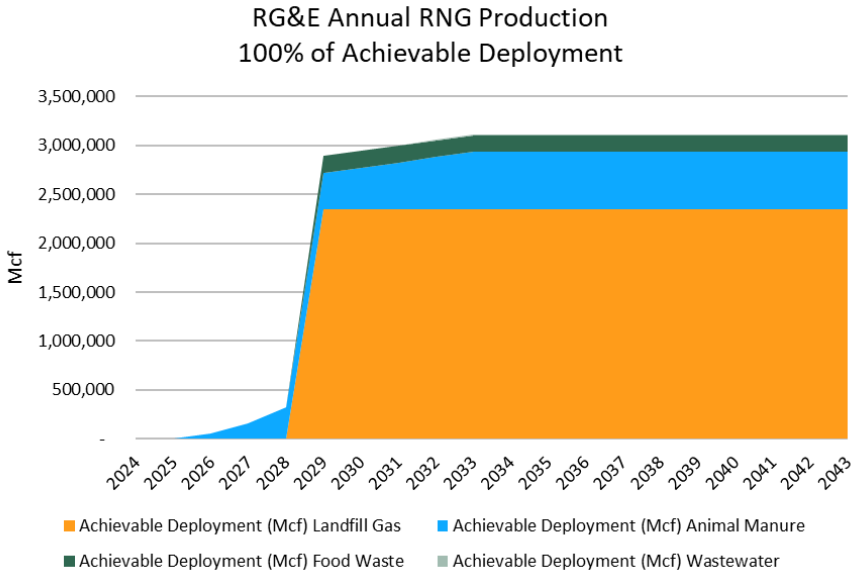
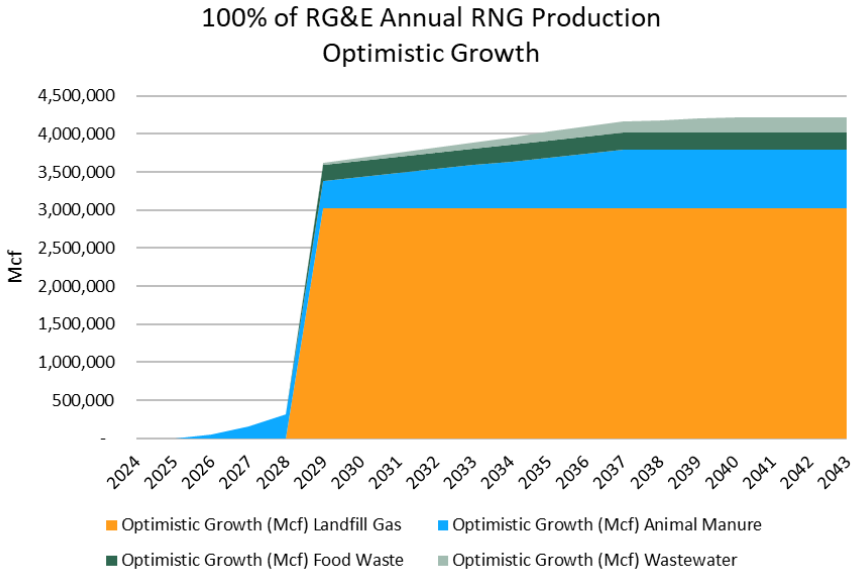


Figure A-4
Available RNG Production in RG&E's Service Territory





Total RNG technical potential estimates for anaerobic digestion-based feedstocks in Pennsylvania and Ohio are derived from data published in the 2019 American Gas Foundation Study.[29] Annual 2040 RNG production estimates by feedstock in Pennsylvania and Ohio for the "achievable deployment" and "optimistic growth" scenarios are calculated as percentage of total technical potential using the same ratios developed for New York from data published in the NYSERDA RNG Study.

It is assumed that the NYSEG and RG&E would not be able to purchase all the RNG in Pennsylvania and Ohio because other New York utilities and entities in Pennsylvania and Ohio may also be interested in RNG produced in Pennsylvania and Ohio. The amount of RNG in Pennsylvania that could be available to the Companies was estimated by calculating NYSEG and RG&E's percentages of total annual natural gas load in Pennsylvania plus New York (i.e. the Companies' New York load divided by the sum of total gas load in Pennsylvania and total gas load in New York), which is 2.15% and 2.19%, respectively. Similarly, the amount of RNG in Ohio that could be available to the Companies was estimated by calculating NYSEG and RG&E's percentages of total annual natural gas load in Ohio plus New York (i.e. the Companies' (New York) load divided by the sum of total gas load in Ohio and total gas load in New York), which is 2.33% and 2.38%, respectively. The resulting 2023-2042 timelines of annual RNG production supply projected to be available to NYSEG and RG&E from Pennsylvania and Ohio are presented in Tables A-45 and A-46, followed by Figures A-5 and A-6.

[29] "Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment," American Gas Foundation Study prepared by ICF, Appendix A, December 2019, pg. 64-69.

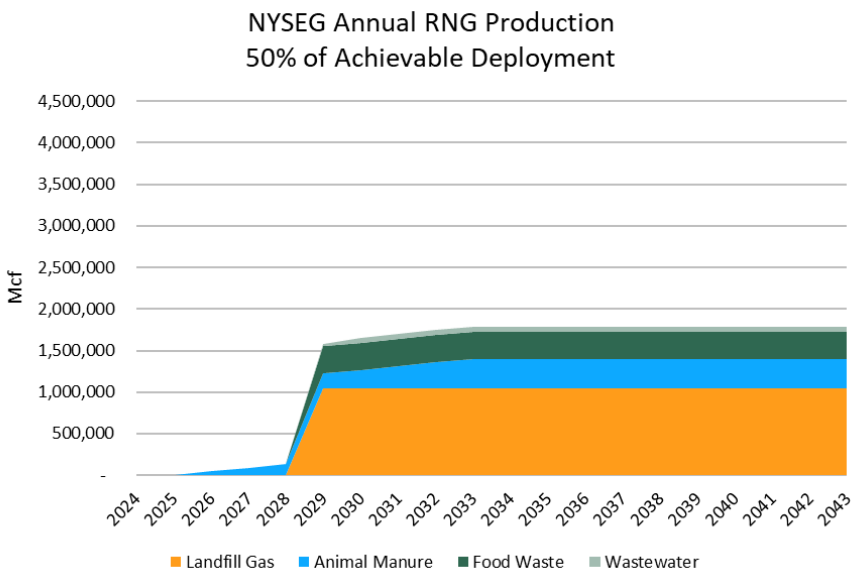
Table A-45
Available RNG Production to NYSEG in Pennsylvania and Ohio

	Achievable Deployment (Mcf)				Optimistic Growth (Mcf)			
	Landfill Gas	Animal Manure	Food Waste	Wastewater	Landfill Gas	Animal Manure	Food Waste	Wastewater
2024	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-
2026	-	44,795	-	-	-	44,795	-	-
2027	-	89,590	-	-	-	89,590	-	-
2028	-	134,385	-	-	-	134,385	-	-
2029	1,042,456	179,180	328,281	29,860	1,339,529	179,180	415,179	29,860
2030	1,042,456	223,975	328,281	59,719	1,339,529	223,975	415,179	59,719
2031	1,042,456	268,770	328,281	65,853	1,339,529	268,770	415,179	87,804
2032	1,042,456	313,565	328,281	65,853	1,339,529	313,565	415,179	87,804
2033	1,042,456	349,525	328,281	65,853	1,339,529	358,360	415,179	87,804
2034	1,042,456	349,525	328,281	65,853	1,339,529	403,155	415,179	87,804
2035	1,042,456	349,525	328,281	65,853	1,339,529	447,950	415,179	87,804
2036	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2037	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2038	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2039	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2040	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2041	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2042	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804
2043	1,042,456	349,525	328,281	65,853	1,339,529	464,752	415,179	87,804

Table A-46
Available RNG Production to RG&E in Pennsylvania and Ohio

	Achievable Deployment (Mcf)				Optimistic Growth (Mcf)			
	Landfill Gas	Animal Manure	Food Waste	Wastewater	Landfill Gas	Animal Manure	Food Waste	Wastewater
2024	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-
2026	-	52,454	-	-	-	52,454	-	-
2027	-	104,907	-	-	-	104,907	-	-
2028	-	157,361	-	-	-	157,361	-	-
2029	1,064,164	209,814	218,528	6,774	1,367,423	209,814	218,528	6,774
2030	1,064,164	262,268	335,117	13,547	1,367,423	262,268	423,824	13,547
2031	1,064,164	314,721	335,117	20,321	1,367,423	314,721	423,824	20,321
2032	1,064,164	356,803	335,117	27,094	1,367,423	367,175	423,824	27,094
2033	1,064,164	356,803	335,117	33,868	1,367,423	419,628	423,824	33,868
2034	1,064,164	356,803	335,117	40,641	1,367,423	472,082	423,824	40,641
2035	1,064,164	356,803	335,117	47,415	1,367,423	474,430	423,824	47,415
2036	1,064,164	356,803	335,117	54,188	1,367,423	474,430	423,824	54,188
2037	1,064,164	356,803	335,117	60,962	1,367,423	474,430	423,824	60,962
2038	1,064,164	356,803	335,117	67,224	1,367,423	474,430	423,824	67,735
2039	1,064,164	356,803	335,117	67,224	1,367,423	474,430	423,824	74,509
2040	1,064,164	356,803	335,117	67,224	1,367,423	474,430	423,824	81,282
2041	1,064,164	356,803	335,117	67,224	1,367,423	474,430	423,824	88,056
2042	1,064,164	356,803	335,117	67,224	1,367,423	474,430	423,824	89,632
2043	1,064,164	356,803	335,117	67,224	1,367,423	474,430	423,824	89,632

Figure A-5
Available RNG Production to NYSEG in Pennsylvania and Ohio



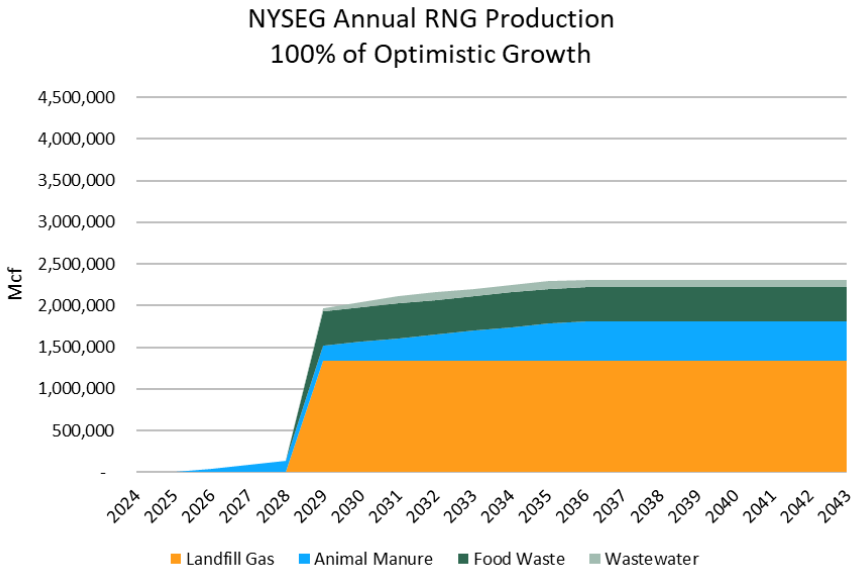
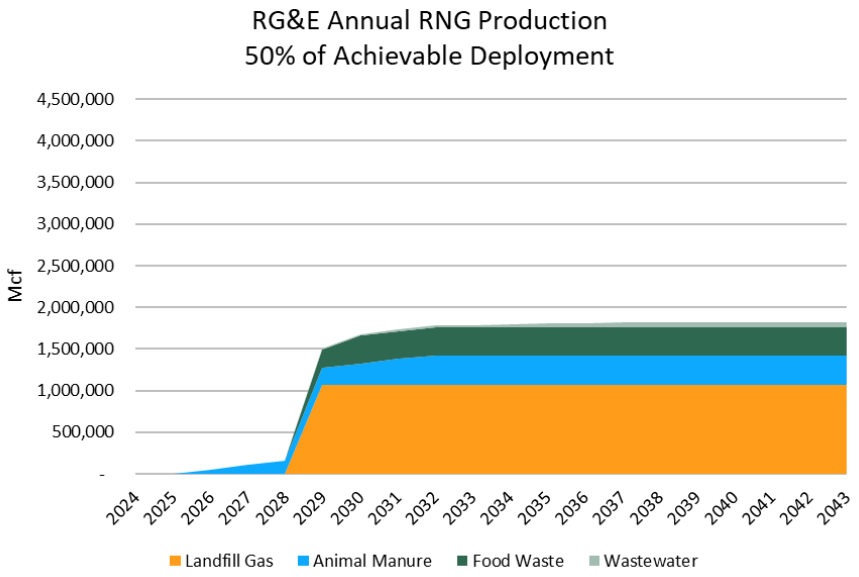
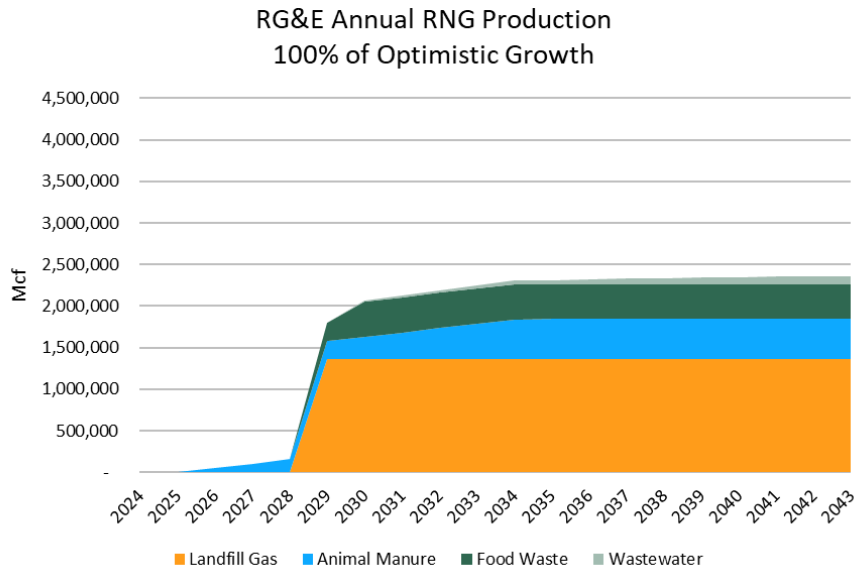


Figure A-6
Available RNG Production to RG&E in Pennsylvania and Ohio





C. Scenario and LTP Inputs

- In the **CLCPA scenarios** and the **LTP**, it is assumed RNG is produced consistent with the "optimistic growth" scenario, and the Companies acquire their pro rata share of the RNG produced in Pennsylvania and Ohio (i.e., approximately 2% of the RNG in each state for each utility).
- In the **Delayed Achievement scenarios**, it is assumed that RNG is produced consistent with the "achievable deployment" scenario, and the Companies acquire half of their pro rata share of the RNG in Pennsylvania and Ohio (i.e., approximately 1% of the RNG in each state for each utility).

- In **CRA/Stakeholder scenarios**, it is assumed that the Companies will not acquire RNG.

XII. Green Hydrogen

A. Methodology

Blending green hydrogen into the natural gas distribution system can eliminate emissions associated with end-use combustion. An assumed schedule of annual hydrogen blend is specified as a percentage of total throughput, from which total incremental costs and associated GHG emission reductions are calculated.

B. Assumptions, Inputs, Sources

Green hydrogen costs are based on projections from ICF's 2021 hydrogen study, shown in Table A-47.[30]

Table A-47
Cost Projection of Green Hydrogen 2023-2043

Year	Green Hydrogen ($2020/MMBtu)
2023	$24.02
2024	$23.26
2025	$22.50
2026	$21.46
2027	$20.42
2028	$19.38
2029	$18.34
2030	$17.30
2031	$16.76
2032	$16.22
2033	$15.68
2034	$15.14
2035	$14.60
2036	$14.18
2037	$13.76
2038	$13.34
2039	$12.92
2040	$12.50
2041	$12.18
2042	$11.86

Source: Estimated from graph in "Examining the Current and Future Economics of Hydrogen Energy," ICF, August 13, 2021. Cost adjusted for inflation in modeling to nominal dollars.

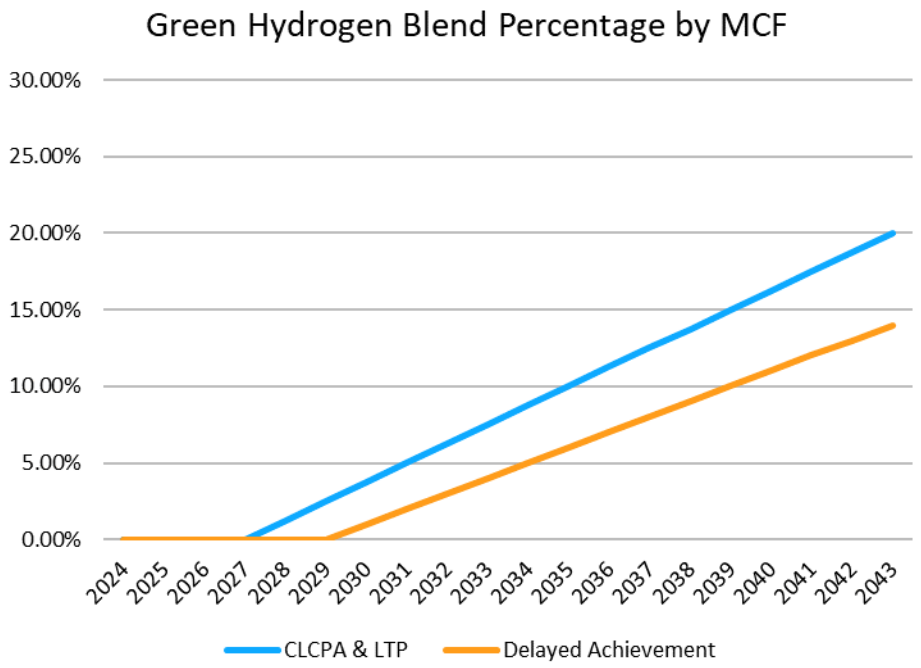
[30] "Examining the Current and Future Economics of Hydrogen Energy," ICF, August 13, 2021.

C. Scenario and LTP Inputs

- The **CLCPA scenarios** and the **LTP** assume a 1.25% (by volume) increase in hydrogen blend as a percentage of total throughput per year starting in 2028.
- The **Delayed Achievement scenarios** assume a 1.0% (by volume) increase in hydrogen blend as a percentage of total throughput per year starting in 2030.
- The **CRA/Stakeholder scenarios** assume the Companies will not utilize hydrogen blending.

Figure A-7 depicts the start year, total blend percentage, and annual increase by scenario.

Figure A-7
NYSEG and RG&E: Percent Hydrogen Blend by Scenario 2024-2043



Appendix B:

Energy Prices

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

April 26, 2024

Avangrid

A member of the Iberdrola Group

CONTENTS

Appendix B: Energy Prices

All analyses discussed in this Appendix B are performed separately for NYSEG and RG&E, as the Companies are distinct entities with their own gas and electric tariffs.

I. Gas Prices

The gas bill impact for a non-participating gas customer over the 20-year period due to increased utility costs and reduced gas usage associated with the decarbonization actions is determined by multiplying the all-in gas price by gas usage for a non-participating customer. The Companies' Reference Case cost of gas and base gas distribution rate forecasts are adjusted separately based on the combined effects of decarbonization actions on costs and billing determinants, as discussed in more detail below. The Reference Case commodity prices are used to quantify the economic benefits of reduced gas usage for each scenario.

A. Cost of Gas

1. Reference Case Overview

The cost of gas forecast is comprised of a per unit commodity gas price as well as fixed storage and pipeline demand/reservation charges. Commodity prices are forecasted for 20 years, starting with NYSEG and RG&E's budgeted 2023 commodity unit cost per MCF, escalated by the yearly growth rate projected by the U.S. Energy Information Administration's Annual Energy Outlook 2023 ("EIA AEO 2023") Henry Hub nominal forecast.

2. Monthly and Seasonal Shaping

Seasonal commodity gas prices are required to estimate the economics of decarbonization actions that have varying impacts throughout the year (e.g., electrification, weatherization). Monthly average commodity gas prices are estimated first, and seasonal average prices are derived from the monthly prices. The ratios of monthly average commodity prices to annual commodity prices are assumed to remain constant over the 20-year forecast period based on the 2023 budget. For each scenario, the average monthly gas commodity prices are weighted by heating degree days (HDDs) and cooling degree

days (CDDs)[1] to estimate average seasonal prices for "cold" winter days, "moderately cold" shoulder days and summer days. Cold days are considered winter days and are assumed to be days with at least 35 HDD. Moderately cold days are considered shoulder days and are assumed to be days with between 0 and 35 HDD. Summer days are assumed to be days with CDDs greater than 0. The seasonal allocations by month for NYSEG and RG&E are shown in Table B-1.

Table B-1
NYSEG Seasonal Allocation by Month

	NYSEG			RG&E		
Seasonal Allocation by Month	% Winter	% Shoulder	% Summer	% Winter	% Shoulder	% Summer
Jan	38%	0%	0%	47%	1%	0%
Feb	32%	1%	0%	34%	6%	0%
Mar	7%	22%	0%	6%	21%	0%
Apr	0%	18%	0%	0%	15%	0%
May	0%	7%	0%	0%	6%	0%
Jun	0%	1%	14%	0%	0%	18%
Jul	0%	0%	50%	0%	0%	43%
Aug	0%	0%	35%	0%	0%	35%
Sep	0%	3%	1%	0%	2%	4%
Oct	0%	14%	0%	0%	11%	0%
Nov	0%	23%	0%	0%	19%	0%
Dec	23%	10%	0%	13%	19%	0%
Total	100%	100%	100%	100%	100%	100%

3. Scenarios

RNG and Hydrogen Supplies: The Companies' CLCPA and Delayed Achievement scenarios and LTP incorporate the cost premium associated RNG and hydrogen. Since the amount of RNG and hydrogen differs among scenarios, the effect of these fuels on the cost of gas differs among scenarios. No adjustments are made to the CRA/Stakeholder scenarios for the cost premium associated with RNG and hydrogen as all of these scenarios exclude all RNG and hydrogen.

[1] HDD is a unit of measure used to relate a day's temperature to the energy consumption associated with space heating. HDD = 65 minus average daily temperature. Days with average daily temperatures above 65 degrees have HDD of 0 (i.e., HDD does not go negative). Similarly, CDD is a unit of measure used to relate a day's temperature to the energy consumption associated with cooling. CDD = average daily temperature minus 65. Days with average daily temperatures below 65 degrees have CDD of 0 (i.e., CDD does not go negative).

Pipeline and Storage Contract Restructuring: The Companies' CLCPA and Delayed Achievement scenarios assume that current levels of fixed pipeline storage costs remain flat and continue to be recovered. In contrast, the Companies assume fixed pipeline and storage costs are reduced proportional to reductions in design day demand. The LTP modeling ties fixed pipeline and storage cost reductions to design day demand reductions that are sustained throughout the prior three-years. Specifically, in 2029 and each following year, the maximum design day demand over the prior three-year period is compared to 2024 design day demand and that percentage reduction is applied to the Companies' current fixed pipeline and storage costs. As a result, 2043 fixed pipeline and storage costs are reduced by 20% in NYSEG's LTP and 15% in RG&E's LTP.[2]

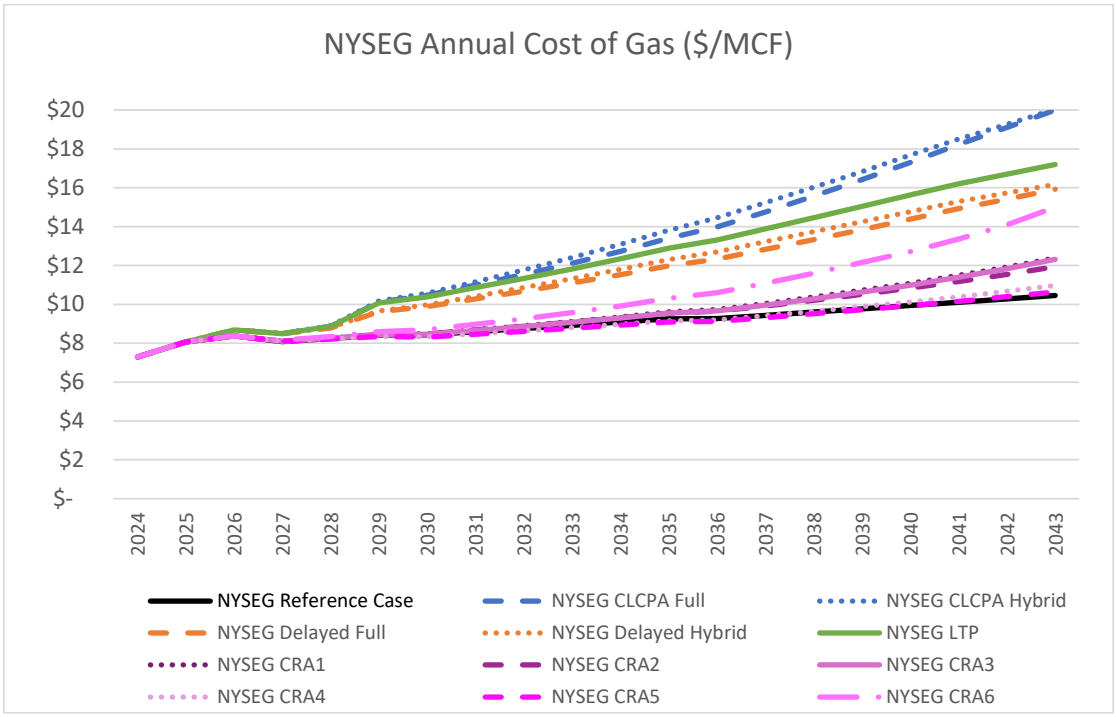
The CRA/Stakeholder scenarios assume pre-defined reductions in pipeline and storage fixed costs.

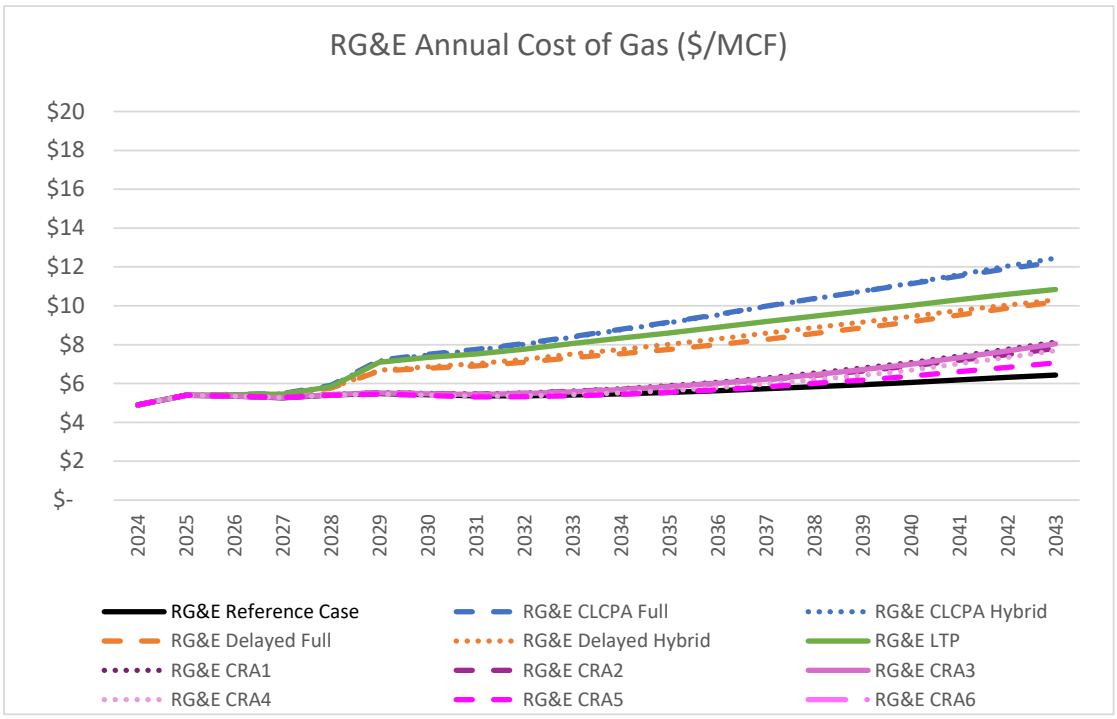
- CRA 1 and CRA 2 assume pipeline and storage fixed reservation charges decrease at a rate of 0.5%/year starting in 2028.
- CRA 3 assumes pipeline and storage fixed reservation charges decrease at a rate of 1.0%/year starting in 2028.
- CRA 4, 5 and 6 assume pipeline and storage fixed reservation charges decrease at a rate of 3.0%/year starting in 2028.

The cost of gas in the Companies' CLCPA scenarios are higher than the cost of gas in the Delayed Achievement scenarios and the LTP because: (1) the CLCPA scenarios include more RNG and hydrogen than the Delayed Achievement scenarios, and (2) the CLCPA scenarios have lower billing determinants than both the Delayed Achievement scenarios and LTP. The cost of gas in the CRA/Stakeholder scenarios is less than the Companies' scenarios and LTP due to the elimination of RNG and hydrogen. The Reference Case, CLPA scenarios, Delayed Achievement scenarios, CRA/Stakeholder scenarios and LTP cost of gas are illustrated in Figure B-1.

[2] Pipeline and storage contract restructuring will not likely occur at a steady rate that matches the decline in design day demand. Instead, the Companies will update their respective portfolios periodically as contracts approach their end-of-term dates (i.e., pipeline or storage contract restructuring will likely be "lumpy" as it will be subject to existing contract terms that include specific end dates and contract capacities). In addition, the amount of reduction in capacity will not match annual design day demand reductions, because the Companies' must be sure that design day demand reductions are sustained and permanent before capacity is reduced. Contract restructuring must also consider the dispersed nature of the Companies' customer base and contract capacity must match the distinct locations where design day demand reductions have occurred.

Figure B-1
Annual Cost of Gas by Scenario ($/MCF)





B. Base Distribution Gas Rates

A 20-year Reference Case base gas distribution revenue requirement forecast was developed for NYSEG and RG&E, applying existing revenue requirements policies and capital expenditure and O&M forecasts from the Order Adopting Joint Proposal in Case 22-E-0317, et al[3] ("Order Adopting Joint Proposal") for the three proposed rate years (2024-2026, twelve months ending April 30th). For the years 2027 and later, the 2026 capital expenditure amounts are escalated by the Companies' inflation forecast provided in Appendix A, Table A-2. Reference Case Capital expenditures are reduced for avoided new gas meters and services resulting from the full electrification of new residential and commercial customers starting in 2026 and new municipal and industrial customers starting in 2029, consistent with legislation enacted in 2023.

O&M expense for 2027 is escalated through 2043 using Rate Year 3 percent change from Rate Year 2 O&M expense. O&M Working capital is assumed to equal the 3-year average percentage of O&M Working capital of total O&M. Plant retirements as a percentage of plant additions are assumed to be 11% for NYSEG and 4% for RGE, based on each Company's electric distribution plant's four-year historical average as reported in Federal Energy Regulatory Commission ("FERC") Form 1 reports for 2019-2022. Forecasted plant retirements are removed from accumulated depreciation reserve and gross plant in-service in calculation of rate base.

For each scenario, the following adjustments are made to Reference Case capital expenditures and O&M:

- Capital expenditures are reduced for avoided replacement of existing gas meters and services resulting from the full electrification, probability adjusted assuming an average life of 35 years for meters and 45 years for services. Specifically, when a meter and service are retired, 1/35th of replacement cost of meter and 1/45th of replacement cost of a service is deducted from the capital expenditure forecast in the retirement year and each subsequent year. This adjustment is made to reflect the probability that the meter and/or service might have required replacement at some point during the LTP analysis period, had the equipment not been retired.
- Capital expenditures are increased for UTENs capital expenditures.
- O&M expense is increased for UTENs O&M and Utility/NYSERDA energy efficiency and electrification incentive program rebates.

For CRA/Stakeholder scenarios CRA 3 and CRA 4 - 6, Reference Case capital expenditures and O&M expenses are reduced starting in 2028 by 1%/year and 3%/year, respectively as a proxy for strategic downsizing.

Illustrative gas base distribution non-gas costs are calculated for each rate class using each Company's adjusted revenue requirement forecast and proposed class level revenues as filed in the Joint Proposal.

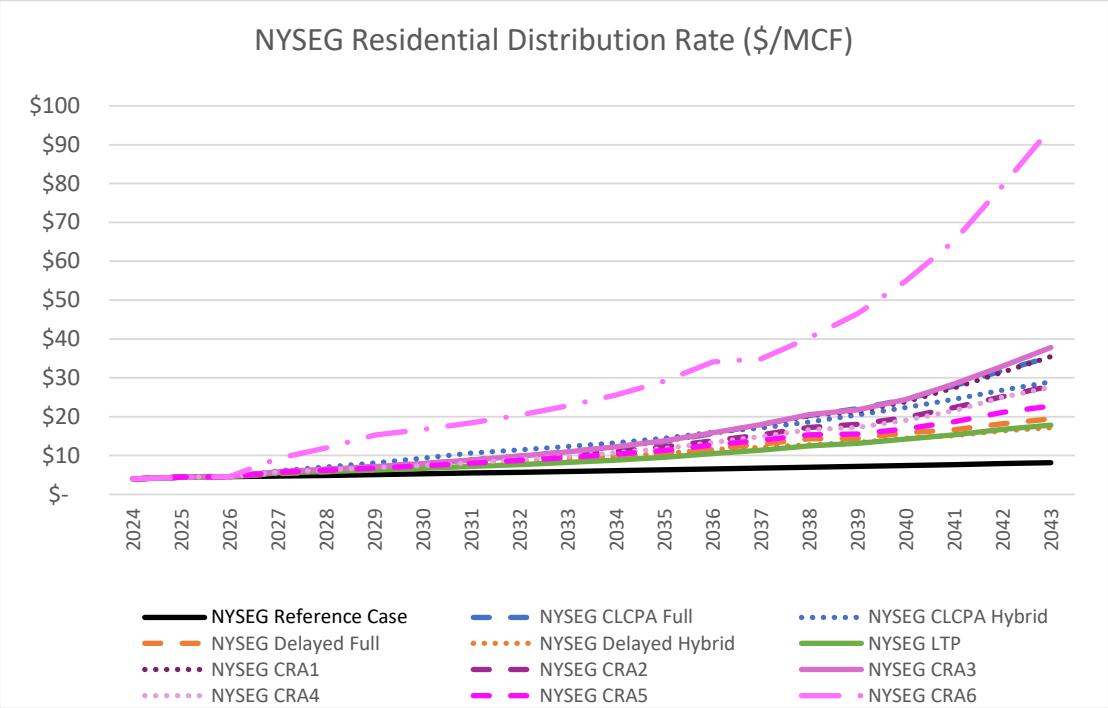
[3] Order Adopting Joint Proposal. October 12, 2023, Docket 22-G-0318.

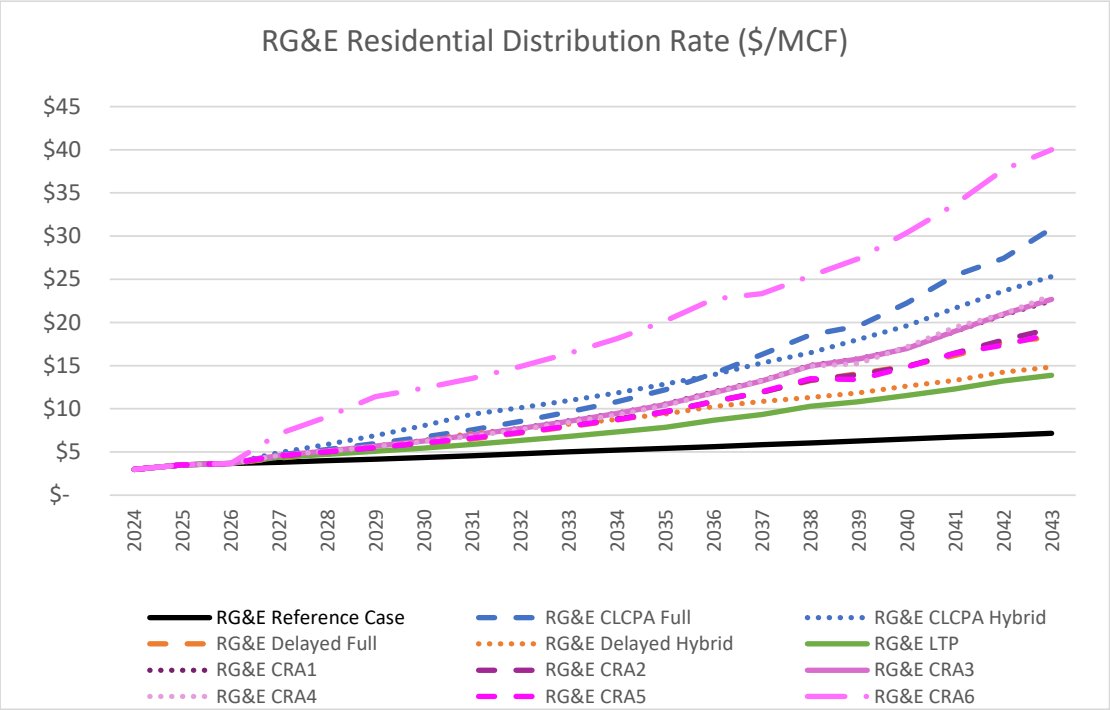
For each forecasted year, the model calculates the cumulative percentage change in NYSEG and RG&E's forecasted revenue requirement from its proposed revenue requirement in its Joint Proposal for each gas division. These cumulative percentage changes are then applied to the base distribution revenues for each rate class.

Customer charge revenues are assumed to increase at 2% from the Reference Case, reduced for any reduction in customer counts resulting from full electrification or UTENs. The resulting customer charge revenues are netted from base distribution revenues to calculate volumetric revenues. Volumetric revenues are divided by NYSEG and RG&E's Reference Case throughput, adjusted by the reduction in throughput resulting from the decarbonization actions included in the scenario to derive a base distribution volumetric gas rate.

Average gas base distribution costs are then calculated for each customer segment (i.e., residential, commercial, industrial, municipal). The distribution rate for residential customers for the Reference Case, CLCPA scenarios, Delayed Achievement scenarios, the CRA/Stakeholder scenarios and LTP are illustrated in Figure B-2.

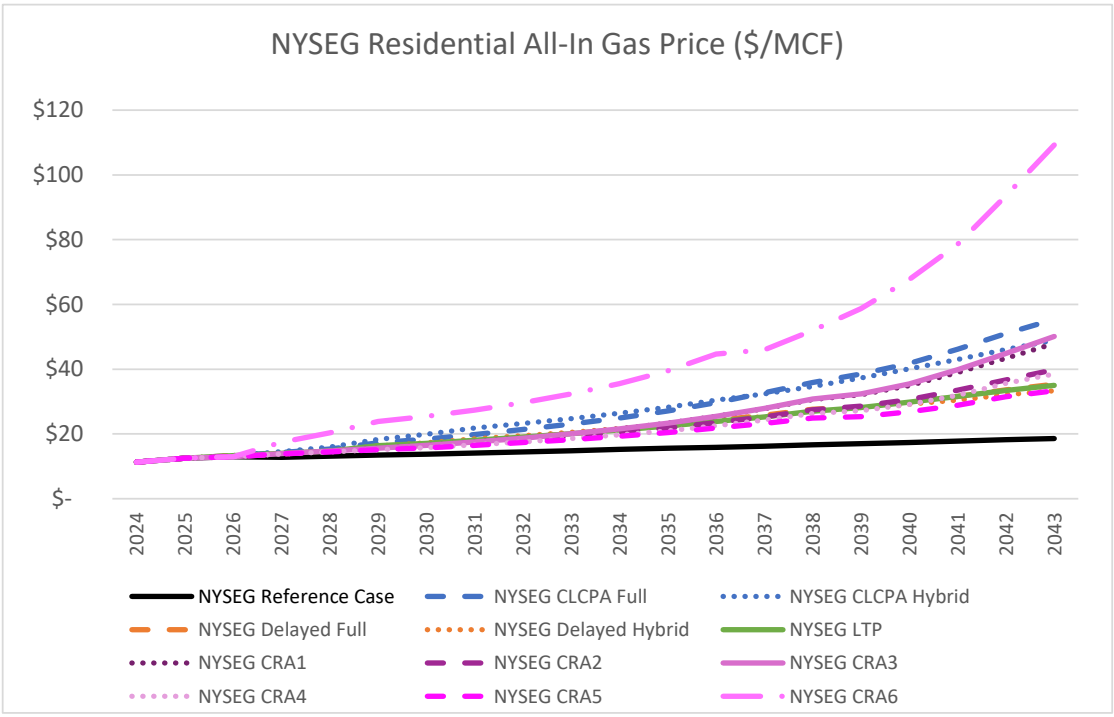
Figure B-2
Annual Residential Base Gas Distribution Rate by Scenario ($/MCF)

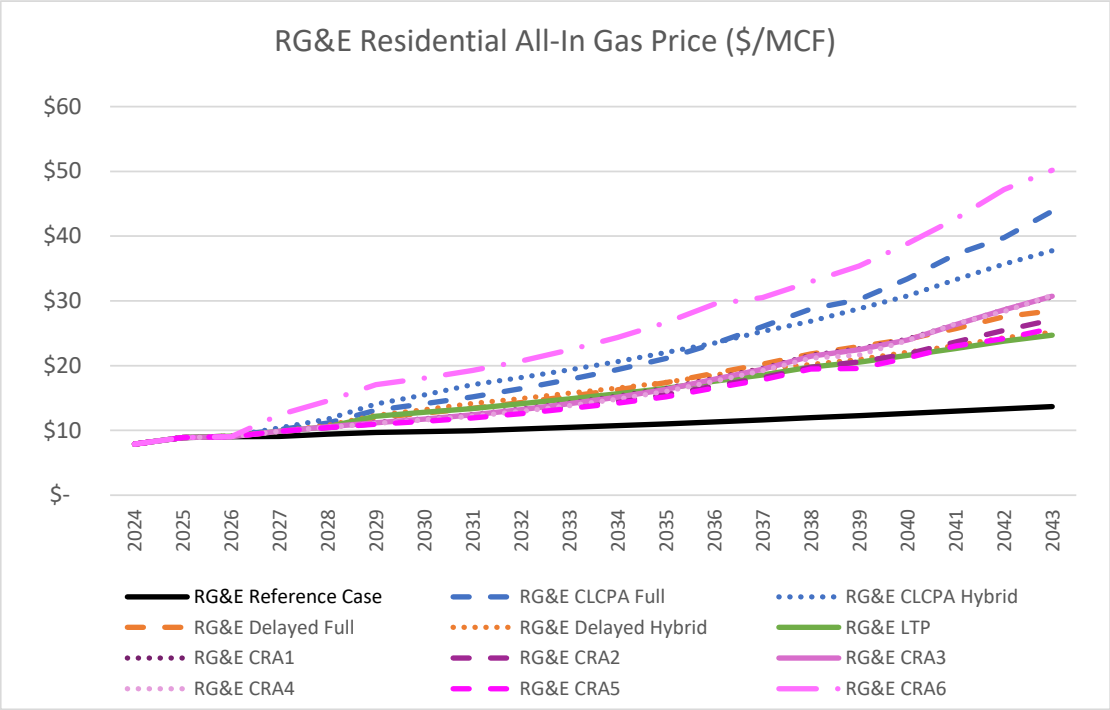




The all-in (distribution plus cost of gas) residential gas price forecast is shown in Figure B-3 below.

Figure B-3
Annual Residential All-In Gas Price ($/MCF)





II. Electric Prices

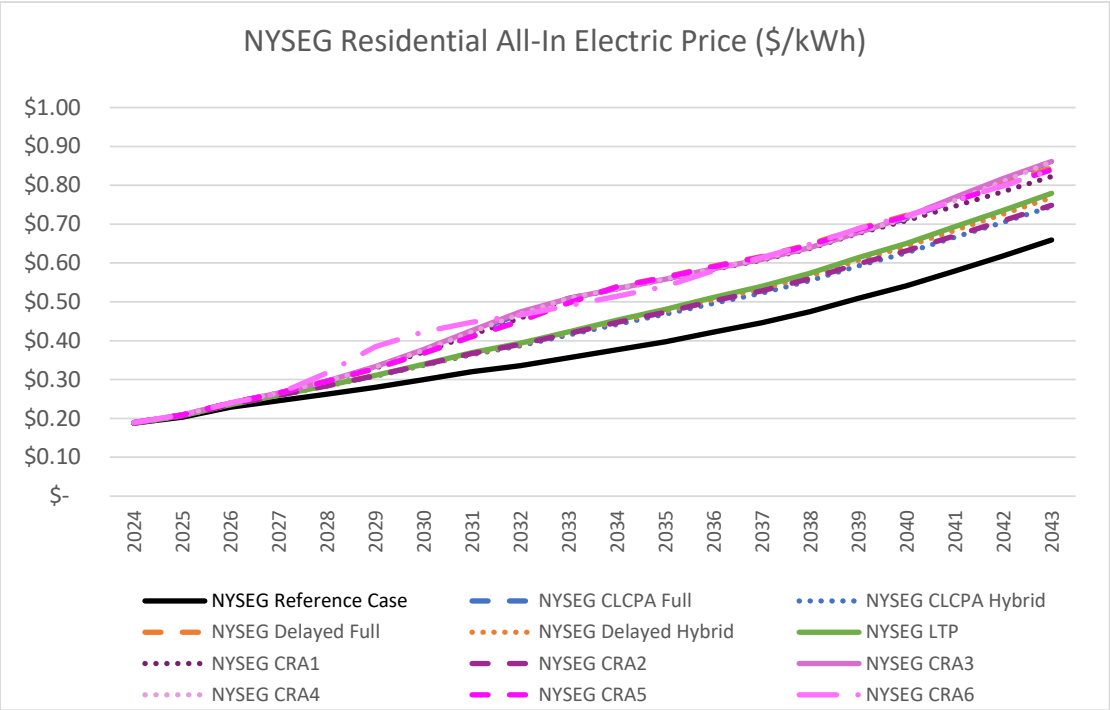
A. Electric Prices: Overview

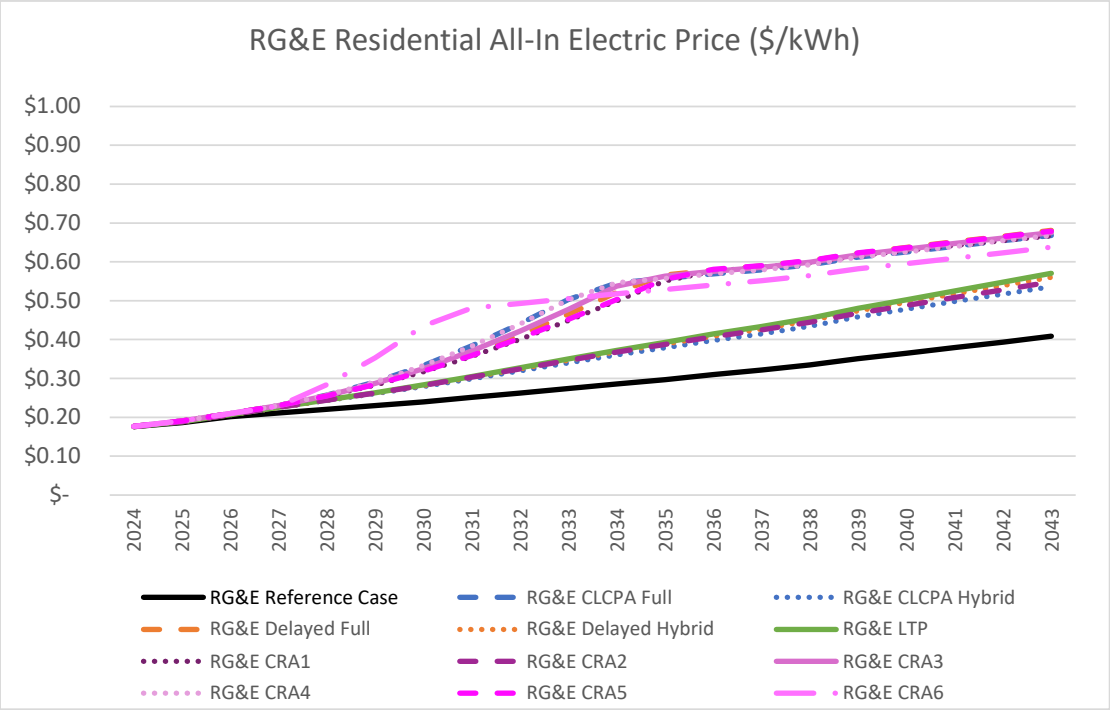
The economic impacts due to changes in electric usage associated with each decarbonization action are determined by multiplying the electric price by the change in electric usage over the 20-year period. The projection of future electric revenue requirements and associated electric price forecasts requires consideration of three components: (1) supply costs that are associated with the procurement of energy that are recovered through the monthly supply charge; (2) costs that are collected in base distribution rates; and (3) other costs that are not collected in base rates and are not associated with the procurement of energy (and are primarily related to expenditures required to implement the clean energy objectives established in the CLCPA).

Electric price forecasts are developed for each scenario and the LTP and adjustments are made to each of the three electric price components to account for investments required to (1) meet peak electric demand growth associated with electrification of gas loads, and (2) accommodate the transition of power system towards zero-emission generation. Each of the components of the electric price are summed together to estimate an all-in electricity price.

Figure B-4 illustrates the resulting nominal residential all-in electric price forecasts used for each Company's four scenarios, the CRA/stakeholder six scenarios, and the LTP. A detailed explanation of the electric price forecast is provided in the following sections.

Figure B-4
Annual Residential Electric Price ($/kWh)





B. Electric Prices: Supply Component

1. Reference Case

The Reference Case supply component of the electric price forecast begins by estimating the supply price for the most recent year for which data is available (2021). The annual average supply components of NYSEG and RG&E's electric price are first estimated on a $/kWh basis for residential, commercial, and industrial customer segments using Edison Electric Institute's ("EEI") Winter 2022 Typical Bills and Average Rates Report. The EEI report provides average monthly bills by customer segment separately for generation (i.e., supply) and distribution bill components assuming different levels of use that are standardized by EEI across all reported utilities. The EEI reported monthly generation bill components for each customer segment were calibrated to reflect a typical customer specific to NYSEG and RG&E electric divisions by using weighted averages of the two EEI reported usage levels closest to NYSEG and RG&E's 2021 average monthly kWh use per customer as reported in electric sales data from S&P Capital IQ.

The resulting annual average 2021 $/kWh customer segment electric price supply components for NYSEG and RG&E are then escalated by historical and NYMEX forwards for weighted all-hours Location Based Marginal Price ("LBMP") for New York Independent System Operator ("NYISO") Central Zone C and Genesee Zone B, respectively for 2022 through 2024. For 2025 and later, the supply component of NYSEG and RG&E's electric price for each customer segment is escalated by the year-to-year forecasted change in the EIA's 2023 AEO end-use Upstate New York $2022/kWh electric price forecast,[4] adjusted to nominal dollars using the inflation forecast provided in Appendix A, Table A-2.

2. Monthly and Seasonal Shaping

Seasonal electric prices are required to estimate the economics of decarbonization actions that have varying impacts on net electric use throughout the year (e.g., electrification, weatherization), including a comparison of full electrification and hybrid heating systems. Monthly average electric prices are estimated first, and seasonal average prices are derived from the monthly prices. The annual average supply component of NYSEG and RG&E's electric price are shaped into monthly average supply prices based on the average monthly LBMP differentials forecasted in the NYISO's 2021-2040 System & Resource Outlook ("SRO")[5] for NYISO Central Zone C and Genesee Zone B, respectively. The NYISO SRO provided potential resource development under a "wide range of potential future system conditions"

[4] U.S. Energy Information Administration, Annual Energy Outlook 2023, March 2023. Table 54.9 Electric Power Projections by Electricity Market Module Region, Northeast Power Coordinating Council / Upstate New York.

[5] NYISO 2021-2040 System & Resource Outlook Data Document (August 10, 2022).

that "enables comparisons between possible pathways to an increasingly greener resource mix.[6] The NYISO SRO evaluated four potential future scenarios. NYSEG and RG&E's Full Electrification scenarios and CRA/Stakeholder scenarios CRA1, CRA3 and CRA4 rely on the NYISO SRO Policy Case Scenario 2, which is the NYISO Policy Case that meets the New York policy mandates and utilizes assumptions most closely aligned with the Climate Action Council analysis for load and specific resource targets. The NYISO SRO Policy Case Scenario 2 provides for a greater shift of system to winter peaking due to electrification of gas heating loads compared to the NYISO Base Case. The Companies' LTP and Hybrid Electrification scenarios and the CRA/Stakeholder hybrid CRA2 scenario have less of an impact on electric peak demand growth than the Companies' Full Electrification scenarios and therefore rely on the NYISO SRO Base Case, which evaluates a future with little change from today.

Monthly average LBMP percentage differentials from the annual average LBMP are calculated from NYISO's SRO Policy Case Scenario 2 and Base Case. The NYISO SRO Base Case monthly LBMP forecasted prices were provided through 2040. For 2040 and later, monthly ratios are assumed to remain constant in the Companies' LTP and Hybrid Electrification scenarios. Monthly forecasted LBMPs are provided for the NYISO Policy Case Scenario 2 for years 2025, 2030 and 2035 only. NYSEG and RG&E's Full Electrification scenarios therefore, assumed linear interpolation for remaining non-reported years.

The resulting monthly supply component of electric price is then weighted by HDDs and CDDs to estimate average seasonal prices for "cold" winter days, "moderately cold" shoulder days and summer days. Cold days are considered winter days and are assumed to be days with at least 35 HDD. Moderately cold days are considered shoulder days and are assumed to be days with between 0 and 35 HDD. Summer days are assumed to be days with CDDs greater than 0. The seasonal allocations by month for NYSEG and RG&E are shown above in Table B-1.

3. Electrification Supply Adjustment

The Companies' Full Electrification scenarios and CRA/Stakeholder scenarios CRA1, CRA3 and CRA4 are accompanied by higher electric supply prices than the Companies' Hybrid Heating scenarios, CRA/Stakeholder scenario CRA2, and LTP due to additional winter electric capacity needs from full electrification for residential customers (as opposed to hybrid heating). The National Renewable Energy Laboratory ("NREL") projects that by 2035 the U.S. average $/MWh generation system cost for its Accelerated Demand Electrification ("ADE") case will be 6% greater than the EIA AEO 2021 reference case.[7] NREL projects this increase to occur after four years, which is equivalent to a 1.48% compound annual growth rate. Therefore, a compound annual growth rate of 1.48% is applied to the supply portion of the nominal electric price forecast to reflect projected increases in electric generation capacity

[6] New York Independent System Operator 2021-2040 System and Resource Outlook, A Report from the New York Independent System Operator, September 22, 2022.

[7] Denholm, Paul, Patrick Brown, Wesley Cole, et al. 2022. *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A40-81644.

required to meet additional demand requirements resulting from the Full Electrification scenarios for both CLCPA and Delayed Achievement scenarios.

4. Clean Generation Supply Adjustment

The Companies' scenarios and all CRA/Stakeholder scenarios assume that New York achieves zero-emission electricity by 2040 and use the NREL All Options Clean Energy Scenario[8] as the basis for determining a "Clean Electric Supply Multiplier" that is applied to electric supply/generation prices. Specifically, the NREL All Options Clean Energy Scenario system costs are 39% and 42% higher than NREL's Ref-ADE case in 2035 and 2042, respectively. In NYSEG and RG&E's scenarios, a Clean Electric Supply Multiplier was applied to the electricity price supply component equal to 1.00 in 2024, 1.39 in 2035 and 1.42 in 2042 with linear interpolation for remaining years.

C. Electric Prices: Non-Supply Component

The non-supply component of electric prices includes two elements: (1) costs that are collected in base distribution rates; and (2) other costs that are not collected in base rates and are not associated with the procurement of energy.

1. Base Distribution Revenue Requirement

The 2023 average base distribution electric rate for each customer segment (i.e., residential, commercial, and industrial) is based on information from the EEI's Winter 2022 Typical Bills and Average Rates Report.[9] NYSEG and RG&E's 2023 average base distribution rates are escalated each year by the change in projected base distribution electric revenue requirement divided by projected annual energy kWh billing quantities. Billing kWh quantities reflect forecasted net changes due to electrification and energy efficiency measures, including increases associated with full electrification of new residential and commercial customers starting in 2026 and new municipal and industrial customers starting in 2029, consistent with legislation enacted in 2023. In estimating annual energy kWh billing quantities, the projected net changes in electrical load from NYSEG and RGE's gas division customers due to decarbonization actions included in this study have been scaled up to reflect total potential from all gas customers within NYSEG and RGE's electric service territories. These adjustment factors are shown in Table B-2 below.

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[8] Ibid.

[9] The EEI report provides average monthly electric bills by customer segment separately for generation (i.e., supply) and distribution bill components assuming different levels of use that are standardized by EEI across all reported utilities. Like the generation component, the electric price base distribution component is calibrated to NYSEG and RG&E's average customer use for each customer segment using a weighted average of the two EEI reported usage levels closest to NYSEG and RG&E's 2021 average monthly kWh use per customer, as reported in electric sales data from S&P Capital IQ.

Table B-2
NYSEG and RG&E Electric Gross Up Adjustment Factors to Represent All Gas Customers

NYSEG	Customers		Gas Customers as % of Electric Customers	% NYS Homes with Gas Heat[10]	Adjustment Factor
	Electric	Gas			
Residential	789,120	240,835	31%	60%	195%
Non-Residential	127,401	30,788	24%	59%	244%

RG&E	Customers		Gas Customers as % of Electric Customers	% NYS Homes with Gas Heat[11]	Adjustment Factor
	Electric	Gas			
Residential	348,940	299,506	86%	70%	100%
Non-Residential	41,515	23,420	56%	59%	105%

Growth in base distribution electric revenue requirement is forecast based on an analysis of NYSEG and RG&E's Five-Year Capital Investment Plan[12] (2023-2027) and the revenue requirements methodology as documented in the Joint Proposal. The Joint Proposal presents electric distribution revenue requirements for three rate years (2024-2026, 12-months ending April 30th). A 20-year forecast of revenue requirements was developed by applying certain assumptions for the 2027-2043 period. Two significant assumptions are that (1) approximately 80% of NYSEG and RG&E's capital forecast will be allowed into rates (mirroring the treatment in the Niagara Mohawk Power Corporation's (dba National Grid) rate case settlement in Case 20-E-0308), and (2) electric O&M expenses will increase annually at 2.1% for both NYSEG and for RG&E, consistent with the inflation forecast provided in Appendix A, Table A-2. The average depreciation rate and the rate of return reflect the Joint Proposal average three rate years and rate year 3 values, respectively. O&M Working capital is assumed to equal the 3 year average percentage of O&M Working capital of total O&M.

As reported in the Five-Year Capital Investment Plan, capital expenditures are forecasted to increase at an average annual rate of 11% for NYSEG and 4% for RG&E for investments in existing infrastructure to maintain asset condition, reliability, and resiliency. For the years 2028-2043, these capital expenditures are assumed to continue to grow at the same annual average rates. Plant retirements as a percentage of plant additions are assumed to be 11% for NYSEG and 4% for RGE, based on each Company's electric distribution plant's 4-year historical average as reported in FERC Form 1 reports for 2019-2022.

[10] Residential Source: NYSERDA *2019 Single-Family Residential Building Stock Assessment*, page 18.
Non-Residential Source: NYSERDA *Commercial Statewide Baseline Study of New York State, Volume 1: Commercial Baseline Study*. February 2021.

[11] Ibid.

[12] NYSEG and RG&E Five-Year Capital Investment Plan (2023-2027), June 30, 2023.

a. Electrification Adjustment to Base Distribution Revenue Requirement

For each scenario modeled in this study, the capital expenditure forecast included in NYSEG and RG&E's Reference Case base distribution revenue requirement calculation is amended to include additional transmission and distribution system investment costs required for NYSEG and R&GE to meet projected increases in winter peak electric demand associated with electrification of gas demand, including increases in winter peak electric demand associated with full electrification of new residential and commercial customers starting in 2026 and new municipal and industrial customers starting in 2029, consistent with legislation enacted in 2023.

The 2022 Natural Gas and Grid Modernization Study ("Gas-Electric Study")[13] modeled various future scenarios for 2030, 2040, and 2050 in which gas use is substantially reduced, demand for electricity increases to accommodate alternatives to gas combustion, and significant renewable electricity generation is deployed to enable the achievement of CLCPA goals. The Gas-Electric Study included two scenarios, a "High Electrification Scenario and a "Delayed Achievement Scenario." For each of these scenarios, the Gas-Electric Study provides projected transmission and distribution system future investment cost estimates in transmission capacity, distribution capacity, and grid modernization associated with replacement costs of overloaded circuits and substations for years 2030, 2040, and 2050 as shown in Table B-3, below.

Table B-3
Projected Transmission and Distribution System Future Investment Costs
($2022 millions)[14]

Facility	2030		2040		2050	
	Delayed Achievement Scenario	High Electrification Scenario	Delayed Achievement Scenario	High Electrification Scenario	Delayed Achievement Scenario	High Electrification Scenario
Transmission Capacity	$ 3,725	$ 5,262	$ 7,930	$ 14,445	$ 15,305	$ 18,423
Distribution Capacity	$ 4,491	$ 5,750	$ 6,097	$ 11,050	$ 11,015	$ 15,370
Grid Modernization	$ 188	$ 239	$ 255	$ 455	$ 471	$ 647
Total	$ 8,404	$ 11,251	$ 14,282	$ 25,950	$ 26,791	$ 34,440

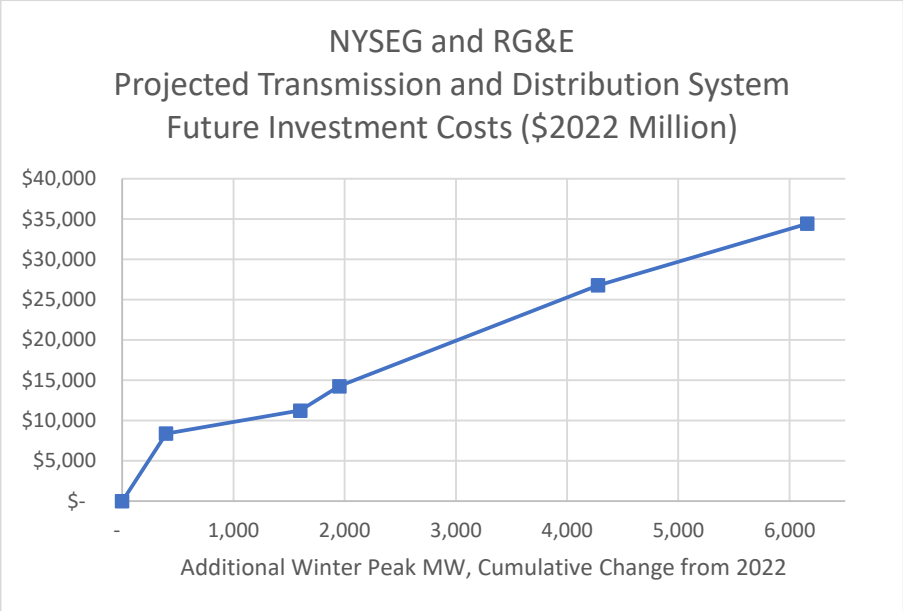
Concentric developed a future investment cost curve for NYSEG and RG&E's electric transmission and distribution system by taking the Gas-Electric Study's six projected cost data estimates (represented by y-axis value of square markers in Figure B-5) and associated forecasted incremental winter peak MW demand since 2022 (represented by x-axis value of square markers in Figure B-5) for each scenario and

[13] Natural Gas and Grid Modernization Study, Appendix N, Special Study #5, filed on May 17, 2022, in Case 19-E-0378, et. al.

[14] ICF Resources, LLC. *NYSEG and RG&E's Natural Gas and Grid Modernization Study*. Appendix N Special Study #5. May 17, 2022. Exhibit 7.

year available. Linear interpolation was used to determine the values between each of the square markers. The future investment cost curve is shown in Figure B-5 below.

Figure B-5
Projected Transmission and Distribution System Future Investment Cost Curve[15]



The future investment cost curve is used to estimate the electric transmission and distribution system investments necessary to meet projected levels of cumulative winter electric peak demand growth for each year of the 20-year LTP period resulting from the various portfolios of decarbonization actions. In estimating the annual increment in winter peak MW demand, the projected net changes in winter electric peak demand from NYSEG and RG&E's gas division customers for each scenario have been scaled up using the adjustment factors shown in Table B-2 to reflect total potential from all gas customers within NYSEG and RGE's electric service territories. Annual incremental investment costs are calculated for each year of the 20-year LTP period by taking the year-to-year difference in cumulative investment costs (in $2022 dollars) and adjusting to nominal dollars using the inflation forecast provided in Appendix A, Table A-2. These annual incremental investment costs are treated as additional capital expenditures in the NYSEG and RG&E base distribution revenue requirement calculation.

[15] Ibid. Exhibit 7 and Exhibit 38 supplemental data.

2. Clean Energy Policy Adjustment

a. Overview

This section addresses the other electric costs that are not collected in base rates and are not associated with the procurement of energy. Such costs are primarily related to expenditures required to implement the clean energy objectives established in the CLCPA. Based on information presented to the Commission in a Staff Report at the July 20, 2023 Session,[16] these costs are significant and therefore must be factored into any projection of an electric utility's revenue requirement over the next 20 years.

b. CLCPA Related Costs

The Staff Report identified seven general areas of costs related to implementation of the CLCPA and provided the amount of customer funding that has been committed to each of the areas to date. Table B-4 summarizes this information.[17]

Table B-4
CLCPA Customer Funding Commitments

Program	Customer Funding Committed ($millions)	Included in Clean Energy Policy Adjustment for LTP Modeling (explained below)
Clean Energy Standard ("CES")	$ 25,242	See Table B-4
Clean Energy Fund ("CEF")	$ 7,011	Yes
Electric Vehicle ("EV") Make Ready	$ 701	No
Energy Storage	$ 394	No
Integrated Energy Data Resource ("IEDR")	$ 72	No
Electric Energy Efficiency/Clean Heat	$ 4,337	No
Transmission	$ 5,999	Phase 2 only
Total	**$ 43,756**	**n/a**

The CES figure is composed of four separate funding commitments as shown in Table B-5.[18]

[16] Case 22-M-0149, Proceeding on Motion of the Commission Assessing Implementation of a Compliance with the Requirements and Targets of the Climate Leadership and Community Protection Act (CLCPA Compliance Proceeding), New York State Department of Public Service First Annual Informational Report on Overall Implementation of the Climate Leadership and Community Protection Act (Dated July 20, 2023) (Staff Report).

[17] CLCPA Compliance Proceeding, Staff Report, p. 29.

[18] Ibid.

Table B-5
CES Customer Funding Commitment

Program	Customer Funding Committed ($millions)	Included in Clean Energy Policy Adjustment for LTP Modeling (explained below)
REC	$ 3,500	Yes
ZEC	$ 2,642	Yes
OREC	$ 6,900	Yes
Tier 4	$ 12,200	Yes
Total	**$ 25,242**	**n/a**

It is important to emphasize two considerations regarding the customer funding commitments presented in the prior two tables. First, these are commitments that have been made to date and are not necessarily the final amount that customers will contribute to these initiatives. For example, the Staff Report notes that "Future expenditures for Tier 1 and offshore wind will depend on a variety of factors including future procurements, market energy, and capacity prices…"[19] Thus the likely amount that customers will ultimately contribute to these initiatives will be greater than the $43.8 billion amount presented in Table B-4. Second, customers have already begun paying for some of the commitments such as the REC and ZEC programs, but there have been no customer contributions to programs such as OREC, Tier 4, and the $4.4 billion portion of Transmission related to Phase 2 upgrades because the assets associated with these initiatives have not yet gone into service.

c. Methodology for Quantifying NYSEG/RG&E Rate Impacts

A two-step approach is employed to estimate the impact of the costs associated with these CLCPA initiatives on the forecasted electric prices used in the LTP modeling. Step one identifies how the costs of these initiatives would be collected in rates. Some costs are collected in base rates, other costs are collected via surcharges, while other costs are collected as part of the monthly supply charge. Each type of collection approach is analyzed to determine whether it is appropriate to include as a separate cost in the LTP modeling. For example, CLCPA initiative costs that are collected in base rates will not be included in this portion of the electric price forecast because such costs are already factored into the analysis of base rate increases discussed above. Step two involves a determination of the amounts that have already been recovered in rates and an assessment of whether there will be new customer commitments for each CLCPA initiative and how those commitments will be recouped from customers. The purpose of this step is to quantify future customer costs associated with implementation of the

[19] Ibid.

CLCPA and determine the amount of these future customer costs that are attributable to the customers of NYSEG and RG&E. These amounts are then included in the overall revenue requirement projections.

d. Step One: Cost Collection Approach

The approach employed to collect costs from customers for CLCPA initiatives impacts whether those costs should be included as a separate component in the electric price forecast for the LTP modeling. CLCPA expenditures that are collected in base rates should not be separately included in this portion of the electric price analysis because they presumably have already been accounted for when projecting the expected increases in base rates over the next 20 years. Costs that fall into this category include energy efficiency, clean heat, and EV make-ready program costs. Specifically, the Commission finalized the transition from surcharges to include such costs in base rates by Orders issued in 2018[20] and 2020.[21] The Commission's logic for including energy efficiency, clean heat, and EV make-ready expenses in rates is that these programs represent critical aspects of a utility's day-to-day operations and as such no longer required special recovery treatment via a surcharge. As a result, these costs are not included in this portion of the electric price analysis.

The approach regarding costs associated with energy storage is less clear. While the initial funding for energy storage was provided by funds collected via surcharges for New York State Energy Research and Development Authority ("NYSERDA") programs, the state has established a goal of 6 GW of energy storage by 2030 and the Energy Storage Roadmap estimates that $1.0-1.7 billion of additional funding is needed to achieve that objective.[22] While the Commission has not addressed the recommendations in the Roadmap or how the associated costs will be recovered, it is reasonable to conclude that support for energy storage will be an integral part of utility operations in the future. Moreover, there is a real possibility that utility owned storage operated to support the transmission and distribution system will be part of the portfolio that helps achieve this objective. Thus, it is assumed that costs associated with implementing the Roadmap will be included in base rates. Thus, energy storage costs are not included in this portion of the electric price analysis.

The costs associated with the REC and ZEC CES programs are currently collected by NYSEG and RG&E as part of the supply component of the utility bill. Nevertheless, the forecast employed to develop the supply component of future revenue requirements reflects only an estimate of the cost of procuring

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[20] Case 18-M-0084, *In the Matter of a Comprehensive Energy Efficiency Initiative,* Order Adopting Accelerated Energy Efficiency Targets (issued December 13, 2018), pp. 65-70.

[21] Case 18-E-0138, *Proceeding on Motion of the Commission Regarding Electric Vehicle Supply Equipment and Infrastructure*, Order Establishing Electric Vehicle Infrastructure Make-Ready Program and Other Programs (issued July 16, 2020), pp. 78-79.

[22] Case 18-E-0130, *In the Matter of Energy Storage Deployment Program,* New York's 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (dated December 28, 2022) (Roadmap), pp. 6-7.

energy and as such does not reflect the cost associated with the REC and ZEC programs. Thus, customer costs associated with the REC and ZEC programs are included in this portion of the electric price analysis.

NYSEG and RG&E have not recovered any costs from customers for the OREC and Tier 4 initiatives as none of the projects associated with these initiatives are operational. However, as explained in more detail below, the Commission has determined that costs associated with these programs will be socialized via a yet to be determined charge that will not be in base rates. Thus, customer costs associated with OREC and Tier 4 initiatives are included in this portion of the electric price analysis.

CEF costs are currently collected by NYSEG and RG&E via a specific surcharge. Thus, the costs associated with CEF are reflected in this portion of the electric price analysis.

While IEDR costs are collected via a surcharge, the amounts involved are viewed as insignificant and are not included in this portion of the electric price analysis.

Transmission costs fall into three categories. Phase 1 projects include $691 million that the Commission authorized for National Grid in July 2022[23] and $98 million that the Commission authorized for NYSEG in December 2022.[24] The costs associated with these projects will be recovered in the respective utility's base rates and as such are not considered in this portion of the electric price analysis. In addition, the Commission approved $810 million for Con Edison's Clean Energy Hub the costs of which will be collected in Con Edison's base rates and are not considered here.[25] The remaining $4.4 billion[26] of costs are for Phase 2 projects; this cost will be socialized across all New York State electric customers.[27] As such, NYSEG and RG&E's portion of the $4.4 billion of transmission costs are considered in this portion of the electric price analysis.

In summary, this portion of the electric price analysis will quantify the future costs of CES programs (REC, ZEC, OREC, and Tier 4), CEF, and Phase 2 transmission for the purpose of including such costs in the computation of NYSEG and RG&E electric revenue requirements over the next 20 years. Costs associated with energy efficiency, clean heat and other electrification efforts, energy storage, and Phase 1 transmission projects were previously addressed in the projection of base rate increases and thus are not included in this portion of the electric price analysis to avoid double counting.

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[23] Case 20-E-0197, Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act (Transmission Planning Proceeding), Order Authorizing Development of Phase 1 Transmission Projects and Cost Recovery Measures (issued July 14, 2022), Appendix p. 19.

[24] Transmission Planning Proceeding, Order Authorizing Continuation of Phase 1 Transmission Projects and Cost Recovery Measures (issued December 15, 2022), p. 24.

[25] Transmission Planning Proceeding, Order Approving Cost Recovery for Clean Energy Hub (issued April 20, 2023), p. 32.

[26] CLCPA Compliance Proceeding, Staff Report, p. 29.

[27] Transmission Planning Proceeding, Order Approving Phase 2 Areas of Concern Transmission Upgrades (issued February 16, 2023), pp. 43-45.

e. Step Two: Quantification of Future Customer Costs

i. CES: Tier 1 and Tier 2 RECs

REC payments support the development of land-based Tier 1 and Tier 2 renewable resources that are acquired through NYSERDA solicitations. Currently NYSEG and RG&E are authorized to collect about $16 million and $6 million, respectively, from customers to support REC purchases from Tiers 1 and 2 as part of supply costs.

The Staff Report indicates that a $3.3 billion customer commitment is estimated for Tier 1 resources and that $200 million is committed to Tier 2 which is the Maintenance Tier.[28] The Staff Report also states that this amount may change as the result of "a variety of factors including future procurements, market energy, and capacity prices."[29] Given the lack of transparency into how these amounts were computed and how much of these amounts are currently reflected in rates any forecast of Tier 1 and Tier 2 costs must consider other evidence regarding the cost of these programs in the future. Several key facts suggest that these programs are likely to continue well into the future and that customer support for them will increase for some time. The CLCPA's clean energy objectives for 2030, 2040, and 2050 are well documented and require aggressive actions by the state to assure achievement.[30] The Climate Action Council's Final Report states that significant increases in renewable generation including the Tier 1 and 2 resources are needed and notes that in order to achieve the 2030 target, NYSERDA will need to acquire, on average, almost 4,500 GWH annually over the 2021-26 period and that the Commission and NYSERDA will need to continue to adjust program requirements and targets over the next decade.[31] Regarding renewable resources, the Scoping Plan also states that "While many programs are already in place to support and encourage these types of resources and significant progress has been made, aggressive deployment of clean resources must continue**…**"[32] and that there needs to be an acceleration in the growth of large-scale renewable energy.[33]

A recent report by NYSERDA provides additional context on this matter. While NYSERDA notes that the State has made progress toward achieving CLCPA objectives, many parties have recently petitioned the Commission seeking increases in contractual payments due to the effects of inflation and supply chain disruptions associated with the pandemic and its aftermath. For example, NYSERDA notes this request

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[28] Tier 2 was established in the Renewable Portfolio Standard to assure the continued operation of clean generation that would otherwise discontinue operations due to declining project economics. This program was continued in the initial CES Order at page 18.

[29] CLCPA Compliance Proceeding, Staff Report, p. 29.

[30] Among other things, the CLCPA requires 70 percent renewable generation by 2030, 100 percent zero-emission electricity by 2040, and net zero emissions statewide by 2050.

[31] New York State Climate Action Council (CAC), New York State Climate Action Council Scoping Plan (issued December 2023) (Scoping Plan), available at climate.ny.gov/Scoping Plan, p. 222.

[32] *Id*., p.225.

[33] *Id*., pp. 231-233.

covers "4 OSW projects totaling 4.23 GW (11.8% of 2030 Statewide Load), 86 Tier 1 projects totaling 7.54 GW (10.0% of 2030 Statewide Load), and 1 Tier 4 transmission project totaling 1.75 GW (2.8% of 2030 Statewide Load)."[34] The NYSERDA Comments also conclude that while the parties' request for relief appears excessive, supply chain problems and inflation did put upward pressure on developer costs and absent some Commission action on this matter, there is the risk that some projects will be cancelled or delayed thereby threatening achievement of the 2030 CLCPA goal.[35] Finally, NYSERDA estimates that the cost of providing the requested relief to the developers will result in an increase in retail bills of about 4 percent for NYS consumers.[36]

This information leads to two conclusions. First, there will need be solicitations for land-based renewable resources well into the next decade to achieve the 2030 and 2040 CLCPA objectives, and second, the costs associated with these solicitations are likely to be significant.

As noted above, NYSEG and RG&E currently collect $16 million and $6 million, respectively, from customers to support REC purchases from Tiers 1 and 2 for projects that are producing electricity. This amount is likely to increase as more projects go into service and incremental costs related to inflation and supply chain issues are addressed. To achieve the state's 2040 goal, NYSERDA will need to have completed solicitations for all land-based wind by 2035 to assure that all projects will be operational by 2040. To reflect the expected growth in these projects and the payments associated with them, this analysis assumes that NYSEG and RG&E REC payments will increase by 10 percent each year between now and 2040.

ii. CES: ZEC

The Commission established the ZEC program in 2016 as part of CES. The purpose of the program was to assure that the State would continue to realize the zero-emission benefits of the upstate nuclear plants (i.e., Nine Mile Point Units 1 and 2, FitzPatrick, and Ginna). The program was created because there was concern that energy and capacity prices in upstate New York might be insufficient to support the continued operation of these units. To implement the ZEC program, NYSERDA provides these units 12-year (2017-2029) contracts based on a fixed price for the first two years followed by formulaic adjustments every two-years thereafter. NYSEG and RG&E customers currently make payments supporting ZECs of about $29 million and $11 million, respectively, as part of the costs included in the supply charge.

While the Commission initially established this as a 12-year program, the CAC Scoping Plan notes the importance of nuclear power as part of the path toward achieving the CLCPA goals as nuclear currently

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[34] Case 15-E-0302 *et. al.*, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard* (CES Proceeding), NYSERDA Comments on Petitions Requesting Price Adjustments to Existing Contracts (filed August 28, 2023) (NYSERDA Comments), pp. 1-2.

[35] *Id*., pp. 4-9, 22-37.

[36] *Id*., Tables 26 and 28 portfolio totals, pp. 41-42.

accounts for about 24 percent of generated electricity in the State.[37] The Scoping Plan also states that "The State should evaluate the role of existing nuclear reactors within the 100x40 requirements as part of policy actions needed prior to the cessation of the State's Zero Emissions Credit program in 2029, and also include the time needed for potential federal and State relicensing of these facilities…"[38] These are important matters especially considering that the operating licenses of Nine Mile Point Unit 1, FitzPatrick, and Ginna are set to expire in 2029, 2029, and 2034, respectively (the license for Nine Mile Point Unit 2 expires in 2046). If the licenses are not extended then the State would have to replace about 2000 MW of zero-emission, non-intermittent resources. This LTP analysis assumes that the State, recognizing the importance of the continued operation of these baseload resources and the need to assure that the owners of the plants seek timely license extensions, will continue the ZEC program. Due to uncertainty regarding how the program will be structured post 2029, this analysis assumes that future ZEC costs will track inflation.[39]

iii. CES: OREC

In 2020, the Commission adopted a Staff recommendation supporting the acquisition of 9 GW of offshore wind (OSW) by 2035 with committed customer funding totaling $6.9 billion.[40] Currently, NYSERDA has entered into the following contracts shown in Table B-6 for OSW.

Table B-6
Current OSW Contracts

Project	GW	In-service	% of Goal
Sunrise Wind	0.924	2025	10.23%
Empire Wind 1	0.816	2026	9.04%
Empire Wind 2	1.26	2027	13.95%
Beacon Wind	1.23	2028	13.62%
Total	4.23		46.84%

Thus, NYS needs approximately 4.8 GW of additional OSW to hit its 2035 target.

Utility customers will begin to pay OREC costs when the projects commence operation. For the purpose of this analysis, it is assumed that these costs will be collected in utility supply charges in a manner similar

37 CAC, Scoping Plan, p. 219.

38 *Id*., p. 256.

39 To the extent that any of the nuclear plants do not seek relicensing, the cost of replacing them with renewable resources is assumed to be similar to the cost reflected here assuming the plants extend their licenses.

40 CES Proceeding, Order Adopting Modifications to the Clean Energy Standard (issued October 15, 2020), pp. 41-41. Please note that this Order does not state the customer cost commitment associated with this program. The Staff Report derived that commitment from a joint DPS Staff/NYSERDA CES Whitepaper that was released on June 18, 2020.

to RECs and ZECs. Because the forecast of future supply charges does not include payments for ORECs, these costs must be accounted for separately.

To determine the impact of these projects on NYSEG and RG&E customers, this analysis assumes four additional projects go into service prior to 2035 in order to achieve the State's goal. Table B-7 presents a path toward meeting this objective.

Table B-7
Offshore Wind Projects

Project	GW	In-service	% of Goal
Sunrise Wind	0.924	2025	10.23%
Empire Wind 1	0.816	2026	9.04%
Empire Wind 2	1.26	2027	13.95%
Beacon Wind	1.23	2028	13.62%
A	1.2	2029	13.29%
B	1.2	2031	13.29%
C	1.2	2033	13.29%
D	1.2	2035	13.29%
Total	9.03		100.00%

While the Staff Report indicates the customer commitment to ORECs is $6.9 billion under this program, it is important to recognize that parties are seeking increases in contract prices as the result of pressures from inflation and supply chain difficulties. While this suggests that the ultimate cost to customers may be greater than the $6.9 billion original estimate, this analysis employs the $6.9 billion amount to estimate customer impacts. For ease of analysis, it is assumed that each project's portion of the $6.9 billion total cost is split among the eight projects on a GW weighted basis. Because the Commission determined that the OREC contracts are to be for a 25-year period,[41] each project's annual cost was levelized using at 7 percent discount rate over that period commencing in the in-service year. Because the Commission determined that these costs should be socialized,[42] NYSEG and RG&E were allocated costs on a load-share basis. Based on these assumptions and each project's in-service date, NYSEG and RG&E customer contributions for ORECs rise from $7.2 million and $3.2 million, respectively in 2025 to $70.2 million and $31.3 million respectively by 2035 when the final project become operational. The 2035 costs are assumed to remain constant through the end of the study period.

41 Case 18-E-0071, *In the Matter of Offshore Wind Energy* (Offshore Wind Proceeding), Order Establishing Offshore Wind Standard and Framework for Phase 1 Procurement (issued July 12, 2018) (Offshore Wind Order), p. 41.

42 Offshore Wind Proceeding, Offshore Wind Order, p. 4.

iv. CES: Tier 4

Tier 4 consists of two projects (Champlain Hudson Express (CHPE) and Clean Path New York (CPNY)) that will be built to bring greater amounts of clean energy to Zone J, and in doing so, significantly reduce emissions from fossil fired generation. The projected in-service date for CHPE is 2026 while CPNY is scheduled to go into service in 2027. Combined the two projects will deliver up to 2550 MW of clean energy to Zone J. The Staff Report indicates that the customer commitment supporting these endeavors over the term of a 25-year contract is estimated to be $12.2 billion.[43]

About 20 percent of the costs will be funded by the City of New York with the remaining 80 percent of the costs socialized across all other NYS electric customers.[44] Thus, this analysis assumes that 80 percent of the total $12.2 billion customer obligation, or $9.76 billion will be borne by NYSE electric customers on a load share basis. This cost was allocated to the two projects on a proportional GW-share basis with about $5.0 billion allocated to CPNY and about $4.8 billion allocated to CHPE. These amounts were then levelized using a 7 percent discount rate over the 25-year contract terms. Payments by customers for these projects were assumed to begin at the beginning of the in-service year and the NYSEG and RG&E obligations were computed on a load-share basis. NYSEG and RG&E payments for CHPE which commence in 2026 are $48.7 million and $21.7 million, respectively. These amounts rise to $99.3 million and $44.3 million respectively once CPNY becomes operational in 2027 and these amounts are assumed to continue over the life of the contract.

v. CEF

The CEF consists of programs operated by NYSERDA including: (1) Market Development and Innovation & Research; (2) NY Green Bank; and (3) NY-Sun.[45] The CEF was initially envisioned as a program that would support the State's clean energy initiatives. For the period 2016 to 2036, the Staff Report indicates that the Commission has committed about $7.0 billion of customer funding.[46] The Commission established new utility funding requirements for CEF in 2021 for the 2021 to 2029 period.[47] For 2023 NYSEG and RG&E are authorized to collect $63 million and $34 million, respectively, from customers via a surcharge to support CEF. Currently, the CEF program is slated to begin to wind down in 2027 with no further collections by NYSEG and RG&E after 2029.

Considering CEF's prominent role in supporting the State's clean energy objectives and the fact that these objectives have been codified, it is reasonable to assume that the CEF program (or a similar

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43 CLCPA Compliance Proceeding, Staff Report, p. 29.

44 CES Proceeding, Order Approving Contracts for the Purchase of Tier 4 Renewable Energy Certificates (issued April 14, 2022), p. 3.

45 Case 14-M-0094, *Proceeding on Motion of the Commission to Consider a Clean Energy Fund* (CEF Proceeding), Order Authorizing the Clean Energy Fund Framework (issued January 21, 2016).

46 CLCPA Compliance Proceeding, Staff Report, p. 29.

47 CEF Proceeding, Order Approving Clean Energy Fund Modifications (issued September 9, 2021), Appendix D.

successor program) will be necessary beyond 2029. As a result, this analysis assumes that CEF collections by NYSEG and RG&E continue to increase from current levels at the rate of inflation.

vi. Phase 2 Transmission

The Commission has determined that Phase 2 Transmission costs will be socialized across all of the State's utilities on a load-share basis. Thus far the Commission has approved $4.4 billion of investments in such projects. While it is likely that this amount will increase as electrification efforts expand over the next 20 years, this analysis uses the $4.4 billion of customer funds that have been committed by the Commission to Phase 2. There is some uncertainty regarding the timing of these commitments. For the purpose of this analysis it was assumed that these amounts would be invested in equal amounts annually between 2024 and 2030. A levelized cost to customers was then computed based on a 30-year collection period and a 7.0% discount rate. Once all the investments have been completed in 2030, the levelized annual cost to electric customers would be about $330 million per year. Based on a load-share computation reflecting 2022 sales for the Joint Utilities and LIPA, this equates to annual cost for NYSEG of about $39.1 million and an annual cost to RGE of about $17.5 million. These amounts are conservative estimates as there is a strong likelihood that the State will identify the need for additional Phase 2 projects in the future, the costs of which will be socialized.

f. Estimated Cost Impacts: Clean Energy Policy Adjustment Revenue Requirement

Table B-8 presents a summary of the annual revenue requirement impacts for NYSEG and RG&E based on the analysis described above.

Table B-8
Clean Energy Policy Adjustment Revenue Requirement

NYSEG	REC	ZEC	OREC	T4	CEF	Trans	Total
2024	$ 16,000,000	$ 29,000,000	$ -	$ -	$ 63,000,000	$ 2,795,492	$ 110,795,492
2025	$ 17,600,000	$ 29,725,000	$ 7,184,446	$ -	$ 64,575,000	$ 8,386,477	$ 127,470,923
2026	$ 19,360,000	$ 30,468,125	$ 13,529,152	$ 48,683,258	$ 66,189,375	$ 13,977,461	$ 192,207,371
2027	$ 21,296,000	$ 31,229,828	$ 23,326,124	$ 99,313,846	$ 67,844,109	$ 19,568,445	$ 262,578,353
2028	$ 23,425,600	$ 32,010,574	$ 32,889,835	$ 99,313,846	$ 69,540,212	$ 25,159,430	$ 282,339,497
2029	$ 25,768,160	$ 32,810,838	$ 42,220,284	$ 99,313,846	$ 71,278,717	$ 30,750,414	$ 302,142,261
2030	$ 28,344,976	$ 33,631,109	$ 42,220,284	$ 99,313,846	$ 73,060,685	$ 36,341,399	$ 312,912,300
2031	$ 31,179,474	$ 34,471,887	$ 51,550,734	$ 99,313,846	$ 74,887,202	$ 39,136,891	$ 330,540,034
2032	$ 34,297,421	$ 35,333,684	$ 51,550,734	$ 99,313,846	$ 76,759,383	$ 39,136,891	$ 336,391,959
2033	$ 37,727,163	$ 36,217,026	$ 60,881,184	$ 99,313,846	$ 78,678,367	$ 39,136,891	$ 351,954,477
2034	$ 41,499,879	$ 37,122,452	$ 60,881,184	$ 99,313,846	$ 80,645,326	$ 39,136,891	$ 358,599,578
2035	$ 45,649,867	$ 38,050,513	$ 70,211,633	$ 99,313,846	$ 82,661,459	$ 39,136,891	$ 375,024,210
2036	$ 45,649,867	$ 39,001,776	$ 70,211,633	$ 99,313,846	$ 84,727,996	$ 39,136,891	$ 378,042,010
2037	$ 45,649,867	$ 39,976,820	$ 70,211,633	$ 99,313,846	$ 86,846,196	$ 39,136,891	$ 381,135,254
2038	$ 45,649,867	$ 40,976,241	$ 70,211,633	$ 99,313,846	$ 89,017,351	$ 39,136,891	$ 384,305,829
2039	$ 45,649,867	$ 42,000,647	$ 70,211,633	$ 99,313,846	$ 91,242,784	$ 39,136,891	$ 387,555,669
2040	$ 45,649,867	$ 43,050,663	$ 70,211,633	$ 99,313,846	$ 93,523,854	$ 39,136,891	$ 390,886,755
2041	$ 45,649,867	$ 44,126,930	$ 70,211,633	$ 99,313,846	$ 95,861,950	$ 39,136,891	$ 394,301,118
2042	$ 45,649,867	$ 45,230,103	$ 70,211,633	$ 99,313,846	$ 98,258,499	$ 39,136,891	$ 397,800,840
2043	$ 45,649,867	$ 46,360,855	$ 70,211,633	$ 99,313,846	$ 100,714,962	$ 39,136,891	$ 401,388,055

RG&E	REC	ZEC	OREC	T4	CEF	Trans	Total
2024	$ 6,000,000	$ 11,000,000	$ -	$ -	$ 34,000,000	$ 1,247,189	$ 52,247,189
2025	$ 6,600,000	$ 11,275,000	$ 3,205,291	$ -	$ 34,850,000	$ 3,741,568	$ 59,671,859
2026	$ 7,260,000	$ 11,556,875	$ 6,035,937	$ 21,719,696	$ 35,721,250	$ 6,235,947	$ 88,529,705
2027	$ 7,986,000	$ 11,845,797	$ 10,406,788	$ 44,308,181	$ 36,614,281	$ 8,730,326	$ 119,891,372
2028	$ 8,784,600	$ 12,141,942	$ 14,673,571	$ 44,308,181	$ 37,529,638	$ 11,224,704	$ 128,662,636
2029	$ 9,663,060	$ 12,445,490	$ 18,836,286	$ 44,308,181	$ 38,467,879	$ 13,719,083	$ 137,439,979
2030	$ 10,629,366	$ 12,756,628	$ 18,836,286	$ 44,308,181	$ 39,429,576	$ 16,213,462	$ 142,173,498
2031	$ 11,692,303	$ 13,075,543	$ 22,999,001	$ 44,308,181	$ 40,415,316	$ 17,460,651	$ 149,950,994
2032	$ 12,861,533	$ 13,402,432	$ 22,999,001	$ 44,308,181	$ 41,425,699	$ 17,460,651	$ 152,457,496
2033	$ 14,147,686	$ 13,737,493	$ 27,161,716	$ 44,308,181	$ 42,461,341	$ 17,460,651	$ 159,277,068
2034	$ 15,562,455	$ 14,080,930	$ 27,161,716	$ 44,308,181	$ 43,522,875	$ 17,460,651	$ 162,096,807
2035	$ 17,118,700	$ 14,432,953	$ 31,324,431	$ 44,308,181	$ 44,610,946	$ 17,460,651	$ 169,255,863
2036	$ 17,118,700	$ 14,793,777	$ 31,324,431	$ 44,308,181	$ 45,726,220	$ 17,460,651	$ 170,731,960
2037	$ 17,118,700	$ 15,163,621	$ 31,324,431	$ 44,308,181	$ 46,869,376	$ 17,460,651	$ 172,244,960
2038	$ 17,118,700	$ 15,542,712	$ 31,324,431	$ 44,308,181	$ 48,041,110	$ 17,460,651	$ 173,795,785
2039	$ 17,118,700	$ 15,931,280	$ 31,324,431	$ 44,308,181	$ 49,242,138	$ 17,460,651	$ 175,385,381
2040	$ 17,118,700	$ 16,329,562	$ 31,324,431	$ 44,308,181	$ 50,473,191	$ 17,460,651	$ 177,014,716
2041	$ 17,118,700	$ 16,737,801	$ 31,324,431	$ 44,308,181	$ 51,735,021	$ 17,460,651	$ 178,684,785
2042	$ 17,118,700	$ 17,156,246	$ 31,324,431	$ 44,308,181	$ 53,028,396	$ 17,460,651	$ 180,396,605
2043	$ 17,118,700	$ 17,585,152	$ 31,324,431	$ 44,308,181	$ 54,354,106	$ 17,460,651	$ 182,151,221

Appendix C:

BCA Methodology

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

April 26, 2024

Avangrid

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CONTENTS

Appendix C: Benefit Cost Analysis Methodology

I. Policy Guidance

The Commission's Gas Planning Order directs LDCs to apply benefit-cost analyses ("BCA") to long-term plans, adopting the methodology established in the BCA Framework Order.[1]

In the absence of a gas-specific BCA handbook, this analysis follows guidance previously provided in the BCA Framework Order and industry best practices. Care was taken to avoid double counting of monetized benefits or costs by defining each benefit and cost, following the cost and benefit streams resulting from multiple elements of each decarbonization action, and allowing for consideration of how the interconnected components interact.

The BCA Framework Order designated the Societal Cost Test ("SCT") as the primary BCA method. In addition to performing the SCT, the Companies also perform the Utility Cost Test ("UCT") and Ratepayer Impact Measure ("RIM"). All three BCA tests are applied to NYSEG and RG&E's LTPs at the portfolio level (rather than evaluating individual decarbonization actions in isolation), allowing for a comprehensive view, balancing of potential synergies and economies across all decarbonization actions and allowing the use of broader assumptions when more granular data is not readily available or quantifiable. Each BCA test requires a Benefit Cost Ratio greater than 1.0 to be considered "passing." This Appendix contains a description of the benefit and cost streams included in the three BCA tests and identifies the sources of values used to monetize them over the 20-year planning horizon.

II. BCA Tests

A. The Societal Cost Test ("SCT")

The SCT is the broadest measure and attempts to measure all the benefits and costs with the goal of answering whether society is better off as a whole as a result of implementing the plan. The SCT includes measures of direct costs and benefits (e.g., capital costs, customer installation costs, avoided gas costs, incremental electric costs) as well as broader indirect costs and benefits (e.g., avoided cost of GHG emissions). By utilizing the SCT, NYSEG and RG&E assess the impact of its LTP from a holistic perspective that recognizes customer, utility, and societal impacts. The SCT attempts to identify, evaluate, and compare the net present value of all benefits and costs to society.

[1] Case 14-M-0101, Reforming the Energy Vision, Order Establishing the Benefit Cost Analysis Framework (issued January 21, 2016).

B. The Utility Cost Test ("UCT")

The UCT focuses on how gas utility costs will be affected by the plan and only includes the utility's direct costs. For this reason, the UCT excludes avoided costs of GHG emissions, customer installation costs, electricity costs, and federal and state incentives. Lost utility revenue is not included in the UCT because any reduced revenues from participating customers are assumed to be made up by non-participating customers through future rate adjustments. The UCT Benefit Cost Ratio could be higher than or lower than the SCT, depending on the relative size of the cost and benefit items that are excluded.

C. The Ratepayer Impact Measure ("RIM")

The RIM evaluates gas rate impacts for non-participating customers and focuses on how gas utility rates will be affected by the plan. External benefits such as avoided GHG emissions do not apply to the RIM because they do not directly affect customer rates. The RIM is similar to the UCT, but includes the impacts of lost gas utility revenues on remaining customers. Since the RIM is the same as the UCT with added costs, the RIM will always result in a lower Benefit Cost Ratio result than the UCT.

Table C-1 summarizes the costs and benefits that are applicable to each BCA test.

Table C-1:
Components Applicable to BCA Tests

	SCT	UCT	RIM
Benefits			
Avoided Gas Costs	✓	✓	✓
Avoided Gas System O&M and CapEx Rev Req	✓	✓	✓
Avoided Pipeline and Storage Fixed Costs	✓	✓	✓
Avoided Emissions, Societal Cost	✓		
Costs			
Incremental Electricity Cost	✓		
Weatherization Cost			
Weatherization Cost - Federal & State Incentive	✓		
Weatherization Cost - Utility Incentive	✓	✓	✓
Weatherization Cost - Participant Customer	✓		
Net Installed Cost			
Net Installed Cost - Federal & State Incentive	✓		
Net Installed Cost - Utility Incentive	✓	✓	✓
Net Installed Cost - Participant Customer	✓		
UTENs Revenue Requirement	✓	✓	✓
Hydrogen Cost	✓	✓	✓
RNG Production Cost	✓	✓	✓
Lost Utility Revenue- Base Distribution			✓
Lost Utility Revenue- Pipeline and Storage Fixed Costs			✓
Increased Emissions, Societal Cost	✓		

III. Benefit and Cost Category Definitions

A. Definitions of Benefit Categories

The following categories of benefits are quantified and included in the BCA tests:

- **Fixed and Variable Avoided Upstream Supply:**
    - **Avoided Gas Commodity Cost** includes the commodity cost associated with physical molecules of natural gas that are delivered to city-gate by pipeline and storage capacity. Avoided commodity costs are the result of displaced natural gas supply by RNG and hydrogen or reduced throughput resulting from demand related decarbonization actions.
    - **Avoided Pipeline and Storage Fixed Costs** includes costs associated with the Companies' upstream pipeline and storage capacity that can be reduced as a result of the decarbonization actions.

- **Avoided Gas System O&M and CapEx Revenue Requirement:** includes reduction in the Companies' revenue requirement associated with avoided services and meters capital expenditures due to the full electrification of existing customers as well as reductions in the Companies' revenue requirement associated with reduced capital expenditures and O&M expense from downsizing mains due to full electrification.
- **Avoided Emissions, Societal Cost (SCT Only):** accounts for reduced CO2, CH4 and N20 emissions from reduced gas use.

B. Definitions of Cost Categories

The following categories of costs are quantified and included in the BCA tests:

- **Incremental Electricity Costs (SCT Only):** includes incremental participant costs for net increased electricity use resulting from electrification and UTENs.
- **Installation Costs (Weatherization and Net Installed):** includes behind-the-meter up-front installation costs for energy efficiency, electrification, and industrial carbon capture. Electrification installation costs are net of avoided replacement cost of retired appliances. Installation costs are comprised of up to three categories:
    - **Federal and State Incentives (SCT Only):** Includes installation costs covered by federal and state incentives (excluding NYSERDA incentives).
    - **Utility/NYSERDA Incentives:** Includes installation costs covered by utility or NYSERDA sponsored programs.
    - **Participant Customer Costs (SCT Only):** The remaining net installation cost after federal, state, and utility/NYSERDA incentives.
- **UTENs Revenue Requirement:** includes increases in the Company's revenue requirement associated with UTENs installation costs and annual O&M expense.
- **Hydrogen Cost:** includes cost of hydrogen supply
- **RNG Production Cost:** includes cost of RNG supply
- **Lost Utility Revenue (RIM Only):** Includes lost base distribution revenues and unrecovered fixed pipeline and storage costs from reduced participant demand and customer counts. A proxy for UTENs service revenue is netted from lost utility revenue.
- **Increased GHG Emissions, Societal Cost (SCT Only):** accounts for CO2, CH4, and N2O emissions from increased electricity use resulting from electrification and UTENs. This includes emissions that occur during combustion at fossil plants and transportation of natural gas through pipelines to location of combustion.

IV. Avoided and Incremental Cost Values for Monetizing Costs and Benefits

Avoided and Incremental cost values are used to monetize some of the benefits and costs listed above. For example, the social cost of carbon is an avoided cost, which, when multiplied by the amount of CO2 avoided by a decarbonization measure, provides a dollar value for the societal benefit of reduced CO2 for that measure. These avoided and incremental costs and associated assumptions are listed in Tables C-2, C-3 and C-4 below.

Table C-2
BCA Global Modeling Assumptions

Input	Description	Source	Value
Analysis Period	20-years (2024-2043)	Same as LTP	n/a
Inflation Rate	Inflation rate applied if forecasted data is not available.	Blue Chip Economic Indications ("BCEI"), GDP Chained Price Index, July 10, 2023 at 5 and BCEI Long- Range Consensus US Economic Projections at, GDP Chained Price Index, March 10, 2023 at 14.	2023: 3.6% 2024: 2.6% 2025/26: 2.1% 2027: 2.2% 2028/43: 2.1%
Company-retained gas	Gas lost between send-out and point of consumption; includes lost and unaccounted for gas (LAUF) and shrinkage.	NYSEG Annual Gas Cost Adjustment 2022 Case 22-G-0464, Exhibit 3, Page 2 of 3. Target LAUF, 12 months ending 8/31/22 RG&E Annual Gas Cost Adjustment 2022, September 2021 through August 2022 Actual LAUF.	NYSEG: 0.014% RG&E: 0.509%
Electric loss rate	Electricity lost between wholesale and retail	NYSEG and RG&E, NY PSC Case 22-E-0317 Order Accepting Joint Proposal, October 12, 2023. Cumulative loss multipliers for Secondary Voltage.	NYSEG: 7.28% RG&E: 6.87%
Discount Rate	Weighted Average Cost of Capital (WAAC)	NYSEG and RG&E, NY PSC Case 22-E-0317 Order Accepting Joint Proposal, October 12, 2023. Rate Year 3 (TME 4/30/23 Post-Tax WACC)	NYSEG: 6.58% RG&E: 6.80%

Table C-3
Avoided Gas Supply and Capacity Benefits

Input	Description	Source
Cost of Gas	Gas price used to monetize reduced gas use resulting from decarbonization actions.	Reference Case commodity prices; See Appendix B.I.
Social Cost of Carbon (SCC)	Social cost of CO2 used to monetize gas and electric GHG emissions ($/MT)	NY DEC Social Cost of CO2 at 3% discount rate.[2]
Social Cost of Methane and Nitrous Oxide	Social cost of CH4 and N20 used to monetize avoid gas GHG emissions ($/MT)	NY DEC Social Cost of CH4 and N2O at 3% discount rate.[3]

Table C-4
Increased Electric Supply and Capacity Costs

Input	Description	• Source
Electric All-In Rate	Avoided or increased electricity costs	• See Appendix B.II. • Includes electric generation supply cost adjustment for electrification discussed in Appendix B, Section II.B.3.
Incremental cost of generating capacity	Incremental cost of capacity associated with generation	• Included in electric bundled full rate.
Incremental cost of transmission	Incremental cost of electric transmission	• Included in electric bundled full rate.
Incremental cost of distribution	Incremental cost of electric distribution	• Included in electric bundled full rate.
Electric cost of carbon	Social cost of CO2 used to monetize increased electric GHG emissions ($/MT)	• NY DEC Social Cost of CO2 at 3% discount rate[4] net of RGGI credit,[5] escalated by inflation forecast (provided in Appendix A, Table A-2), multiplied by assumed electric emissions rate. Forecasted electric generation emission rates are provided in Appendix A, Table A-5. These emission rates are based on EPA's eGrid data[6] by fuel stock applied to EIA's 2023 AEO reference case forecasted generation mix with linear interpolation of decrease starting in 2025 required to hit CLCPA target of zero-emission generation by 2040.
Social Cost of Methane and Nitrous Oxide	Social cost of CH4 and N20 used to monetize avoid gas GHG emissions ($/MT)	• NY DEC Social Cost of CH4 and N2O at 3% discount rate.

2 New York State Department of Conservation's report, "Establishing a Value of Carbon. Guidelines for use by State Agencies," Appendix A, Table A1. August 2023.

3 Ibid.

4 Ibid.

5 Most recent RGGI Auction 62 (12/6/2023) Clearing Price is $14.88 per Short Ton CO2. The cost of CO2 collected through RGGI is already reflected in New York LBMPs component of forecasted fully bundled electric rates. The cost of CO2 collected via RGGI credits are subtracted from the social cost of carbon to avoid double counting.

6 United States Environmental Protection Agency. Emissions & Generation Resource Integrated Database (eGrid), NPCC Upstate NY subregion year 2021 data (SRL21).

Appendix D:

Scenario and LTP Modeling Outputs

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

April 26, 2024

Avangrid

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CONTENTS

Appendix D: Scenario and LTP Modeling Outputs

I. NYSEG Scenario and LTP Modeling Outputs

A. Summary Outputs

Table D-1: NYSEG CLCPA Scenario Model Output

	NYSEG CLCPA Full			NYSEG CLCPA Hybrid		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,007	n/a	n/a	4,007	n/a
Weatherization						
Residential	$ 56	(199)	$ 30	$ 60	(199)	$ 32
Commercial	$ 504	(68)	$ 126	$ 507	(68)	$ 127
Municipal	$ 504	(53)	$ 98	$ 507	(53)	$ 98
Electrification						
Residential	$ 1,626	(650)	$ 2,816	$ 901	(564)	$ 1,817
Commercial	$ 2,556	(186)	$ 1,392	$ 1,850	(289)	$ 1,956
Municipal	$ 2,692	(111)	$ 875	$ 2,216	(95)	$ 607
Industrial						
Process Energy Efficiency	$ 247	(33)	$ 34	$ 248	(33)	$ 34
Space Heating Electrification	$ 2,829	(10)	$ 64	$ 2,227	(11)	$ 61
Carbon Capture	$ 404	(18)	$ 25	$ 404	(18)	$ 25
Utility Thermal Energy Networks	$ 8,186	(6)	$ 88	$ 8,117	(6)	$ 87
RNG						
RNG (within Service Territory)	$ 212	(605)	$ 695	$ 212	(605)	$ 695
RNG (outside NY)	$ 231	(190)	$ 278	$ 231	(190)	$ 278
Hydrogen Enriched Natural Gas	$ 195	(152)	$ 129	$ 195	(149)	$ 123
Scenario Total	$ 743	1,725		$ 614	1,725	
Change from Ref Case	n/a	(2,282)	$ 6,648	n/a	(2,281)	$ 5,940
% Change from Ref Case		-57%			-57%	
% Change from 1990 Level		-65%			-65%	

Table D-2: NYSEG Delayed Achievement Scenario Model Output

	NYSEG Delayed Full			NYSEG Delayed Hybrid		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,007	n/a	n/a	4,007	n/a
Weatherization						
Residential	$ 56	(100)	$ 15	$ 60	(100)	$ 16
Commercial	$ 504	(34)	$ 63	$ 507	(34)	$ 63
Municipal	$ 504	(26)	$ 49	$ 507	(26)	$ 49
Electrification						
Residential	$ 1,651	(411)	$ 1,743	$ 776	(493)	$ 1,372
Commercial	$ 2,555	(156)	$ 1,164	$ 729	(124)	$ 371
Municipal	$ 2,695	(90)	$ 704	$ 813	(45)	$ 124
Industrial						
Process Energy Efficiency	$ 257	(18)	$ 19	$ 258	(18)	$ 19
Space Heating Electrification	$ 2,830	(8)	$ 53	$ 649	(5)	$ 7
Carbon Capture	$ 404	(9)	$ 12	$ 404	(9)	$ 12
Utility Thermal Energy Networks	$ 8,126	(4)	$ 49	$ 8,069	(4)	$ 49
RNG						
RNG (within Service Territory)	$ 214	(464)	$ 568	$ 214	(464)	$ 568
RNG (outside NY)	$ 227	(95)	$ 154	$ 227	(95)	$ 154
Hydrogen Enriched Natural Gas	$ 188	(126)	$ 78	$ 188	(125)	$ 75
Scenario Total	$ 761	2,465		$ 425	2,464	
Change from Ref Case	n/a	(1,541)	$ 4,671	n/a	(1,543)	$ 2,880
% Change from Ref Case		-38%			-38%	
% Change from 1990 Level		-50%			-50%	

Table D-3: NYSEG CRA 1 and 2 Model Output

	NYSEG CRA 1			NYSEG CRA 2		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,007	n/a	n/a	4,007	n/a
Weatherization						
Residential	$ 51	(199)	$ 27	$ 47	(199)	$ 25
Commercial	$ 499	(68)	$ 125	$ 497	(68)	$ 124
Municipal	$ 499	(53)	$ 97	$ 497	(53)	$ 96
Electrification						
Residential	$ 1,404	(684)	$ 2,557	$ 1,336	(563)	$ 1,965
Commercial	$ 1,899	(168)	$ 941	$ 1,883	(129)	$ 698
Municipal	$ 1,984	(101)	$ 591	$ 1,904	(81)	$ 442
Industrial						
Process Energy Efficiency	$ 265	(41)	$ 41	$ 264	(41)	$ 41
Space Heating Electrification	$ 1,949	(9)	$ 40	$ 1,858	(7)	$ 30
Carbon Capture	$ -	-	$ -	$ -	-	$ -
Utility Thermal Energy Networks	$ 8,109	(4)	$ 49	$ 8,045	(4)	$ 48
RNG						
RNG (within Service Territory)	$ -	-	$ -	$ -	-	$ -
RNG (outside NY)	$ -	-	$ -	$ -	-	$ -
Hydrogen Enriched Natural Gas	$ -	-	$ -	$ -	-	$ -
Scenario Total	$ 1,184	2,680		$ 1,075	2,862	
Change from Ref Case	n/a	(1,326)	$ 4,467	n/a	(1,145)	$ 3,471
% Change from Ref Case		-33%			-29%	
% Change from 1990 Level		-46%			-42%	

Table D-4: NYSEG CRA 3 and 4 Model Output

	NYSEG CRA 3			NYSEG CRA 4		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,007	n/a	n/a	4,007	n/a
Weatherization						
Residential	$ 20	(199)	$ 10	$ (48)	(199)	$ (26)
Commercial	$ 474	(68)	$ 118	$ 417	(68)	$ 104
Municipal	$ 474	(53)	$ 92	$ 417	(53)	$ 81
Electrification						
Residential	$ 1,359	(743)	$ 2,660	$ 1,126	(667)	$ 1,961
Commercial	$ 1,855	(191)	$ 1,015	$ 1,792	(191)	$ 980
Municipal	$ 1,957	(114)	$ 639	$ 1,890	(114)	$ 617
Industrial						
Process Energy Efficiency	$ 259	(41)	$ 40	$ 246	(41)	$ 38
Space Heating Electrification	$ 1,885	(10)	$ 43	$ 1,809	(10)	$ 41
Carbon Capture	$ -	-	$ -	$ -	-	$ -
Utility Thermal Energy Networks	$ 8,078	(4)	$ 49	$ 7,984	(4)	$ 48
RNG						
RNG (within Service Territory)	$ -	-	$ -	$ -	-	$ -
RNG (outside NY)	$ -	-	$ -	$ -	-	$ -
Hydrogen Enriched Natural Gas	$ -	-	$ -	$ -	-	$ -
Scenario Total	$ 1,169	2,585		$ 1,018	2,660	
Change from Ref Case	n/a	(1,422)	$ 4,666	n/a	(1,347)	$ 3,845
% Change from Ref Case		-35%			-34%	
% Change from 1990 Level		-48%			-46%	

Table D-5: NYSEG CRA 5 and 6 Model Output

	NYSEG CRA 5			NYSEG CRA 6		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,007	n/a	n/a	4,007	n/a
Weatherization						
Residential	$ (62)	(199)	$ (34)	$ (20)	(295)	$ (21)
Commercial	$ 393	(68)	$ 101	$ 450	(68)	$ 114
Municipal	$ 393	(53)	$ 78	$ 450	(53)	$ 88
Electrification						
Residential	$ 944	(535)	$ 1,348	$ 927	(1,023)	$ 3,862
Commercial	$ 1,653	(191)	$ 935	$ 1,540	(562)	$ 3,602
Municipal	$ 1,742	(114)	$ 589	$ 1,618	(210)	$ 1,404
Industrial						
Process Energy Efficiency	$ 241	(41)	$ 38	$ 254	(41)	$ 40
Space Heating Electrification	$ 1,725	(10)	$ 41	$ 1,571	(29)	$ 157
Carbon Capture	$ -	-	$ -	$ -	-	$ -
Utility Thermal Energy Networks	$ 7,610	(4)	$ 48	$ 7,883	(4)	$ 48
RNG						
RNG (within Service Territory)	$ -	-	$ -	$ -	-	$ -
RNG (outside NY)	$ -	-	$ -	$ -	-	$ -
Hydrogen Enriched Natural Gas	$ -	-	$ -	$ -	-	$ -
Scenario Total	$ 892	2,793		$ 1,014	1,722	
Change from Ref Case	n/a	(1,214)	$ 3,142	n/a	(2,285)	$ 9,294
% Change from Ref Case		-30%			-57%	
% Change from 1990 Level		-43%			-65%	

Table D-6: NYSEG LTP Model Output

	NYSEG LTP		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,007	n/a
Weatherization			
Residential	$ 33	(199)	$ 18
Commercial	$ 485	(68)	$ 121
Municipal	$ 485	(53)	$ 94
Electrification			
Residential	$ 859	(358)	$ 830
Commercial	$ 822	(53)	$ 140
Municipal	$ 822	(32)	$ 86
Industrial			
Process Energy Efficiency	$ 243	(33)	$ 34
Space Heating Electrification	$ 652	(3)	$ 4
Carbon Capture	$ 404	(18)	$ 25
Utility Thermal Energy Networks	$ 8,040	(4)	$ 48
RNG			
RNG (within Service Territory)	$ 212	(605)	$ 695
RNG (outside NY)	$ 231	(190)	$ 278
Hydrogen Enriched Natural Gas	$ 193	(182)	$ 139
Scenario Total	$ 330	2,210	
Change from Ref Case	n/a	(1,797)	$ 2,512
% Change from Ref Case		-45%	
% Change from 1990 Level		-55%	

B. GHG Emissions Reductions by Decarbonization Action

Figure D-1: NYSEG CLCPA Full Electrification GHG Emission Reduction 2024-2043 (Million MT CO2e)

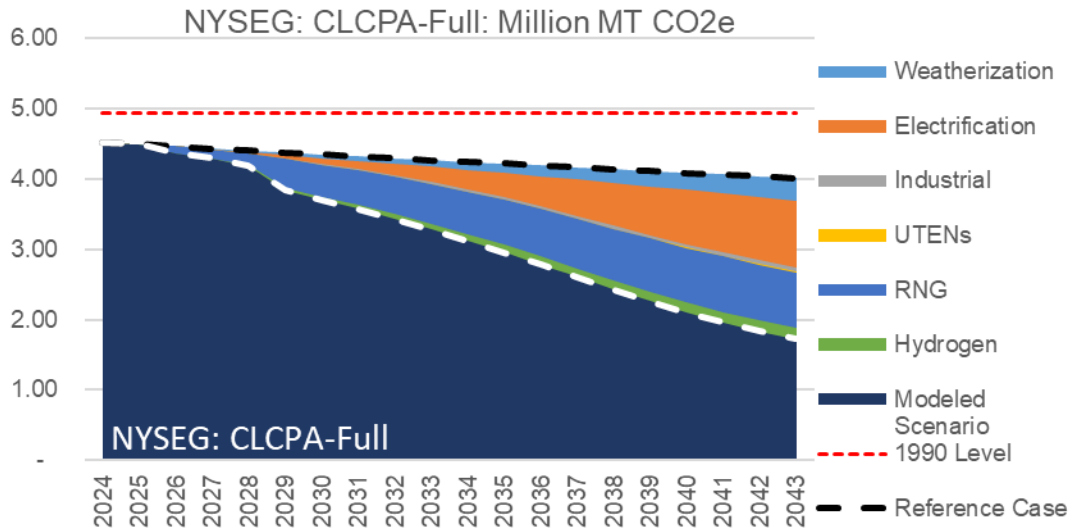


Table D-7: NYSEG CLCPA Full Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.02)	(0.04)	(0.07)	(0.11)	(0.16)	(0.21)	(0.28)	(0.35)	(0.43)	(0.51)	(0.61)	(0.69)	(0.77)	(0.83)	(0.90)	(0.95)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
RNG	-	-	(0.10)	(0.12)	(0.16)	(0.42)	(0.46)	(0.49)	(0.53)	(0.57)	(0.61)	(0.64)	(0.67)	(0.70)	(0.73)	(0.75)	(0.78)	(0.79)	(0.79)	(0.79)
Hydrogen	-	-	-	-	(0.02)	(0.03)	(0.05)	(0.06)	(0.07)	(0.09)	(0.10)	(0.11)	(0.12)	(0.12)	(0.13)	(0.14)	(0.14)	(0.14)	(0.15)	(0.15)
Modeled Scenario	4.51	4.49	4.36	4.29	4.18	3.83	3.70	3.57	3.42	3.27	3.12	2.95	2.78	2.60	2.43	2.26	2.10	1.96	1.84	1.73
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-2: NYSEG CLCPA Hybrid Electrification CO2e Emissions (Million MT CO2e)

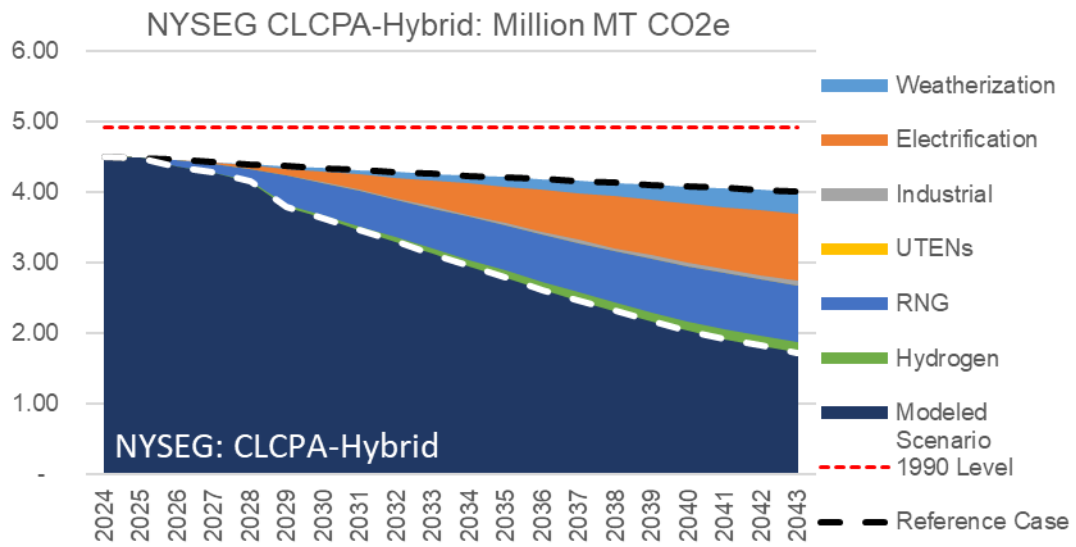


Table D-8: NYSEG CLCPA Hybrid Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.04)	(0.09)	(0.15)	(0.22)	(0.29)	(0.37)	(0.44)	(0.52)	(0.60)	(0.67)	(0.73)	(0.79)	(0.84)	(0.88)	(0.92)	(0.95)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
RNG	-	-	(0.10)	(0.12)	(0.16)	(0.42)	(0.46)	(0.49)	(0.53)	(0.57)	(0.61)	(0.64)	(0.67)	(0.70)	(0.73)	(0.75)	(0.78)	(0.79)	(0.79)	(0.79)
Hydrogen	-	-	-	-	(0.02)	(0.03)	(0.04)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.11)	(0.12)	(0.12)	(0.13)	(0.13)	(0.14)	(0.14)	(0.15)
Modeled Scenario	4.51	4.49	4.36	4.28	4.16	3.79	3.63	3.46	3.29	3.12	2.95	2.78	2.61	2.46	2.31	2.17	2.03	1.91	1.82	1.73
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-3: NYSEG Delayed Achievement Full Electrification CO2e Emissions (Million MT CO2e)

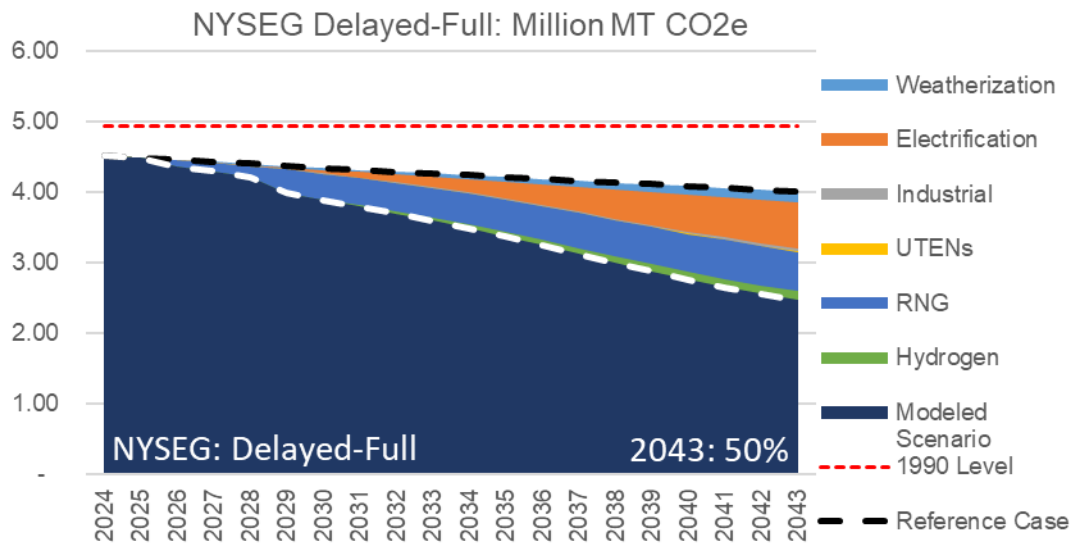


Table D-9: NYSEG Delayed Achievement Full Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.11)	(0.12)	(0.13)	(0.15)	(0.16)
Electrification	-	-	-	(0.00)	(0.01)	(0.03)	(0.05)	(0.08)	(0.11)	(0.14)	(0.19)	(0.23)	(0.29)	(0.35)	(0.41)	(0.47)	(0.53)	(0.57)	(0.61)	(0.66)
Industrial	-	-	-	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	(0.10)	(0.12)	(0.15)	(0.33)	(0.36)	(0.38)	(0.40)	(0.42)	(0.44)	(0.46)	(0.48)	(0.50)	(0.51)	(0.53)	(0.54)	(0.56)	(0.56)	(0.56)
Hydrogen	-	-	-	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.09)	(0.10)	(0.11)	(0.11)	(0.12)	(0.13)
Modeled Scenario	4.51	4.49	4.36	4.30	4.22	3.99	3.89	3.79	3.69	3.59	3.48	3.37	3.25	3.12	2.99	2.87	2.75	2.65	2.56	2.47
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-4: NYSEG Delayed Achievement Hybrid Electrification CO2e Emissions (Million MT CO2e)

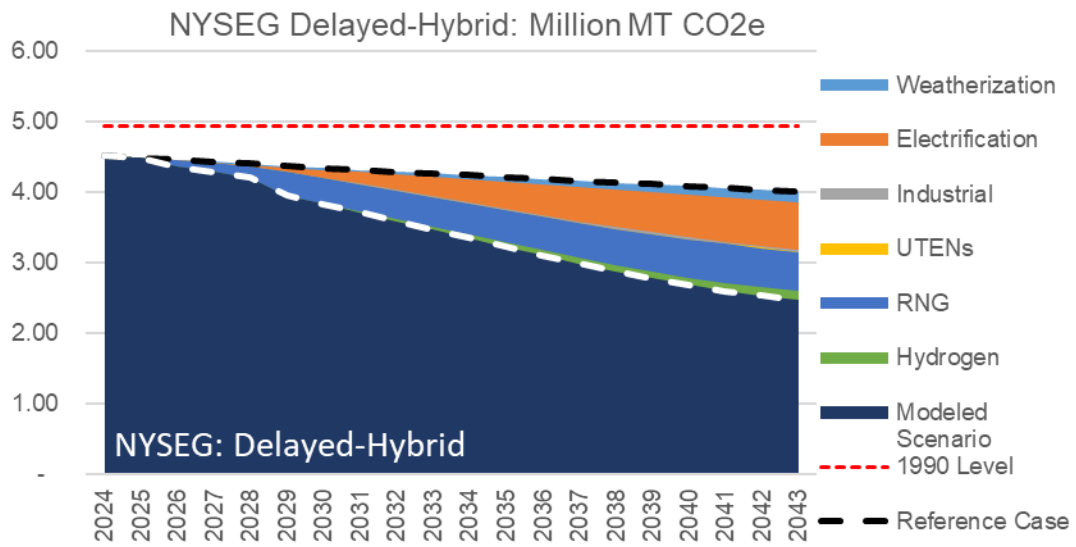


Table D-10: NYSEG Delayed Achievement Hybrid Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.11)	(0.12)	(0.13)	(0.15)	(0.16)
Electrification	-	-	-	(0.01)	(0.03)	(0.06)	(0.11)	(0.16)	(0.21)	(0.27)	(0.32)	(0.38)	(0.44)	(0.49)	(0.53)	(0.57)	(0.61)	(0.63)	(0.65)	(0.66)
Industrial	-	-	-	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	(0.10)	(0.12)	(0.15)	(0.33)	(0.36)	(0.38)	(0.40)	(0.42)	(0.44)	(0.46)	(0.48)	(0.50)	(0.51)	(0.53)	(0.54)	(0.56)	(0.56)	(0.56)
Hydrogen	-	-	-	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.10)	(0.11)	(0.12)	(0.13)
Modeled Scenario	4.51	4.49	4.36	4.29	4.20	3.95	3.83	3.71	3.59	3.47	3.35	3.22	3.10	2.98	2.88	2.78	2.68	2.59	2.53	2.46
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-5: NYSEG CRA 1 CO2e Emissions (Million MT CO2e)

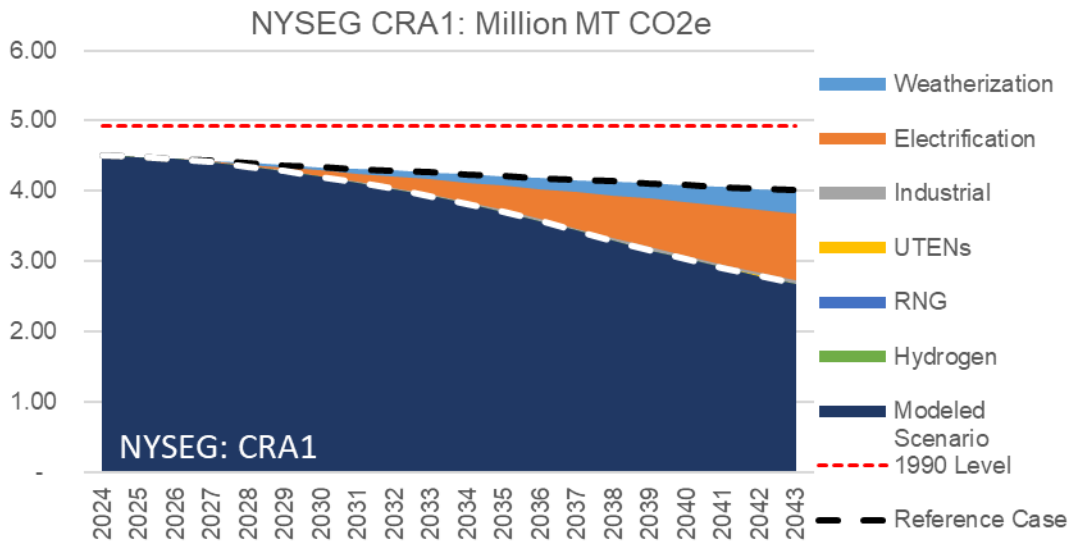


Table D-11: NYSEG CRA 1 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.02)	(0.04)	(0.08)	(0.11)	(0.16)	(0.22)	(0.28)	(0.35)	(0.43)	(0.52)	(0.61)	(0.69)	(0.77)	(0.83)	(0.90)	(0.95)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.51	4.49	4.46	4.41	4.35	4.28	4.20	4.12	4.03	3.93	3.82	3.70	3.57	3.44	3.29	3.16	3.03	2.91	2.79	2.68
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-6: NYSEG CRA 2 CO2e Emissions (Million MT CO2e)

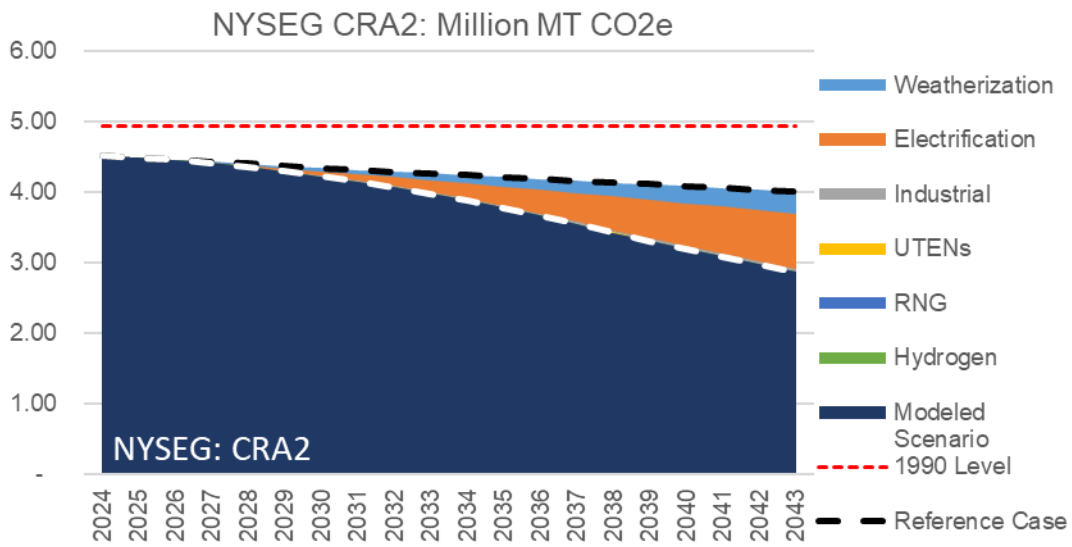


Table D-12: NYSEG CRA 2 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.02)	(0.04)	(0.06)	(0.09)	(0.13)	(0.17)	(0.22)	(0.27)	(0.34)	(0.41)	(0.48)	(0.55)	(0.61)	(0.67)	(0.72)	(0.77)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.51	4.49	4.46	4.41	4.35	4.29	4.22	4.15	4.07	3.98	3.88	3.78	3.67	3.55	3.42	3.31	3.19	3.08	2.97	2.86
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-7: NYSEG CRA 3 CO2e Emissions (Million MT CO2e)

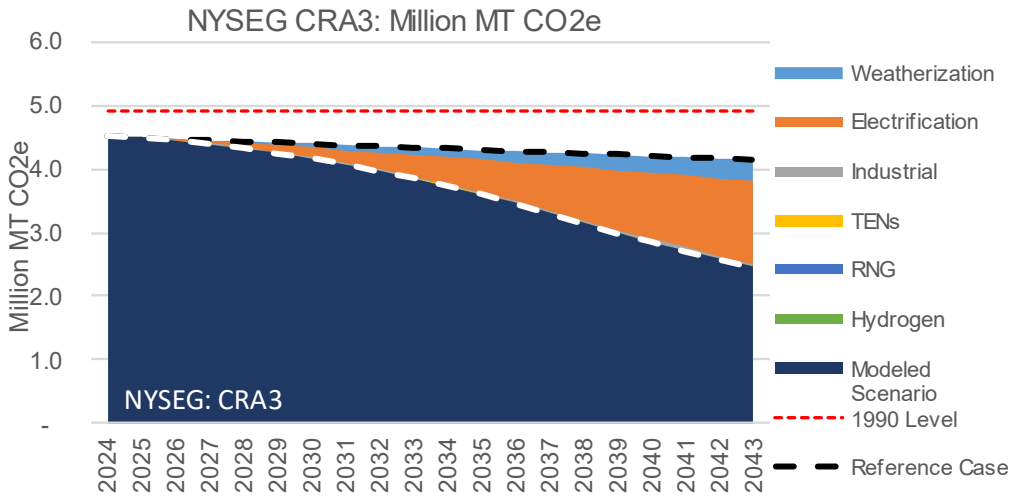


Table D-13: NYSEG CRA 3 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.02)	(0.05)	(0.08)	(0.12)	(0.17)	(0.23)	(0.30)	(0.38)	(0.46)	(0.56)	(0.66)	(0.75)	(0.83)	(0.91)	(0.98)	(1.05)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.51	4.49	4.46	4.41	4.35	4.28	4.20	4.11	4.02	3.92	3.80	3.68	3.54	3.40	3.24	3.10	2.97	2.84	2.71	2.58
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-8: NYSEG CRA 4 CO2e Emissions (Million MT CO2e)

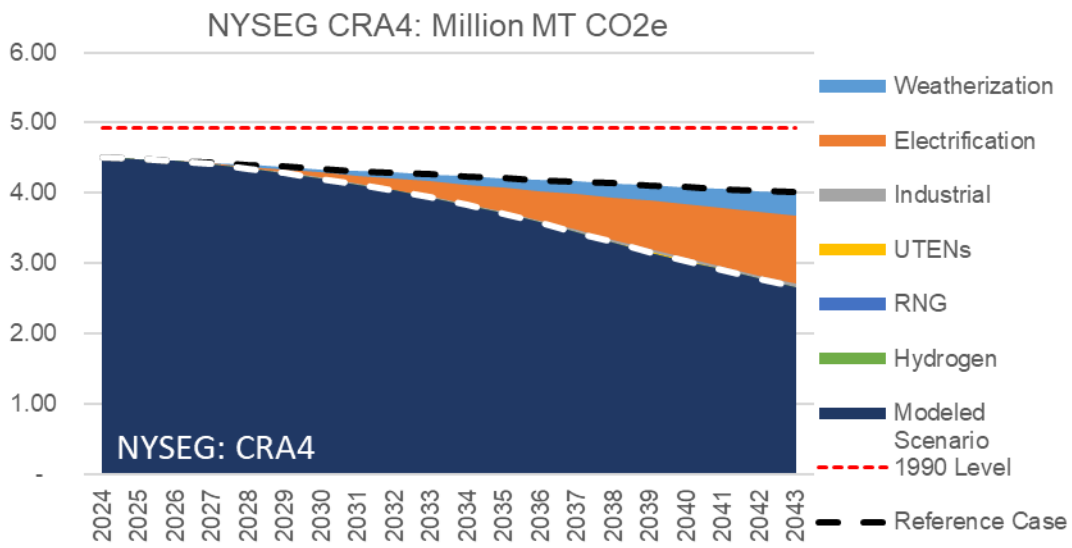


Table D-14: NYSEG CRA 4 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.02)	(0.04)	(0.07)	(0.11)	(0.16)	(0.21)	(0.28)	(0.35)	(0.43)	(0.51)	(0.61)	(0.69)	(0.77)	(0.84)	(0.91)	(0.97)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.51	4.49	4.46	4.41	4.35	4.28	4.20	4.12	4.03	3.93	3.83	3.71	3.58	3.44	3.30	3.16	3.03	2.91	2.78	2.66
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-9: NYSEG CRA 5 CO2e Emissions (Million MT CO2e)

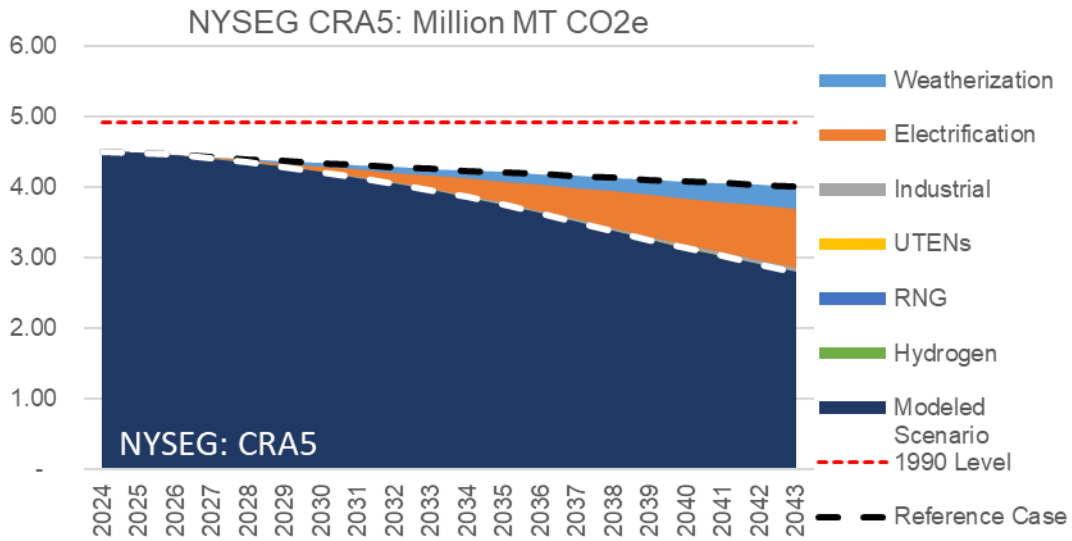


Table D-15: NYSEG CRA 5 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.01)	(0.02)	(0.04)	(0.07)	(0.10)	(0.14)	(0.19)	(0.24)	(0.30)	(0.37)	(0.45)	(0.53)	(0.60)	(0.66)	(0.72)	(0.78)	(0.84)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.51	4.49	4.46	4.41	4.35	4.29	4.21	4.14	4.05	3.96	3.86	3.75	3.63	3.51	3.38	3.25	3.14	3.02	2.90	2.79
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-10: NYSEG CRA 6 CO2e Emissions (Million MT CO2e)

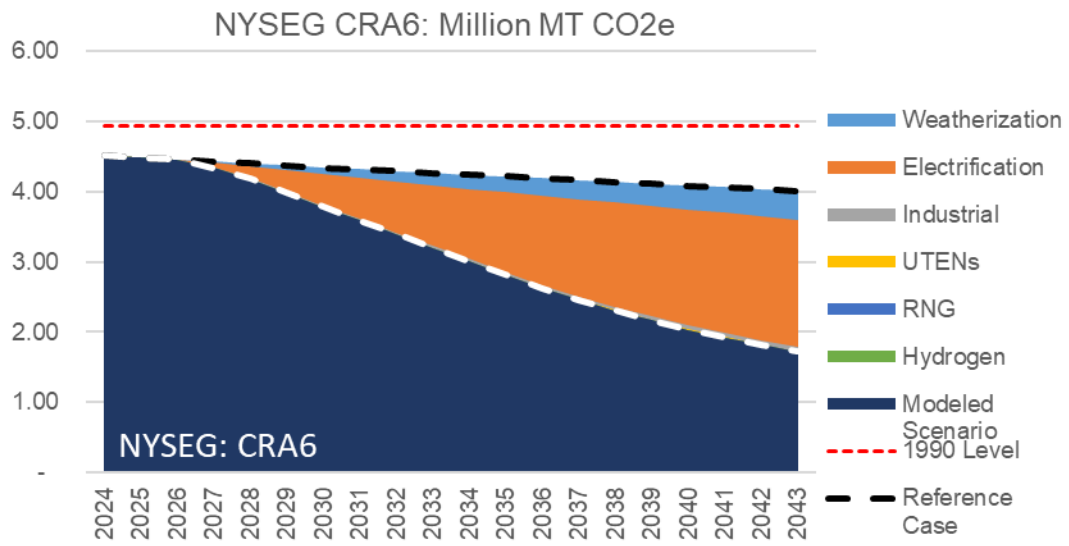


Table D-16: NYSEG CRA 6 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.02)	(0.04)	(0.07)	(0.10)	(0.12)	(0.15)	(0.17)	(0.20)	(0.22)	(0.25)	(0.27)	(0.29)	(0.32)	(0.34)	(0.36)	(0.39)	(0.42)
Electrification	-	-	-	(0.07)	(0.17)	(0.31)	(0.45)	(0.58)	(0.72)	(0.86)	(1.00)	(1.14)	(1.27)	(1.38)	(1.48)	(1.57)	(1.65)	(1.70)	(1.75)	(1.80)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.51	4.49	4.46	4.34	4.18	3.98	3.78	3.59	3.39	3.20	3.01	2.82	2.62	2.46	2.31	2.17	2.04	1.93	1.82	1.72
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Figure D-11: NYSEG Long Term Plan CO2e Emissions (Million MT CO2e)

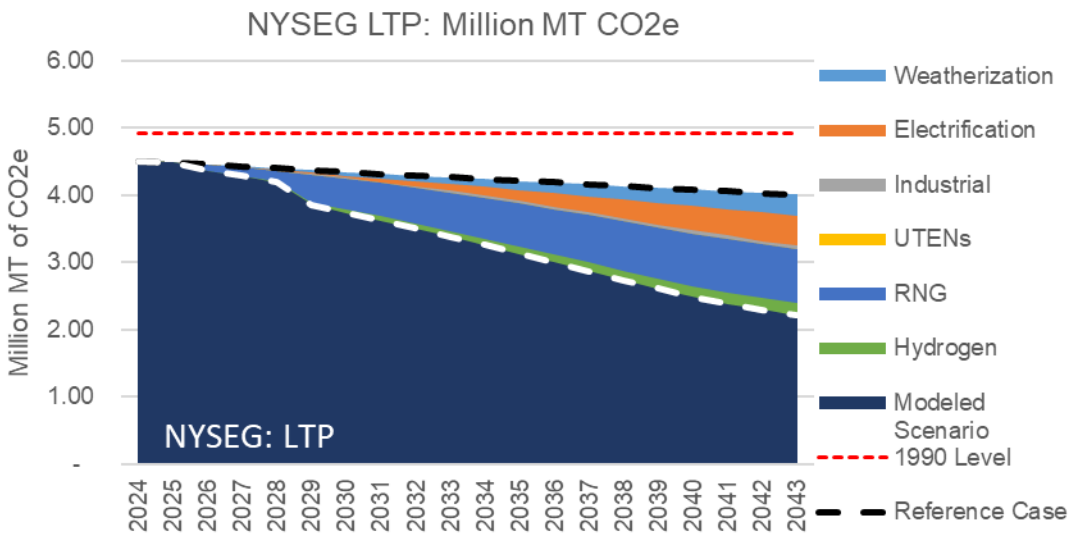


Table D-17: NYSEG LTP Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.13)	(0.15)	(0.18)	(0.20)	(0.22)	(0.24)	(0.27)	(0.29)	(0.32)
Electrification	-	-	-	(0.00)	(0.01)	(0.02)	(0.04)	(0.05)	(0.08)	(0.10)	(0.13)	(0.17)	(0.20)	(0.25)	(0.29)	(0.33)	(0.36)	(0.39)	(0.42)	(0.44)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	(0.10)	(0.12)	(0.16)	(0.42)	(0.46)	(0.49)	(0.53)	(0.57)	(0.61)	(0.64)	(0.67)	(0.70)	(0.73)	(0.75)	(0.78)	(0.79)	(0.79)	(0.79)
Hydrogen	-	-	-	-	(0.02)	(0.03)	(0.05)	(0.06)	(0.07)	(0.09)	(0.10)	(0.11)	(0.12)	(0.13)	(0.14)	(0.15)	(0.16)	(0.17)	(0.17)	(0.18)
Modeled Scenario	4.51	4.49	4.36	4.29	4.19	3.85	3.74	3.62	3.50	3.38	3.26	3.13	3.00	2.87	2.73	2.61	2.49	2.38	2.29	2.21
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

C. GHG Emissions Reductions

Figure D-12: NYSEG CO2e Emissions by Scenario (Million MT)

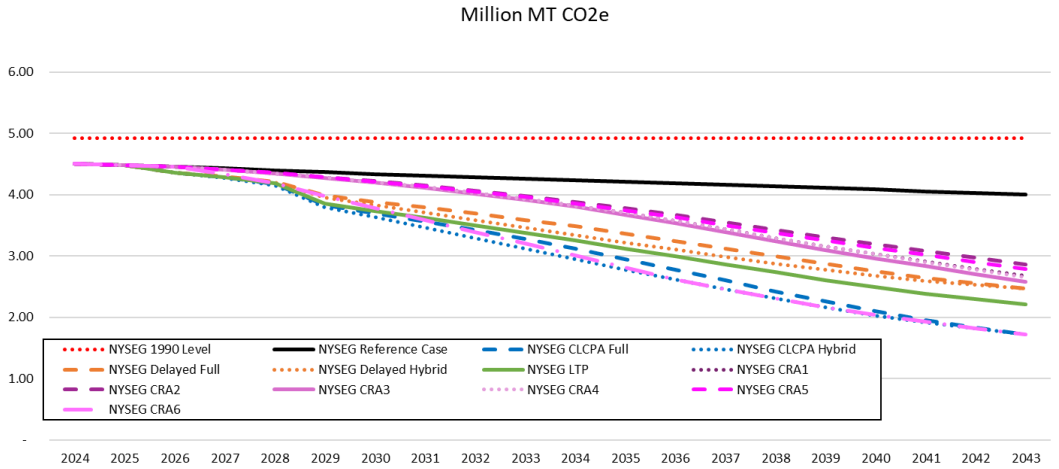


Table D-18: NYSEG CO2e Emissions by Scenario (Million MT)

Million MT CO2e	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
1990 Level	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93
Reference Case	4.51	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.29	4.26	4.24	4.21	4.19	4.16	4.14	4.11	4.08	4.06	4.03	4.01
CLCPA Full	4.51	4.49	4.36	4.29	4.18	3.83	3.70	3.57	3.42	3.27	3.12	2.95	2.78	2.60	2.43	2.26	2.10	1.96	1.84	1.73
CLCPA Hybrid	4.51	4.49	4.36	4.28	4.16	3.79	3.63	3.46	3.29	3.12	2.95	2.78	2.61	2.46	2.31	2.17	2.03	1.91	1.82	1.73
Delayed Full	4.51	4.49	4.36	4.30	4.22	3.99	3.89	3.79	3.69	3.59	3.48	3.37	3.25	3.12	2.99	2.87	2.75	2.65	2.56	2.47
Delayed Hybrid	4.51	4.49	4.36	4.29	4.20	3.95	3.83	3.71	3.59	3.47	3.35	3.22	3.10	2.98	2.88	2.78	2.68	2.59	2.53	2.46
CRA1	4.51	4.49	4.46	4.41	4.35	4.28	4.20	4.12	4.03	3.93	3.82	3.70	3.57	3.44	3.29	3.16	3.03	2.91	2.79	2.68
CRA2	4.51	4.49	4.46	4.41	4.35	4.29	4.22	4.15	4.07	3.98	3.88	3.78	3.67	3.55	3.42	3.31	3.19	3.08	2.97	2.86
CRA3	4.51	4.49	4.46	4.41	4.35	4.28	4.20	4.11	4.02	3.92	3.80	3.68	3.54	3.40	3.24	3.10	2.97	2.84	2.71	2.58
CRA4	4.51	4.49	4.46	4.41	4.35	4.28	4.20	4.12	4.03	3.93	3.83	3.71	3.58	3.44	3.30	3.16	3.03	2.91	2.78	2.66
CRA5	4.51	4.49	4.46	4.41	4.35	4.29	4.21	4.14	4.05	3.96	3.86	3.75	3.63	3.51	3.38	3.25	3.14	3.02	2.90	2.79
CRA6	4.51	4.49	4.46	4.34	4.18	3.98	3.78	3.59	3.39	3.20	3.01	2.82	2.62	2.46	2.31	2.17	2.04	1.93	1.82	1.72
LTP	4.51	4.49	4.36	4.29	4.19	3.85	3.74	3.62	3.50	3.38	3.26	3.13	3.00	2.87	2.73	2.61	2.49	2.38	2.29	2.21

D. Annual Decarbonization Policy Cost

Figure D-13: NYSEG Annual Decarbonization Policy Cost 2024-2043 ($M)

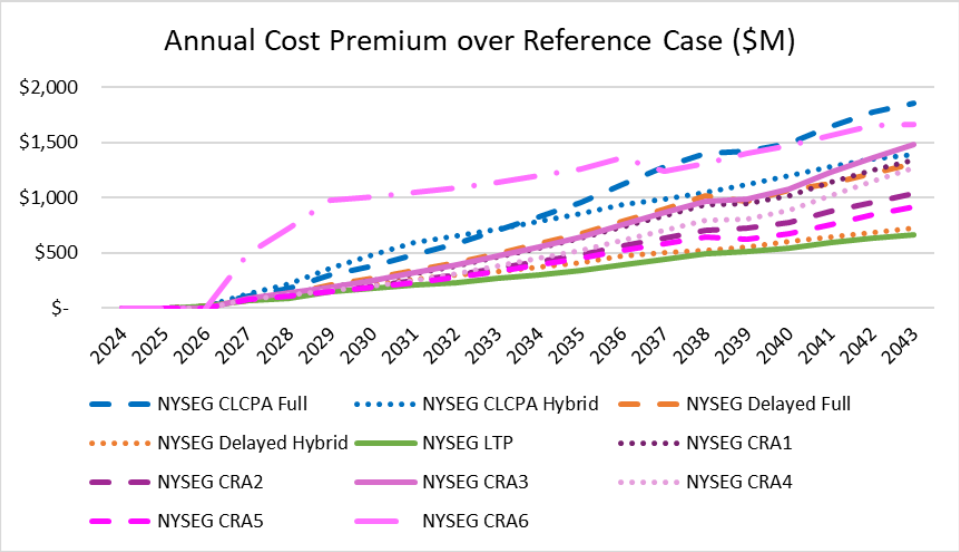


Table D-19: NYSEG Annual Decarbonization Policy Cost 2024-2043 ($M)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
CLCPA Full	$-	$-	$16	$109	$177	$295	$381	$478	$584	$701	$825	$959	$1,114	$1,276	$1,405	$1,417	$1,493	$1,644	$1,775	$1,851
CLCPA Hybrid	$-	$-	$16	$131	$223	$365	$476	$597	$653	$715	$782	$851	$935	$984	$1,046	$1,122	$1,199	$1,278	$1,352	$1,387
Delayed Full	$-	$-	$16	$77	$125	$205	$268	$335	$408	$491	$582	$677	$789	$900	$1,013	$969	$1,068	$1,129	$1,221	$1,308
Delayed Hybrid	$-	$-	$16	$63	$96	$162	$211	$263	$296	$332	$372	$414	$468	$501	$525	$555	$602	$639	$686	$725
CRA1	$-	$-	$-	$84	$134	$187	$244	$308	$379	$460	$542	$630	$735	$838	$932	$946	$1,019	$1,141	$1,244	$1,340
CRA2	$-	$-	$-	$76	$116	$158	$203	$251	$301	$357	$417	$481	$558	$634	$708	$724	$777	$873	$955	$1,032
CRA3	$-	$-	$-	$86	$136	$190	$249	$315	$389	$469	$554	$646	$755	$863	$963	$986	$1,076	$1,225	$1,358	$1,477
CRA4	$-	$-	$-	$77	$115	$155	$201	$253	$312	$378	$447	$524	$616	$708	$790	$805	$890	$1,015	$1,150	$1,265
CRA5	$-	$-	$-	$76	$112	$149	$188	$231	$278	$331	$388	$446	$517	$585	$638	$619	$676	$758	$843	$913
CRA6	$-	$-	$-	$487	$721	$971	$1,010	$1,048	$1,089	$1,139	$1,195	$1,258	$1,357	$1,236	$1,309	$1,398	$1,475	$1,566	$1,652	$1,664
LTP	$-	$-	$16	$65	$85	$149	$175	$204	$233	$266	$302	$342	$392	$438	$489	$514	$546	$592	$629	$661

E. Nonparticipant Typical Monthly Bill

Figure D-14: NYSEG Residential Nonparticipant Typical Monthly Gas Bill ($)

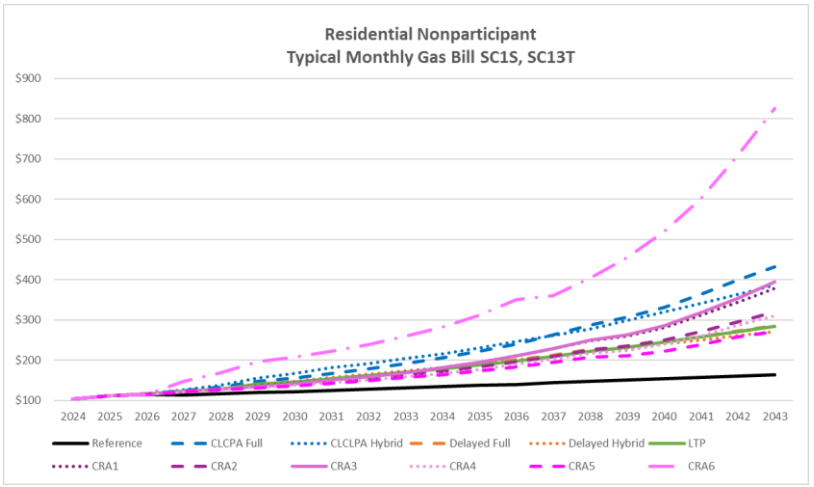


Table D-20: NYSEG Residential Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$104	$111	$115	$114	$117	$120	$122	$125	$128	$132	$135	$138	$140	$144	$147	$150	$154	$157	$161	$164
CLCPA Full	$104	$111	$117	$125	$133	$148	$156	$167	$179	$192	$206	$222	$241	$264	$288	$307	$331	$364	$400	$433
CLCPA Hybrid	$104	$111	$117	$127	$137	$155	$167	$182	$192	$204	$217	$230	$247	$261	$278	$298	$319	$341	$364	$386
Delayed Full	$104	$111	$117	$121	$128	$138	$145	$153	$161	$170	$179	$190	$201	$213	$227	$232	$247	$258	$273	$287
Delayed Hybrid	$104	$111	$117	$122	$129	$140	$148	$157	$165	$173	$182	$191	$201	$210	$219	$228	$240	$249	$262	$272
CRA1	$104	$111	$115	$122	$128	$135	$142	$150	$160	$170	$181	$195	$211	$228	$249	$261	$281	$311	$344	$378
CRA2	$104	$111	$115	$121	$127	$134	$139	$147	$155	$163	$173	$183	$196	$210	$226	$235	$250	$272	$296	$319
CRA3	$104	$111	$115	$122	$128	$135	$142	$150	$159	$170	$181	$194	$211	$229	$250	$263	$285	$318	$355	$394
CRA4	$104	$111	$115	$122	$127	$132	$137	$144	$151	$159	$167	$177	$189	$203	$218	$224	$240	$261	$288	$310
CRA5	$104	$111	$115	$122	$127	$132	$137	$143	$149	$157	$165	$173	$184	$195	$207	$211	$223	$238	$258	$272
CRA6	$104	$111	$115	$148	$170	$196	$208	$222	$239	$259	$283	$312	$351	$361	$405	$455	$521	$601	$710	$826
LTP	$104	$111	$117	$123	$129	$141	$147	$154	$162	$170	$178	$188	$199	$209	$223	$232	$245	$258	$272	$284

Figure D-15: NYSEG General Service Nonparticipant Typical Monthly Gas Bill ($)

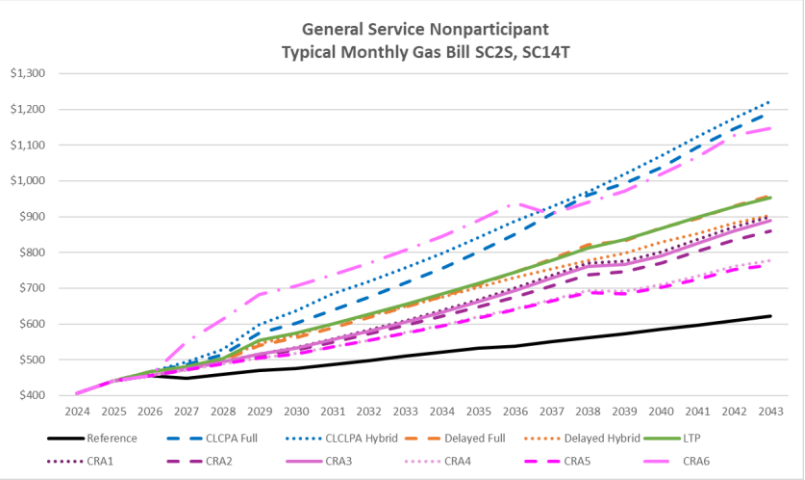


Table D-21: NYSEG General Service Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$406	$442	$455	$448	$459	$470	$476	$487	$498	$510	$521	$532	$539	$550	$562	$573	$585	$597	$609	$621
CLCPA Full	$406	$442	$466	$487	$515	$574	$602	$638	$675	$714	$756	$802	$851	$908	$961	$994	$1,038	$1,093	$1,145	$1,190
CLCPA Hybrid	$406	$442	$466	$493	$530	$597	$636	$684	$720	$758	$798	$841	$888	$927	$970	$1,019	$1,070	$1,123	$1,175	$1,222
Delayed Full	$406	$442	$466	$476	$498	$540	$562	$589	$618	$647	$678	$710	$745	$781	$821	$832	$869	$895	$930	$960
Delayed Hybrid	$406	$442	$466	$477	$501	$545	$569	$600	$624	$649	$675	$702	$731	$754	$777	$798	$828	$852	$881	$905
CRA1	$406	$442	$455	$473	$494	$516	$533	$558	$583	$610	$638	$668	$700	$735	$770	$775	$801	$836	$871	$901
CRA2	$406	$442	$455	$472	$491	$511	$527	$549	$572	$596	$621	$648	$676	$706	$737	$747	$771	$802	$834	$861
CRA3	$406	$442	$455	$473	$494	$515	$532	$556	$580	$606	$634	$663	$694	$728	$762	$766	$791	$825	$860	$889
CRA4	$406	$442	$455	$472	$488	$505	$517	$536	$555	$575	$597	$619	$643	$669	$694	$691	$709	$733	$762	$778
CRA5	$406	$442	$455	$472	$488	$505	$517	$535	$554	$574	$595	$617	$640	$664	$689	$685	$702	$724	$751	$765
CRA6	$406	$442	$455	$551	$613	$683	$706	$737	$770	$806	$845	$889	$939	$908	$940	$972	$1,019	$1,067	$1,127	$1,148
LTP	$406	$442	$466	$481	$503	$554	$574	$600	$627	$655	$683	$714	$745	$777	$813	$836	$867	$897	$927	$953

Figure D-16: NYSEG Large Firm Transportation Nonparticipant Typical Monthly Gas Bill ($)

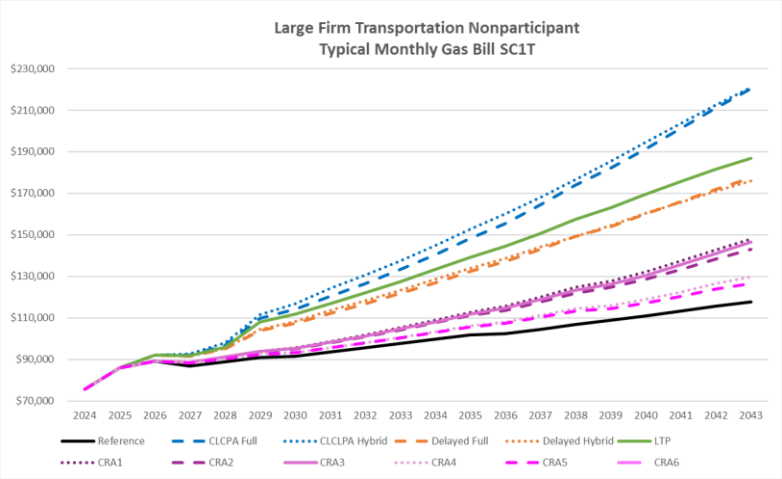


Table D-22: NYSEG Large Firm Transportation Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$75,674	$86,022	$89,253	$86,816	$88,801	$90,807	$91,406	$93,479	$95,502	$97,571	$99,654	$101,753	$102,438	$104,570	$106,715	$108,876	$111,051	$113,262	$115,526	$117,840
CLCPA Full	$75,674	$86,022	$92,058	$92,182	$96,864	$109,614	$114,107	$120,267	$126,567	$133,284	$140,458	$148,181	$155,508	$164,621	$173,843	$182,075	$191,260	$201,418	$211,082	$220,491
CLCPA Hybrid	$75,674	$86,022	$92,058	$92,665	$97,915	$111,436	$116,815	$124,057	$130,568	$137,482	$144,828	$152,679	$160,070	$168,111	$176,569	$185,409	$194,626	$203,808	$212,446	$221,004
Delayed Full	$75,674	$86,022	$92,048	$91,432	$95,070	$103,881	$107,342	$112,027	$116,775	$121,745	$126,937	$132,388	$137,202	$143,112	$149,326	$153,813	$160,115	$165,899	$171,755	$177,435
Delayed Hybrid	$75,674	$86,022	$92,048	$91,555	$95,382	$104,501	$108,345	$113,517	$118,321	$123,324	$128,519	$133,936	$138,675	$144,074	$149,329	$154,549	$160,383	$165,838	$171,082	$175,996
CRA1	$75,674	$86,022	$89,253	$88,484	$91,183	$94,006	$95,535	$98,661	$101,874	$105,285	$108,887	$112,721	$115,692	$120,097	$124,719	$127,702	$132,010	$137,287	$142,722	$148,105
CRA2	$75,674	$86,022	$89,253	$88,395	$90,988	$93,688	$95,072	$98,031	$101,050	$104,235	$107,571	$111,092	$113,687	$117,640	$121,859	$124,807	$128,740	$133,403	$138,237	$142,965
CRA3	$75,674	$86,022	$89,253	$88,516	$91,111	$93,828	$95,246	$98,257	$101,350	$104,634	$108,103	$111,800	$114,629	$118,891	$123,370	$126,212	$130,406	$135,613	$141,026	$146,451
CRA4	$75,674	$86,022	$89,253	$88,423	$90,444	$92,567	$93,366	$95,725	$98,126	$100,670	$103,338	$106,157	$108,013	$111,178	$114,402	$116,073	$119,012	$122,502	$126,492	$129,718
CRA5	$75,674	$86,022	$89,253	$88,409	$90,406	$92,495	$93,247	$95,548	$97,877	$100,333	$102,894	$105,582	$107,276	$110,238	$113,208	$114,563	$117,225	$120,339	$123,866	$126,627
CRA6	$75,674	$86,022	$89,253	$93,798	$99,038	$104,850	$106,624	$110,038	$113,605	$117,462	$121,653	$126,292	$130,435	$132,190	$137,395	$142,901	$149,289	$156,214	$164,363	$172,041
LTP	$75,674	$86,022	$92,058	$91,782	$96,012	$108,008	$111,678	$116,895	$122,103	$127,547	$133,229	$139,191	$144,406	$150,703	$157,336	$163,155	$169,568	$175,841	$181,540	$187,025

Figure D-17: NYSEG Small Firm Transportation Nonparticipant Typical Monthly Gas Bill ($)

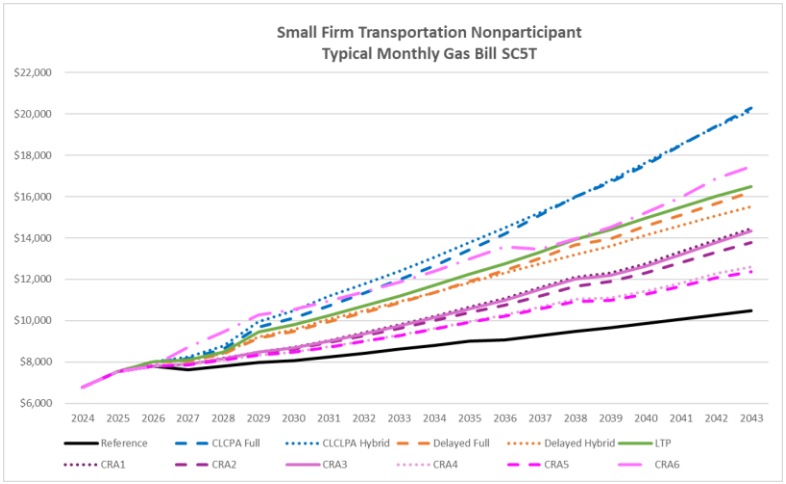


Table D-23: NYSEG Small Firm Transportation Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$6,769	$7,527	$7,789	$7,617	$7,796	$7,979	$8,054	$8,243	$8,428	$8,617	$8,807	$8,998	$9,081	$9,275	$9,470	$9,667	$9,865	$10,065	$10,270	$10,479
CLCPA Full	$6,769	$7,527	$8,005	$8,167	$8,613	$9,689	$10,136	$10,720	$11,324	$11,970	$12,664	$13,415	$14,183	$15,110	$16,001	$16,682	$17,510	$18,484	$19,412	$20,277
CLCPA Hybrid	$6,769	$7,527	$8,005	$8,239	$8,765	$9,937	$10,491	$11,199	$11,781	$12,403	$13,066	$13,779	$14,500	$15,208	$15,964	$16,782	$17,642	$18,515	$19,366	$20,181
Delayed Full	$6,769	$7,527	$8,005	$8,051	$8,398	$9,149	$9,494	$9,938	$10,392	$10,870	$11,373	$11,904	$12,424	$13,013	$13,648	$13,967	$14,578	$15,090	$15,674	$16,208
Delayed Hybrid	$6,769	$7,527	$8,005	$8,065	$8,431	$9,208	$9,583	$10,062	$10,480	$10,917	$11,371	$11,846	$12,300	$12,756	$13,188	$13,614	$14,137	$14,592	$15,081	$15,511
CRA1	$6,769	$7,527	$7,789	$7,882	$8,174	$8,485	$8,702	$9,050	$9,412	$9,799	$10,211	$10,654	$11,075	$11,594	$12,113	$12,320	$12,757	$13,330	$13,911	$14,457
CRA2	$6,769	$7,527	$7,789	$7,867	$8,143	$8,434	$8,628	$8,948	$9,279	$9,629	$9,998	$10,390	$10,749	$11,196	$11,664	$11,899	$12,298	$12,800	$13,315	$13,791
CRA3	$6,769	$7,527	$7,789	$7,887	$8,171	$8,472	$8,679	$9,017	$9,369	$9,745	$10,147	$10,579	$10,989	$11,498	$12,008	$12,202	$12,632	$13,204	$13,789	$14,342
CRA4	$6,769	$7,527	$7,789	$7,872	$8,096	$8,335	$8,476	$8,744	$9,021	$9,316	$9,629	$9,964	$10,267	$10,655	$11,030	$11,113	$11,426	$11,821	$12,288	$12,616
CRA5	$6,769	$7,527	$7,789	$7,871	$8,093	$8,328	$8,466	$8,729	$9,000	$9,288	$9,592	$9,917	$10,207	$10,579	$10,934	$10,992	$11,285	$11,651	$12,082	$12,375
CRA6	$6,769	$7,527	$7,789	$8,722	$9,444	$10,262	$10,537	$10,951	$11,391	$11,869	$12,391	$12,970	$13,579	$13,444	$13,959	$14,501	$15,207	$15,960	$16,876	$17,449
LTP	$6,769	$7,527	$8,005	$8,103	$8,478	$9,456	$9,795	$10,256	$10,718	$11,202	$11,707	$12,238	$12,741	$13,306	$13,913	$14,388	$14,952	$15,501	$16,023	$16,501

F. Annual Design Day Demand

Table D-24: NYSEG Annual Design Day Demand 2024-2043 (Mcf/d)

	Reference Case	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	LTP
2024	443,635	443,635	443,635	443,635	443,635	443,635	443,635	443,635	443,635	443,635	443,635	443,635
2025	441,495	441,495	441,495	441,495	441,495	441,495	441,495	441,495	441,495	441,495	441,495	441,495
2026	439,156	439,156	439,156	439,156	439,156	439,156	439,156	439,156	439,156	439,156	439,156	439,156
2027	436,551	433,660	434,683	434,903	435,536	433,874	434,766	433,561	433,660	433,866	423,456	434,766
2028	433,972	426,902	429,957	429,830	431,722	427,541	430,203	426,604	426,900	427,514	402,080	430,208
2029	431,265	418,743	424,824	423,791	427,558	420,017	425,306	418,149	418,737	419,957	375,185	425,327
2030	428,429	409,203	419,284	416,795	423,045	411,323	420,072	408,219	409,191	411,209	348,774	420,121
2031	425,504	398,345	413,376	408,894	418,222	401,524	414,538	396,883	398,326	401,329	322,864	414,632
2032	422,531	386,239	407,278	400,144	413,280	390,690	408,740	384,214	386,209	390,379	297,470	408,900
2033	419,593	372,997	401,072	390,643	408,300	378,938	402,758	370,330	372,956	378,464	272,654	403,008
2034	416,625	358,589	394,695	380,342	403,220	366,239	396,526	355,207	358,534	365,546	248,328	396,891
2035	413,637	342,954	388,050	369,163	397,942	352,537	389,942	338,790	342,884	351,557	224,375	390,454
2036	410,593	326,201	381,205	357,300	392,642	338,048	383,180	321,300	326,218	336,701	200,950	383,871
2037	407,534	308,408	374,199	344,603	387,145	322,644	376,063	302,611	308,406	320,837	181,995	376,969
2038	404,507	290,253	367,043	331,529	381,677	307,214	368,853	283,614	290,335	304,844	165,734	369,978
2039	401,474	273,340	359,798	319,805	376,081	293,669	361,467	266,224	273,399	290,106	150,777	362,720
2040	398,459	258,311	352,558	308,342	370,649	282,124	354,031	250,559	258,451	276,701	136,293	355,430
2041	395,468	243,156	345,331	297,722	365,177	270,015	346,340	234,027	242,673	262,564	121,731	347,956
2042	392,463	228,274	338,078	287,163	359,838	258,948	338,576	218,269	226,738	248,248	107,349	340,471
2043	389,436	214,944	330,790	276,508	354,412	248,607	330,524	203,014	212,051	234,693	93,947	332,755

G. Annual Gas Throughput by Sector

Table D-25: NYSEG CLCPA Scenarios Gas Throughput by Customer Segment (Mcf)

	NYSEG CLCPA-Full					NYSEG CLCPA-Hybrid				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655
2025	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495
2026	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101
2027	20,978,555	14,471,671	11,209,440	5,524,348	52,184,014	20,919,244	14,424,427	11,209,274	5,526,308	52,079,254
2028	20,632,097	14,383,449	11,053,706	5,436,832	51,506,084	20,455,189	14,242,222	11,053,208	5,442,721	51,193,340
2029	20,206,666	14,275,964	10,896,650	5,319,184	50,698,464	19,855,845	13,995,268	10,895,653	5,330,989	50,077,755
2030	19,702,301	14,138,905	10,737,669	5,185,533	49,764,407	19,124,089	13,675,213	10,736,008	5,205,271	48,740,581
2031	19,120,402	13,973,259	10,578,297	5,038,304	48,710,262	18,264,911	13,285,653	10,575,805	5,068,034	47,194,403
2032	18,462,503	13,782,274	10,417,999	4,879,708	47,542,485	17,403,937	12,897,833	10,414,510	4,921,535	45,637,815
2033	17,730,670	13,575,530	10,259,088	4,706,411	46,271,699	16,540,939	12,520,851	10,254,436	4,762,496	44,078,722
2034	16,927,491	13,345,886	10,100,018	4,520,668	44,894,064	15,676,087	12,147,050	10,094,037	4,593,229	42,510,402
2035	16,054,077	13,091,841	9,941,664	4,324,677	43,412,258	14,807,959	11,774,379	9,934,188	4,415,990	40,932,515
2036	15,113,819	12,813,253	9,783,910	4,115,206	41,826,188	13,937,326	11,402,117	9,774,772	4,227,607	39,341,822
2037	14,107,614	12,513,393	9,626,997	3,894,500	40,142,503	13,061,713	11,164,857	9,616,031	4,034,965	37,877,566
2038	13,028,920	12,195,145	9,471,807	3,717,606	38,413,478	12,216,764	10,927,888	9,458,847	3,890,482	36,493,981
2039	11,902,561	12,007,214	9,317,641	3,565,851	36,793,266	11,435,326	10,691,295	9,302,522	3,738,721	35,167,864
2040	10,923,180	11,811,944	9,164,186	3,408,570	35,307,881	10,728,759	10,456,252	9,146,741	3,581,435	33,913,187
2041	9,945,276	11,617,081	9,012,651	3,246,189	33,821,198	10,089,406	10,221,615	8,992,880	3,419,739	32,723,639
2042	8,995,000	11,422,405	8,862,265	3,083,069	32,362,739	9,485,588	9,987,165	8,840,167	3,257,227	31,570,146
2043	8,165,148	11,228,609	8,713,123	2,922,141	31,029,021	8,917,158	9,772,023	8,689,099	3,098,780	30,477,059

Table D-26: NYSEG Delayed Achievement Scenarios Gas Throughput by Customer Segment (Mcf)

	NYSEG Delayed-Full					NYSEG Delayed-Hybrid				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655
2025	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495
2026	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101
2027	21,031,523	14,500,932	11,226,445	5,547,264	52,306,165	20,960,907	14,484,008	11,226,724	5,550,871	52,222,509
2028	20,771,833	14,445,538	11,087,134	5,485,616	51,790,122	20,560,994	14,395,060	11,087,969	5,496,453	51,540,476
2029	20,466,450	14,374,423	10,945,917	5,396,755	51,183,545	20,047,721	14,274,497	10,947,588	5,418,481	50,688,287
2030	20,114,752	14,277,238	10,802,188	5,294,760	50,488,939	19,423,269	14,113,125	10,804,973	5,331,095	49,672,462
2031	19,717,361	14,154,920	10,657,479	5,181,986	49,711,747	18,691,820	13,913,428	10,661,656	5,236,730	48,503,634
2032	19,274,913	14,010,649	10,511,255	5,060,558	48,857,375	17,962,946	13,712,985	10,517,103	5,137,609	47,330,643
2033	18,788,472	13,853,928	10,365,829	4,927,037	47,935,265	17,236,499	13,521,012	10,373,625	5,030,410	46,161,547
2034	18,259,540	13,677,524	10,219,655	4,783,560	46,940,279	16,512,721	13,329,966	10,229,679	4,917,399	44,989,766
2035	17,688,067	13,479,833	10,073,609	4,632,193	45,873,702	15,790,264	13,137,907	10,086,139	4,800,780	43,815,089
2036	17,077,663	13,260,602	9,927,574	4,469,560	44,735,399	15,071,407	12,944,217	9,942,889	4,677,326	42,635,839
2037	16,425,549	13,022,974	9,781,793	4,297,752	43,528,068	14,350,984	12,807,864	9,800,171	4,549,277	41,508,296
2038	15,730,370	12,769,703	9,637,152	4,135,462	42,272,686	13,640,676	12,724,273	9,658,871	4,474,931	40,498,751
2039	15,003,323	12,626,576	9,492,950	4,019,435	41,142,284	13,019,571	12,641,060	9,518,290	4,397,488	39,576,408
2040	14,293,173	12,477,581	9,348,877	3,899,098	40,018,729	12,455,484	12,559,395	9,378,115	4,318,703	38,711,697
2041	13,657,575	12,328,992	9,206,003	3,775,148	38,967,718	11,971,545	12,478,137	9,239,139	4,238,623	37,927,444
2042	13,022,630	12,180,591	9,063,557	3,650,292	37,917,069	11,523,918	12,397,066	9,100,591	4,157,381	37,178,956
2043	12,387,623	12,032,286	8,921,559	3,526,740	36,868,208	11,109,569	12,317,711	8,962,526	4,077,072	36,466,878

Table D-27: NYSEG CRA 1 and 2 Gas Throughput by Customer Segment (Mcf)

	NYSEG CRA 1					NYSEG CRA 2				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655
2025	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495
2026	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101
2027	20,973,711	14,473,219	11,209,525	5,525,350	52,181,805	20,986,146	14,477,806	11,209,678	5,528,319	52,201,950
2028	20,617,642	14,388,093	11,053,243	5,439,839	51,498,816	20,654,974	14,401,799	11,053,703	5,448,707	51,559,183
2029	20,177,972	14,285,252	10,895,005	5,325,196	50,683,425	20,252,603	14,312,542	10,895,925	5,342,840	50,803,910
2030	19,654,934	14,154,385	10,734,210	5,195,553	49,739,082	19,779,116	14,199,641	10,735,744	5,224,781	49,939,282
2031	19,050,180	13,996,479	10,572,390	5,053,334	48,672,383	19,235,928	14,063,992	10,574,691	5,096,876	48,971,487
2032	18,365,541	13,814,782	10,409,012	4,900,751	47,490,086	18,624,546	13,908,738	10,412,233	4,961,242	47,906,760
2033	17,603,424	13,618,874	10,246,387	4,734,469	46,203,153	17,946,969	13,743,342	10,250,682	4,814,442	46,755,434
2034	16,766,795	13,401,614	10,082,970	4,556,742	44,808,122	17,205,682	13,560,537	10,088,493	4,658,615	45,513,326
2035	15,857,169	13,161,501	9,919,636	4,369,769	43,308,076	16,401,649	13,358,684	9,926,540	4,495,834	44,182,707
2036	14,879,809	12,898,394	9,756,269	4,170,319	41,704,792	15,539,513	13,137,499	9,764,707	4,322,737	42,764,455
2037	13,833,008	12,615,562	9,593,110	3,960,635	40,002,315	14,616,889	12,900,093	9,603,234	4,141,427	41,261,645
2038	12,712,359	12,315,890	9,431,041	3,795,766	38,255,057	13,628,642	12,649,194	9,443,007	3,992,528	39,713,370
2039	11,581,345	12,148,083	9,269,363	3,657,037	36,655,829	12,625,022	12,493,521	9,283,323	3,861,570	38,263,436
2040	10,583,377	11,974,486	9,107,763	3,513,785	35,179,412	11,702,732	12,332,923	9,123,871	3,726,642	36,886,168
2041	9,544,467	11,793,956	8,946,617	3,360,969	33,646,008	10,744,814	12,166,246	8,965,025	3,583,975	35,460,061
2042	8,572,244	11,606,274	8,785,153	3,202,259	32,165,931	9,824,125	11,993,261	8,806,016	3,435,883	34,059,284
2043	7,657,072	11,412,119	8,623,490	3,040,533	30,733,214	8,933,393	11,814,336	8,646,905	3,285,212	32,679,846

Table D-28: NYSEG CRA 3 and 4 Gas Throughput by Customer Segment (Mcf)

	NYSEG CRA 3					NYSEG CRA 4				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655
2025	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495
2026	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101
2027	20,969,285	14,471,671	11,209,440	5,524,348	52,174,744	20,978,555	14,471,671	11,209,440	5,524,348	52,184,014
2028	20,604,426	14,383,449	11,052,988	5,436,832	51,477,695	20,632,097	14,383,449	11,052,988	5,436,832	51,505,366
2029	20,151,663	14,275,964	10,894,496	5,319,184	50,641,307	20,206,666	14,275,964	10,894,496	5,319,184	50,696,311
2030	19,611,290	14,138,905	10,733,362	5,185,533	49,669,090	19,702,301	14,138,905	10,733,362	5,185,533	49,760,100
2031	18,985,024	13,973,259	10,571,119	5,038,304	48,567,704	19,120,402	13,973,259	10,571,119	5,038,304	48,703,083
2032	18,274,757	13,782,274	10,407,232	4,879,708	47,343,971	18,462,503	13,782,274	10,407,232	4,879,708	47,531,717
2033	17,482,960	13,575,530	10,244,013	4,706,411	46,008,914	17,730,670	13,575,530	10,244,013	4,706,411	46,256,624
2034	16,612,663	13,345,886	10,079,918	4,520,668	44,559,135	16,927,491	13,345,886	10,079,918	4,520,668	44,873,964
2035	15,665,442	13,091,841	9,915,822	4,324,677	42,997,780	16,054,077	13,091,841	9,915,822	4,324,677	43,386,416
2036	14,646,622	12,813,253	9,751,607	4,115,206	41,326,688	15,115,261	12,813,253	9,751,607	4,115,206	41,795,327
2037	13,554,559	12,513,393	9,587,515	3,894,500	39,549,967	14,109,056	12,513,393	9,587,515	3,894,500	40,104,464
2038	12,384,910	12,195,145	9,424,429	3,717,606	37,722,090	13,031,805	12,195,145	9,424,429	3,717,606	38,368,984
2039	11,201,221	12,007,214	9,261,649	3,565,851	36,035,934	11,905,446	12,007,214	9,261,649	3,565,851	36,740,159
2040	10,146,966	11,811,944	9,098,862	3,408,570	34,466,343	10,927,507	11,811,944	9,098,862	3,408,570	35,246,884
2041	9,048,220	11,608,194	8,936,444	3,239,963	32,832,821	9,906,679	11,608,194	8,936,444	3,239,963	33,691,280
2042	8,012,679	11,395,744	8,773,624	3,064,500	31,246,547	8,877,788	11,395,744	8,773,624	3,064,500	32,111,655
2043	7,030,770	11,175,836	8,610,551	2,885,486	29,702,643	7,956,506	11,175,836	8,610,551	2,885,486	30,628,380

Table D-29: NYSEG CRA 5 and 6 Gas Throughput by Customer Segment (Mcf)

	NYSEG CRA 5					NYSEG CRA 6				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655
2025	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495
2026	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101
2027	20,993,982	14,471,671	11,209,440	5,524,348	52,199,442	20,421,227	14,192,739	11,198,611	5,421,570	51,234,147
2028	20,678,120	14,383,449	11,052,988	5,436,832	51,551,390	19,274,846	13,701,425	11,026,332	5,188,589	49,191,192
2029	20,298,136	14,275,964	10,894,496	5,319,184	50,787,780	17,822,579	13,072,609	10,847,015	4,885,032	46,627,234
2030	19,853,683	14,138,905	10,733,362	5,185,533	49,911,483	16,402,440	12,447,235	10,665,889	4,583,690	44,099,254
2031	19,345,724	13,973,259	10,571,119	5,038,304	48,928,404	15,012,899	11,825,737	10,484,486	4,286,654	41,609,776
2032	18,775,293	13,782,274	10,407,232	4,879,708	47,844,507	13,652,442	11,210,769	10,302,273	3,995,762	39,161,246
2033	18,143,912	13,575,530	10,244,013	4,706,411	46,669,866	12,319,977	10,611,290	10,121,561	3,707,261	36,760,089
2034	17,453,582	13,345,886	10,079,918	4,520,668	45,400,055	11,014,839	10,019,508	9,940,806	3,422,953	34,398,107
2035	16,704,791	13,091,841	9,915,822	4,324,677	44,037,130	9,734,811	9,433,239	9,760,883	3,144,547	32,073,480
2036	15,901,716	12,813,253	9,751,607	4,115,206	42,581,782	8,481,352	8,851,632	9,581,674	2,868,291	29,782,949
2037	15,041,685	12,513,393	9,587,515	3,894,500	41,037,092	7,248,078	8,534,164	9,403,420	2,695,671	27,881,333
2038	14,120,336	12,195,145	9,424,429	3,717,606	39,457,515	6,197,120	8,216,985	9,227,006	2,525,013	26,166,125
2039	13,158,887	12,007,214	9,261,649	3,565,851	37,993,600	5,278,164	7,900,184	9,051,731	2,352,806	24,582,885
2040	12,296,783	11,811,944	9,098,862	3,408,570	36,616,159	4,505,904	7,584,932	8,877,282	2,180,803	23,148,922
2041	11,399,090	11,608,194	8,936,444	3,239,963	35,183,691	3,801,926	7,270,086	8,704,035	2,002,305	21,778,353
2042	10,491,598	11,395,744	8,773,624	3,064,500	33,725,465	3,160,046	6,955,427	8,531,219	1,823,223	20,469,915
2043	9,655,222	11,175,836	8,610,551	2,885,486	32,327,095	2,505,557	6,710,895	8,365,677	1,671,302	19,253,431

Table D-30: NYSEG Long Term Plan Gas Throughput by Customer Segment (Mcf)

NYSEG LTP	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	21,594,552	14,470,515	11,544,439	5,620,148	53,229,655
2025	21,389,150	14,533,495	11,472,848	5,611,001	53,006,495
2026	21,243,908	14,546,903	11,362,089	5,596,201	52,749,101
2027	21,008,036	14,485,669	11,210,024	5,533,409	52,237,138
2028	20,720,039	14,425,427	11,055,457	5,463,998	51,664,920
2029	20,381,467	14,359,861	10,900,151	5,373,451	51,014,930
2030	19,991,686	14,278,593	10,743,505	5,275,828	50,289,612
2031	19,551,347	14,182,520	10,587,051	5,173,455	49,494,372
2032	19,061,153	14,074,774	10,430,254	5,068,421	48,634,601
2033	18,522,270	13,964,795	10,275,428	4,957,242	47,719,735
2034	17,936,331	13,845,281	10,121,027	4,842,005	46,744,645
2035	17,303,441	13,714,548	9,967,925	4,724,716	45,710,630
2036	16,627,375	13,572,250	9,816,007	4,601,933	44,617,566
2037	15,904,886	13,421,432	9,665,513	4,475,672	43,467,503
2038	15,129,982	13,264,738	9,517,326	4,372,459	42,284,505
2039	14,344,259	13,171,349	9,370,747	4,281,733	41,168,087
2040	13,616,036	13,077,894	9,225,462	4,190,177	40,109,569
2041	12,888,888	12,984,844	9,082,097	4,098,403	39,054,232
2042	12,207,226	12,891,983	8,939,880	4,005,347	38,044,436
2043	11,559,614	12,797,873	8,798,733	3,912,731	37,068,952

H. Annual Gas Throughput by Fuel Type

Table D-31: NYSEG CLCPA Scenarios Gas Annual Usage by Fuel Type

	NYSEG CLCPA Full Annual Gas Usage by Fuel Type (Mcf)				NYSEG CLCPA Hybrid Annual Gas Usage by Fuel Type (Mcf)			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	53,229,655	-	-	-	53,229,655	-	-	-
2025	53,006,495	-	-	-	53,006,495	-	-	-
2026	52,270,162	434,144	44,795	-	52,270,162	434,144	44,795	-
2027	51,580,393	514,031	89,590	-	51,475,632	514,031	89,590	-
2028	50,535,563	633,862	134,385	202,274	50,224,047	633,862	134,385	201,046
2029	45,611,703	2,724,810	1,963,747	398,204	44,995,869	2,724,810	1,963,747	393,329
2030	44,234,749	2,904,955	2,038,402	586,302	43,222,985	2,904,955	2,038,402	574,240
2031	42,748,704	3,085,099	2,111,281	765,177	41,256,658	3,085,099	2,111,281	741,365
2032	41,187,624	3,265,244	2,156,076	933,541	39,320,355	3,265,244	2,156,076	896,141
2033	39,535,134	3,445,389	2,200,871	1,090,305	37,393,830	3,445,389	2,200,871	1,038,632
2034	37,788,713	3,625,534	2,245,666	1,234,151	35,470,579	3,625,534	2,245,666	1,168,623
2035	35,952,449	3,805,678	2,290,461	1,363,670	33,550,614	3,805,678	2,290,461	1,285,762
2036	34,055,296	3,985,823	2,307,263	1,477,806	31,658,739	3,985,823	2,307,263	1,389,997
2037	32,093,679	4,165,968	2,307,263	1,575,593	29,917,690	4,165,968	2,307,263	1,486,645
2038	30,132,120	4,315,956	2,307,263	1,658,138	28,295,543	4,315,956	2,307,263	1,575,218
2039	28,318,043	4,435,787	2,307,263	1,732,173	26,769,240	4,435,787	2,307,263	1,655,574
2040	26,644,693	4,555,618	2,307,263	1,800,307	25,321,202	4,555,618	2,307,263	1,729,103
2041	25,021,785	4,635,506	2,307,263	1,856,644	23,984,571	4,635,506	2,307,263	1,796,299
2042	23,517,062	4,635,506	2,307,263	1,902,908	22,771,159	4,635,506	2,307,263	1,856,218
2043	22,140,755	4,635,506	2,307,263	1,945,497	21,623,476	4,635,506	2,307,263	1,910,814

Table D-32: NYSEG Delayed Achievement Scenarios Natural Gas Annual Usage by Fuel Type

	NYSEG Delayed Full Annual Gas Usage by Fuel Type (Mcf)				NYSEG Delayed Hybrid Annual Gas Usage by Fuel Type (Mcf)			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	53,229,655	-	-	-	53,229,655	-	-	-
2025	53,006,495	-	-	-	53,006,495	-	-	-
2026	52,271,855	432,451	44,795	-	52,271,855	432,451	44,795	-
2027	51,707,621	508,954	89,590	-	51,623,966	508,954	89,590	-
2028	51,032,030	623,707	134,385	-	50,782,384	623,707	134,385	-
2029	47,843,420	2,253,732	1,086,393	-	47,348,162	2,253,732	1,086,393	-
2030	46,794,361	2,390,724	1,145,230	158,624	45,980,449	2,390,724	1,145,230	156,058
2031	45,718,035	2,527,716	1,153,632	312,364	44,517,514	2,527,716	1,153,632	304,772
2032	44,578,543	2,664,708	1,153,632	460,493	43,066,200	2,664,708	1,153,632	446,103
2033	43,377,531	2,801,701	1,153,632	602,402	41,626,103	2,801,701	1,153,632	580,112
2034	42,110,582	2,938,693	1,153,632	737,373	40,190,709	2,938,693	1,153,632	706,732
2035	40,779,784	3,075,685	1,153,632	864,601	38,759,977	3,075,685	1,153,632	825,795
2036	39,385,422	3,212,677	1,153,632	983,668	37,332,036	3,212,677	1,153,632	937,494
2037	37,961,352	3,319,425	1,153,632	1,093,659	35,992,345	3,319,425	1,153,632	1,042,894
2038	36,528,257	3,395,927	1,153,632	1,194,870	34,804,482	3,395,927	1,153,632	1,144,711
2039	35,224,338	3,472,430	1,153,632	1,291,885	33,707,658	3,472,430	1,153,632	1,242,689
2040	33,933,921	3,548,932	1,153,632	1,382,244	32,672,059	3,548,932	1,153,632	1,337,074
2041	32,720,654	3,625,435	1,153,632	1,467,998	31,719,600	3,625,435	1,153,632	1,428,779
2042	31,590,583	3,625,435	1,153,632	1,547,420	30,882,617	3,625,435	1,153,632	1,517,273
2043	30,469,151	3,625,435	1,153,632	1,619,991	30,085,473	3,625,435	1,153,632	1,602,339

Table D-33: NYSEG CRA 1 and 2 Natural Gas Annual Usage by Fuel Type

	NYSEG CRA 1 Annual Gas Usage by Fuel Type (Mcf)				NYSEG CRA 2 Annual Gas Usage by Fuel Type (Mcf)			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	53,229,655	-	-	-	53,229,655	-	-	-
2025	53,006,495	-	-	-	53,006,495	-	-	-
2026	52,749,101	-	-	-	52,749,101	-	-	-
2027	52,181,805	-	-	-	52,201,950	-	-	-
2028	51,498,816	-	-	-	51,559,183	-	-	-
2029	50,683,425	-	-	-	50,803,910	-	-	-
2030	49,739,082	-	-	-	49,939,282	-	-	-
2031	48,672,383	-	-	-	48,971,487	-	-	-
2032	47,490,086	-	-	-	47,906,760	-	-	-
2033	46,203,153	-	-	-	46,755,434	-	-	-
2034	44,808,122	-	-	-	45,513,326	-	-	-
2035	43,308,076	-	-	-	44,182,707	-	-	-
2036	41,704,792	-	-	-	42,764,455	-	-	-
2037	40,002,315	-	-	-	41,261,645	-	-	-
2038	38,255,057	-	-	-	39,713,370	-	-	-
2039	36,655,829	-	-	-	38,263,436	-	-	-
2040	35,179,412	-	-	-	36,886,168	-	-	-
2041	33,646,008	-	-	-	35,460,061	-	-	-
2042	32,165,931	-	-	-	34,059,284	-	-	-
2043	30,733,214	-	-	-	32,679,846	-	-	-

Table D-34: NYSEG CRA 3 and 4 Natural Gas Annual Usage by Fuel Type

	NYSEG CRA 3 Annual Gas Usage by Fuel Type (Mcf)				NYSEG CRA 4 Annual Gas Usage by Fuel Type (Mcf)			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	53,229,655	-	-	-	53,229,655	-	-	-
2025	53,006,495	-	-	-	53,006,495	-	-	-
2026	52,749,101	-	-	-	52,749,101	-	-	-
2027	52,174,744	-	-	-	52,184,014	-	-	-
2028	51,477,695	-	-	-	51,505,366	-	-	-
2029	50,641,307	-	-	-	50,696,311	-	-	-
2030	49,669,090	-	-	-	49,760,100	-	-	-
2031	48,567,704	-	-	-	48,703,083	-	-	-
2032	47,343,971	-	-	-	47,531,717	-	-	-
2033	46,008,914	-	-	-	46,256,624	-	-	-
2034	44,559,135	-	-	-	44,873,964	-	-	-
2035	42,997,780	-	-	-	43,386,416	-	-	-
2036	41,326,688	-	-	-	41,795,327	-	-	-
2037	39,549,967	-	-	-	40,104,464	-	-	-
2038	37,722,090	-	-	-	38,368,984	-	-	-
2039	36,035,934	-	-	-	36,740,159	-	-	-
2040	34,466,343	-	-	-	35,246,884	-	-	-
2041	32,832,821	-	-	-	33,691,280	-	-	-
2042	31,246,547	-	-	-	32,111,655	-	-	-
2043	29,702,643	-	-	-	30,628,380	-	-	-

Table D-35: NYSEG CRA 5 and 6 Natural Gas Annual Usage by Fuel Type

	NYSEG CRA 5 Annual Gas Usage by Fuel Type (Mcf)				NYSEG CRA 6 Annual Gas Usage by Fuel Type (Mcf)			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	53,229,655	-	-	-	53,229,655	-	-	-
2025	53,006,495	-	-	-	53,006,495	-	-	-
2026	52,749,101	-	-	-	52,749,101	-	-	-
2027	52,199,442	-	-	-	51,234,147	-	-	-
2028	51,551,390	-	-	-	49,191,192	-	-	-
2029	50,787,780	-	-	-	46,627,234	-	-	-
2030	49,911,483	-	-	-	44,099,254	-	-	-
2031	48,928,404	-	-	-	41,609,776	-	-	-
2032	47,844,507	-	-	-	39,161,246	-	-	-
2033	46,669,866	-	-	-	36,760,089	-	-	-
2034	45,400,055	-	-	-	34,398,107	-	-	-
2035	44,037,130	-	-	-	32,073,480	-	-	-
2036	42,581,782	-	-	-	29,782,949	-	-	-
2037	41,037,092	-	-	-	27,881,333	-	-	-
2038	39,457,515	-	-	-	26,166,125	-	-	-
2039	37,993,600	-	-	-	24,582,885	-	-	-
2040	36,616,159	-	-	-	23,148,922	-	-	-
2041	35,183,691	-	-	-	21,778,353	-	-	-
2042	33,725,465	-	-	-	20,469,915	-	-	-
2043	32,327,095	-	-	-	19,253,431	-	-	-

Table D-36: NYSEG Long Term Plan Natural Gas Annual Usage by Fuel Type

	NYSEG LTP Annual Gas Usage by Fuel Type (Mcf)			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	53,229,655	-	-	-
2025	53,006,495	-	-	-
2026	52,270,162	434,144	44,795	-
2027	51,633,517	514,031	89,590	-
2028	50,693,775	633,862	134,385	202,898
2029	45,925,683	2,724,810	1,963,747	400,690
2030	44,753,766	2,904,955	2,038,402	592,490
2031	43,520,498	3,085,099	2,111,281	777,494
2032	42,258,296	3,265,244	2,156,076	954,985
2033	40,949,050	3,445,389	2,200,871	1,124,425
2034	39,588,422	3,625,534	2,245,666	1,285,024
2035	38,178,612	3,805,678	2,290,461	1,435,879
2036	36,747,750	3,985,823	2,307,263	1,576,730
2037	35,287,808	4,165,968	2,307,263	1,706,464
2038	33,835,279	4,315,956	2,307,263	1,826,006
2039	32,485,994	4,435,787	2,307,263	1,939,043
2040	31,200,098	4,555,618	2,307,263	2,046,589
2041	29,965,876	4,635,506	2,307,263	2,145,587
2042	28,862,308	4,635,506	2,307,263	2,239,358
2043	27,799,296	4,635,506	2,307,263	2,326,887

I. Annual Customer Counts by Sector

Table D-37: NYSEG CLCPA Scenarios Annual Customer Counts 2024-2043

	NYSEG CLCPA Full Annual Customer Counts					NYSEG CLCPA Hybrid Annual Customer Counts				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025	243,918	26,831	411	2,865	274,025
2027	243,150	26,749	394	2,865	273,158	243,918	26,800	394	2,874	273,986
2028	241,615	26,617	376	2,856	271,464	243,918	26,769	376	2,883	273,946
2029	239,320	26,435	358	2,829	268,942	243,918	26,739	358	2,883	273,898
2030	236,273	26,201	340	2,794	265,608	243,918	26,708	340	2,883	273,849
2031	232,486	25,918	323	2,749	261,477	243,918	26,677	323	2,883	273,801
2032	227,974	25,586	305	2,697	256,562	243,918	26,646	305	2,883	273,752
2033	222,756	25,204	287	2,635	250,882	243,918	26,615	287	2,883	273,703
2034	216,851	24,775	269	2,566	244,461	243,918	26,584	269	2,883	273,654
2035	210,259	24,300	251	2,489	237,298	243,894	26,554	251	2,883	273,582
2036	203,029	23,777	234	2,404	229,444	243,870	26,523	234	2,883	273,510
2037	195,189	23,209	216	2,312	220,925	243,846	26,492	216	2,883	273,437
2038	186,768	22,597	198	2,246	211,809	243,822	26,461	198	2,883	273,364
2039	177,797	22,292	180	2,198	202,467	243,798	26,430	180	2,883	273,291
2040	171,529	21,966	162	2,146	195,804	243,774	26,399	162	2,883	273,218
2041	165,260	21,642	145	2,090	189,137	243,750	26,369	145	2,883	273,147
2042	159,436	21,316	127	2,034	182,914	243,726	26,338	127	2,883	273,074
2043	155,650	20,997	109	1,980	178,736	243,702	26,307	109	2,883	273,001

Table D-38: NYSEG Delayed Achievement Scenarios Annual Customer Counts 2024-2043

	NYSEG Delayed Full Annual Customer Counts					NYSEG Delayed Hybrid Annual Customer Counts				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025	243,918	26,831	411	2,865	274,025
2027	243,461	26,758	394	2,867	273,480	243,918	26,800	394	2,874	273,986
2028	242,548	26,642	376	2,862	272,427	243,918	26,769	376	2,883	273,946
2029	241,180	26,485	358	2,841	270,864	243,918	26,739	358	2,883	273,898
2030	239,361	26,286	340	2,813	268,799	243,918	26,708	340	2,883	273,849
2031	237,095	26,044	323	2,778	266,240	243,918	26,677	323	2,883	273,801
2032	234,388	25,761	305	2,736	263,190	243,918	26,646	305	2,883	273,752
2033	231,245	25,438	287	2,688	259,657	243,918	26,615	287	2,883	273,703
2034	227,675	25,074	269	2,633	255,650	243,918	26,584	269	2,883	273,654
2035	223,661	24,671	251	2,571	251,155	243,894	26,554	251	2,883	273,582
2036	219,263	24,228	234	2,504	246,228	243,894	26,523	234	2,883	273,534
2037	214,441	23,747	216	2,430	240,833	243,870	26,492	216	2,883	273,461
2038	209,254	23,227	198	2,361	235,041	243,870	26,461	198	2,883	273,412
2039	203,668	22,968	180	2,324	229,140	243,846	26,430	180	2,883	273,339
2040	198,539	22,691	162	2,283	223,675	243,846	26,399	162	2,883	273,290
2041	194,664	22,415	145	2,238	219,463	243,822	26,369	145	2,883	273,219
2042	190,813	22,138	127	2,194	215,273	243,822	26,338	127	2,883	273,170
2043	186,977	21,866	109	2,151	211,103	243,798	26,307	109	2,883	273,097

Table D-39: NYSEG CRA 1 and 2 Annual Customer Counts 2024-2043

	NYSEG CRA1 Annual Customer Counts					NYSEG CRA2 Annual Customer Counts				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025	243,918	26,831	411	2,865	274,025
2027	243,260	26,762	394	2,867	273,283	243,918	26,800	394	2,874	273,986
2028	241,946	26,655	376	2,863	271,840	243,918	26,769	376	2,883	273,946
2029	239,983	26,511	358	2,843	269,696	243,918	26,739	358	2,883	273,898
2030	237,384	26,329	340	2,816	266,869	243,918	26,708	340	2,883	273,849
2031	234,162	26,110	323	2,783	263,379	243,918	26,677	323	2,883	273,801
2032	230,338	25,855	305	2,744	259,242	243,918	26,646	305	2,883	273,752
2033	225,935	25,563	287	2,699	254,484	243,918	26,615	287	2,883	273,703
2034	220,977	25,237	269	2,648	249,131	243,918	26,584	269	2,883	273,654
2035	215,473	24,877	251	2,591	243,191	243,894	26,554	251	2,883	273,582
2036	209,500	24,482	234	2,528	236,744	243,894	26,523	234	2,883	273,534
2037	203,047	24,055	216	2,461	229,778	243,870	26,492	216	2,883	273,461
2038	196,197	23,597	198	2,423	222,414	243,870	26,461	198	2,883	273,412
2039	189,567	23,459	180	2,404	215,610	243,846	26,430	180	2,883	273,339
2040	185,544	23,313	162	2,384	211,403	243,846	26,399	162	2,883	273,290
2041	181,210	23,159	145	2,359	206,873	243,822	26,369	145	2,883	273,219
2042	178,345	22,997	127	2,333	203,802	243,822	26,338	127	2,883	273,170
2043	176,775	22,829	109	2,306	202,019	243,798	26,307	109	2,883	273,097

Table D-40: NYSEG CRA 3 and 4 Annual Customer Counts 2024-2043

	NYSEG CRA3 Annual Customer Counts					NYSEG CRA4 Annual Customer Counts				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025	243,918	26,831	411	2,865	274,025
2027	243,046	26,749	394	2,865	273,055	243,150	26,749	394	2,865	273,158
2028	241,306	26,617	376	2,856	271,155	241,615	26,617	376	2,856	271,464
2029	238,704	26,435	358	2,829	268,325	239,320	26,435	358	2,829	268,942
2030	235,251	26,201	340	2,794	264,586	236,273	26,201	340	2,794	265,608
2031	230,963	25,918	323	2,749	259,954	232,486	25,918	323	2,749	261,477
2032	225,859	25,586	305	2,697	254,447	227,974	25,586	305	2,697	256,562
2033	219,963	25,204	287	2,635	248,090	222,756	25,204	287	2,635	250,882
2034	213,300	24,775	269	2,566	240,910	216,851	24,775	269	2,566	244,461
2035	205,875	24,300	251	2,489	232,915	210,259	24,300	251	2,489	237,298
2036	197,770	23,777	234	2,404	224,185	203,053	23,777	234	2,404	229,468
2037	188,970	23,209	216	2,312	214,707	195,213	23,209	216	2,312	220,949
2038	179,561	22,597	198	2,246	204,602	186,816	22,597	198	2,246	211,857
2039	170,159	22,292	180	2,198	194,830	177,845	22,292	180	2,198	202,515
2040	163,150	21,966	162	2,146	187,425	171,601	21,966	162	2,146	195,876
2041	155,617	21,621	145	2,086	179,469	164,886	21,621	145	2,086	188,738
2042	149,340	21,253	127	2,022	172,742	158,258	21,253	127	2,022	181,660
2043	144,144	20,872	109	1,956	167,081	153,667	20,872	109	1,956	176,604

Table D-41: NYSEG CRA 5 and 6 Annual Customer Counts 2024-2043

	NYSEG CRA5 Annual Customer Counts					NYSEG CRA6 Annual Customer Counts				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025	243,918	26,831	411	2,865	274,025
2027	243,150	26,749	394	2,865	273,158	236,207	26,089	394	2,799	265,488
2028	241,615	26,617	376	2,856	271,464	224,808	25,002	376	2,696	252,881
2029	239,320	26,435	358	2,829	268,942	209,936	23,585	358	2,549	236,428
2030	236,273	26,201	340	2,794	265,608	195,486	22,196	340	2,405	220,426
2031	232,486	25,918	323	2,749	261,477	181,440	20,833	323	2,264	204,860
2032	227,974	25,586	305	2,697	256,562	167,780	19,497	305	2,126	189,707
2033	222,756	25,204	287	2,635	250,882	154,490	18,185	287	1,990	174,953
2034	216,851	24,775	269	2,566	244,461	141,555	16,899	269	1,857	160,579
2035	210,259	24,300	251	2,489	237,298	128,933	15,637	251	1,727	146,548
2036	203,053	23,777	234	2,404	229,468	116,660	14,396	234	1,599	132,889
2037	195,213	23,209	216	2,312	220,949	104,672	13,787	216	1,537	120,212
2038	186,816	22,597	198	2,246	211,857	96,771	13,177	198	1,476	111,622
2039	177,845	22,292	180	2,198	202,515	91,356	12,567	180	1,415	105,518
2040	171,601	21,966	162	2,146	195,876	86,054	11,957	162	1,354	99,527
2041	164,886	21,621	145	2,086	188,738	80,728	11,349	145	1,287	93,509
2042	158,258	21,253	127	2,022	181,660	75,426	10,739	127	1,221	87,513
2043	153,667	20,872	109	1,956	176,604	70,100	10,299	109	1,172	81,681

Table D-42: NYSEG Long Term Plan Annual Customer Counts 2024-2043

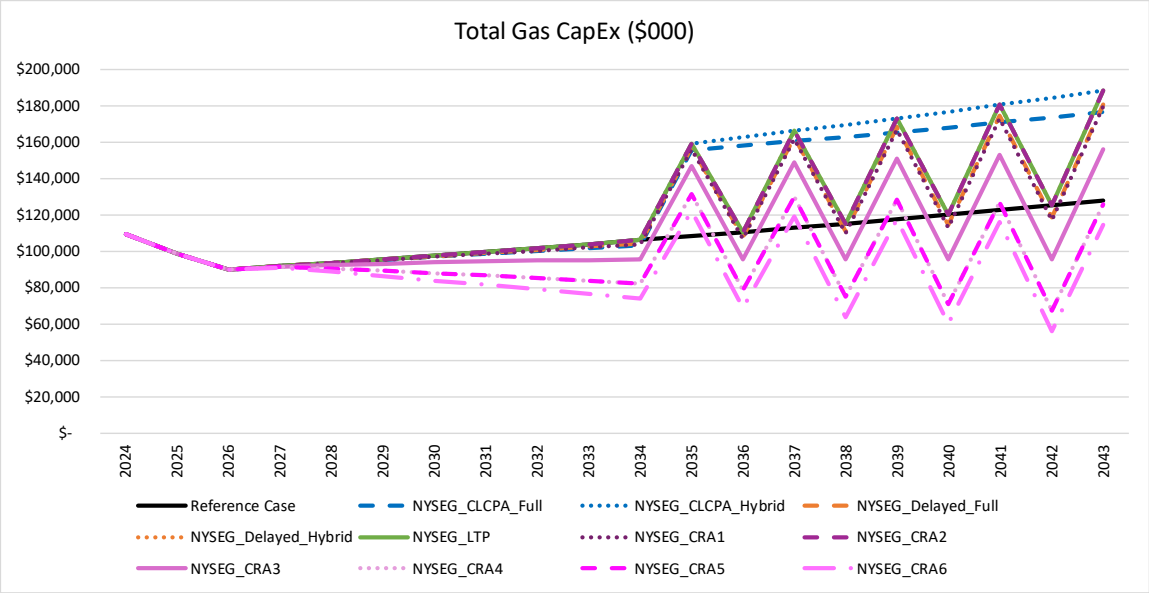
	NYSEG: LTP **Annual Customer Counts**				
	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025
2027	243,918	26,800	394	2,874	273,986
2028	243,918	26,769	376	2,883	273,946
2029	243,918	26,739	358	2,883	273,898
2030	243,918	26,708	340	2,883	273,849
2031	243,918	26,677	323	2,883	273,801
2032	243,918	26,646	305	2,883	273,752
2033	243,918	26,615	287	2,883	273,703
2034	243,918	26,584	269	2,883	273,654
2035	243,894	26,554	251	2,883	273,582
2036	243,894	26,523	234	2,883	273,534
2037	243,870	26,492	216	2,883	273,461
2038	243,870	26,461	198	2,883	273,412
2039	243,846	26,430	180	2,883	273,339
2040	243,846	26,399	162	2,883	273,290
2041	243,822	26,369	145	2,883	273,219
2042	243,822	26,338	127	2,883	273,170
2043	243,798	26,307	109	2,883	273,097

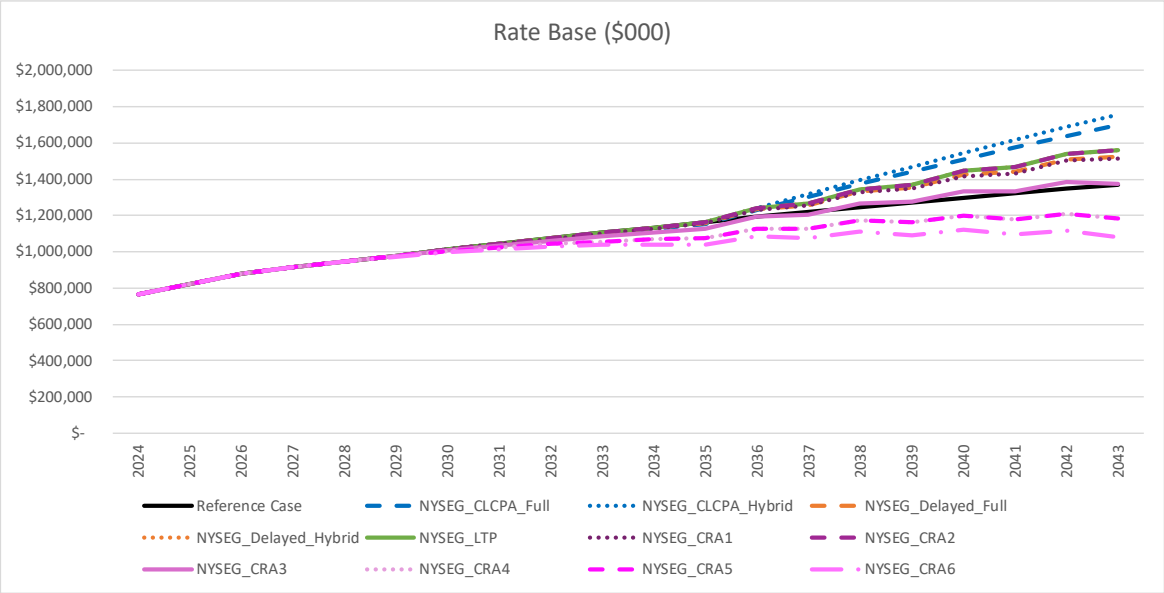
J. Capital Expenditures and Rate Base

Table D-43: NYSEG Capital Expenditures and Rate Base by Scenario

($Million)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case																				
CapEx	$110	$99	$90	$92	$94	$96	$98	$100	$102	$104	$106	$108	$111	$113	$115	$118	$120	$123	$125	$128
Rate Base	$766	$825	$879	$913	$947	$980	$1,012	$1,043	$1,074	$1,105	$1,134	$1,163	$1,192	$1,219	$1,246	$1,272	$1,298	$1,322	$1,346	$1,369
NYSEG_CLCPA_Full																				
CapEx	$110	$99	$90	$92	$94	$95	$97	$99	$100	$102	$103	$156	$158	$161	$163	$166	$168	$171	$174	$177
Rate Base	$766	$825	$879	$913	$947	$979	$1,011	$1,042	$1,072	$1,101	$1,128	$1,155	$1,229	$1,302	$1,374	$1,443	$1,510	$1,575	$1,638	$1,700
NYSEG_CLCPA_Hybrid																				
CapEx	$110	$99	$90	$92	$94	$96	$98	$100	$102	$104	$106	$160	$163	$166	$170	$173	$177	$181	$184	$188
Rate Base	$766	$825	$879	$913	$947	$980	$1,012	$1,043	$1,074	$1,105	$1,134	$1,163	$1,242	$1,319	$1,395	$1,470	$1,543	$1,616	$1,688	$1,758
NYSEG_Delayed_Full																				
CapEx	$110	$99	$90	$92	$94	$95	$97	$99	$101	$103	$104	$157	$108	$163	$111	$168	$115	$175	$119	$181
Rate Base	$766	$825	$879	$913	$947	$979	$1,011	$1,043	$1,073	$1,102	$1,131	$1,158	$1,234	$1,258	$1,332	$1,352	$1,424	$1,440	$1,510	$1,522
NYSEG_Delayed_Hybrid																				
CapEx	$110	$99	$90	$92	$94	$96	$98	$100	$102	$104	$106	$160	$111	$166	$115	$173	$120	$181	$125	$188
Rate Base	$766	$825	$879	$913	$947	$980	$1,012	$1,043	$1,074	$1,105	$1,134	$1,163	$1,242	$1,268	$1,345	$1,369	$1,445	$1,465	$1,541	$1,559
NYSEG_CRA1																				
CapEx	$110	$99	$90	$92	$94	$95	$97	$99	$100	$102	$104	$156	$107	$162	$110	$167	$113	$173	$117	$180
Rate Base	$766	$825	$879	$913	$947	$979	$1,011	$1,042	$1,072	$1,101	$1,129	$1,156	$1,231	$1,254	$1,327	$1,346	$1,417	$1,431	$1,501	$1,511
NYSEG_CRA2																				
CapEx	$110	$99	$90	$92	$94	$96	$98	$100	$102	$104	$106	$160	$111	$166	$115	$173	$120	$181	$125	$188
Rate Base	$766	$825	$879	$913	$947	$980	$1,012	$1,043	$1,074	$1,105	$1,134	$1,163	$1,242	$1,268	$1,345	$1,369	$1,445	$1,465	$1,541	$1,559
NYSEG_CRA3																				
CapEx	$110	$99	$90	$92	$93	$93	$94	$94	$95	$95	$95	$147	$96	$149	$95	$151	$95	$153	$95	$156
Rate Base	$766	$825	$879	$913	$946	$978	$1,008	$1,036	$1,061	$1,085	$1,107	$1,126	$1,193	$1,205	$1,268	$1,274	$1,331	$1,331	$1,384	$1,377
NYSEG_CRA4																				
CapEx	$110	$99	$90	$92	$91	$89	$88	$87	$85	$84	$82	$132	$79	$130	$75	$128	$71	$127	$67	$126
Rate Base	$766	$825	$879	$913	$946	$976	$1,001	$1,024	$1,042	$1,057	$1,068	$1,075	$1,128	$1,126	$1,172	$1,161	$1,199	$1,179	$1,211	$1,181
NYSEG_CRA5																				
CapEx	$110	$99	$90	$92	$91	$89	$88	$87	$85	$84	$82	$132	$79	$130	$75	$128	$71	$127	$67	$126
Rate Base	$766	$825	$879	$913	$946	$976	$1,001	$1,024	$1,042	$1,057	$1,068	$1,075	$1,128	$1,126	$1,172	$1,161	$1,199	$1,179	$1,211	$1,181
NYSEG_CRA6																				
CapEx	$110	$99	$90	$91	$89	$86	$84	$82	$79	$76	$74	$122	$69	$119	$64	$118	$60	$116	$56	$114
Rate Base	$766	$825	$879	$913	$945	$973	$996	$1,015	$1,028	$1,037	$1,042	$1,042	$1,087	$1,076	$1,113	$1,093	$1,123	$1,094	$1,118	$1,081
NYSEG_LTP																				
CapEx	$110	$99	$90	$92	$94	$96	$98	$100	$102	$104	$106	$160	$111	$166	$115	$173	$120	$181	$125	$188
Rate Base	$766	$825	$879	$913	$947	$980	$1,012	$1,043	$1,074	$1,105	$1,134	$1,163	$1,242	$1,268	$1,345	$1,369	$1,445	$1,465	$1,541	$1,559

Figure D-18: NYSEG Capital Expenditures and Rate Base by Scenario





K. BCA Results

Table D-44: NYSEG SCT Results

	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA5	CRA6	LTP
	Discount Rate	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**
Benefit Cost Analysis	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%
Societal Cost Test	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
Benefit: Avoided Gas Commodity Costs	$(719,137)	$(746,943)	$(475,737)	$(512,678)	$(355,026)	$(286,077)	$(383,480)	$(362,513)	$(325,950)	$(852,385)	$(580,325)
Benefit: Avoided Gas System O&M and CapEx Revenue Requirement	$(13,128)	$ (12)	$(8,165)	$ (7)	$(10,873)	$ (7)	$(112,156)	$(282,970)	$(282,970)	$(316,949)	$ (7)
Benefit: Avoided Pipeline and Storage Fixed Costs	$ -	$ -	$ -	$ -	$(13,465)	$(13,465)	$(26,341)	$(72,501)	$(72,501)	$(72,501)	$(28,030)
Benefit: Avoided Emissions, Societal Cost	$(857,468)	$(933,991)	$(575,090)	$(641,988)	$(403,949)	$(349,155)	$(426,232)	$(402,835)	$(367,058)	$(934,408)	$(717,263)
Total Benefit ($)	**$(1,589,733)**	**$(1,680,946)**	**$(1,058,992)**	**$(1,154,673)**	**$(783,313)**	**$(648,704)**	**$(948,209)**	**$(1,120,819)**	**$(1,048,479)**	**$(2,176,243)**	**$(1,325,625)**
Cost: Incremental Electricity Cost	$2,463,543	$1,913,488	$1,633,820	$1,424,387	$2,332,390	$1,524,594	$2,642,503	$2,412,873	$1,692,018	$5,094,034	$791,357
Cost: Weatherization Cost	$349,269	$349,269	$174,634	$174,634	$349,269	$349,269	$349,269	$349,269	$349,269	$400,156	$349,269
Federal &State Incentive	$53,914	$53,914	$26,957	$26,957	$53,914	$53,914	$53,914	$53,914	$53,914	$87,736	$53,914
Utility Incentive	$252,771	$252,771	$126,385	$126,385	$252,771	$252,771	$252,771	$252,771	$252,771	$293,481	$252,771
Participant Customer	$42,584	$42,584	$21,292	$21,292	$42,584	$42,584	$42,584	$42,584	$42,584	$18,939	$42,584
Cost: Net Installed Cost	$3,024,040	$2,888,508	$2,251,069	$702,588	$2,118,273	$1,849,880	$2,150,028	$1,754,066	$1,736,202	$4,995,376	$457,037
Federal & State Incentive	$356,312	$444,493	$221,928	$375,974	$422,787	$419,320	$423,285	$370,021	$367,540	$846,203	$246,461
Utility Incentive	$594,862	$684,995	$437,056	$275,729	$593,956	$523,060	$633,176	$536,884	$533,087	$1,447,860	$166,516
Participant Customer	$2,072,866	$1,759,020	$1,592,086	$50,884	$1,101,531	$907,500	$1,093,567	$847,161	$835,575	$2,701,313	$44,060
Cost: UTENS Revenue Requirement	$83,408	$83,408	$46,403	$46,403	$6,403	$6,403	$46,403	$6,403	$6,403	$6,403	$46,403
Cost: Hydrogen Cost	$190,362	$182,636	$117,046	$113,065	$ -	$ -	$ -	$ -	$ -	$ -	$206,051
Cost: RNG Production Cost	$1,269,864	$1,269,864	$931,564	$931,564	$ -	$ -	$ -	$ -	$ -	$ -	$1,269,864
Cost: Lost Utility Revenue - Base Distribution	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Lost Utility Revenue - Pipeline and Storage Fixed Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Increased Emissions, Societal Cost	$6,659	$8,104	$4,383	$5,943	$6,655	$4,946	$7,257	$6,621	$4,757	$1,601	$2,494
Total Cost ($)	**$7,387,145**	**$6,695,277**	**$5,158,919**	**$3,398,584**	**$4,852,990**	**$3,775,091**	**$5,195,459**	**$4,569,231**	**$3,828,649**	**$10,557,571**	**$3,122,474**
Benefit/Cost Ratio	**0.22**	**0.25**	**0.21**	**0.34**	**0.16**	**0.17**	**0.18**	**0.25**	**0.27**	**0.21**	**0.42**

Table D-45: NYSEG UCT Results

	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA5	CRA6	LTP
	Discount Rate	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**
Benefit Cost Analysis	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%
Utility Cost Test	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
Benefit: Avoided Gas Commodity Costs	$(719,137)	$(746,943)	$(475,737)	$(512,678)	$(355,026)	$(286,077)	$(383,480)	$(362,513)	$(325,950)	$(852,385)	$(580,325)
Benefit: Avoided Gas System O&M and CapEx Revenue Requirement	$(13,128)	$ (12)	$(8,165)	$ (7)	$(10,873)	$ (7)	$(112,156)	$(282,970)	$(282,970)	$(316,949)	$ (7)
Benefit: Avoided Pipeline and Storage Fixed Costs	$ -	$ -	$ -	$ -	$(13,465)	$(13,465)	$(26,341)	$(72,501)	$(72,501)	$(72,501)	$(28,030)
Benefit: Avoided Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Benefit ($)	**$(732,265)**	**$(746,956)**	**$(483,902)**	**$(512,685)**	**$(379,364)**	**$(299,549)**	**$(521,978)**	**$(717,984)**	**$(681,421)**	**$(1,241,835)**	**$(608,362)**
Cost: Incremental Electricity Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Weatherization Cost	$252,771	$252,771	$126,385	$126,385	$252,771	$252,771	$252,771	$252,771	$252,771	$293,481	$252,771
Federal &State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$252,771	$252,771	$126,385	$126,385	$252,771	$252,771	$252,771	$252,771	$252,771	$293,481	$252,771
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Net Installed Cost	$594,862	$684,995	$437,056	$275,729	$593,956	$523,060	$633,176	$536,884	$533,087	$1,447,860	$166,516
Federal & State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$594,862	$684,995	$437,056	$275,729	$593,956	$523,060	$633,176	$536,884	$533,087	$1,447,860	$166,516
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: UTENS Revenue Requirement	$83,408	$83,408	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403
Cost: Hydrogen Cost	$190,362	$182,636	$117,046	$113,065	$ -	$ -	$ -	$ -	$ -	$ -	$206,051
Cost: RNG Production Cost	$1,269,864	$1,269,864	$931,564	$931,564	$ -	$ -	$ -	$ -	$ -	$ -	$1,269,864
Cost: Lost Utility Revenue - Base Distribution	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Lost Utility Revenue - Pipeline and Storage Fixed Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Increased Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Cost ($)	**$2,391,267**	**$2,473,674**	**$1,658,455**	**$1,493,147**	**$893,129**	**$822,233**	**$932,349**	**$836,058**	**$832,261**	**$1,787,744**	**$1,941,605**
Benefit/Cost Ratio	**0.31**	**0.30**	**0.29**	**0.34**	**0.42**	**0.36**	**0.56**	**0.86**	**0.82**	**0.69**	**0.31**

Table D-46: NYSEG RIM Results

	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA5	CRA6	LTP
	Discount Rate	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**
Benefit Cost Analysis	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%	6.58%
Ratepayer Impact Measure	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
Benefit: Avoided Gas Commodity Costs	$(719,137)	$(746,943)	$(475,737)	$(512,678)	$(355,026)	$(286,077)	$(383,480)	$(362,513)	$(325,950)	$(852,385)	$(580,325)
Benefit: Avoided Gas System O&M and CapEx Revenue Requirement	$(13,128)	$(12)	$(8,165)	$(7)	$(10,873)	$(7)	$(112,156)	$(282,970)	$(282,970)	$(316,949)	$(7)
Benefit: Avoided Pipeline and Storage Fixed Costs	$ -	$ -	$ -	$ -	$(13,465)	$(13,465)	$(26,341)	$(72,501)	$(72,501)	$(72,501)	$(28,030)
Benefit: Avoided Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Benefit ($)	**$(732,265)**	**$(746,956)**	**$(483,902)**	**$(512,685)**	**$(379,364)**	**$(299,549)**	**$(521,978)**	**$(717,984)**	**$(681,421)**	**$(1,241,835)**	**$(608,362)**
Cost: Incremental Electricity Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Weatherization Cost	$252,771	$252,771	$126,385	$126,385	$252,771	$252,771	$252,771	$252,771	$252,771	$293,481	$252,771
Federal &State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$252,771	$252,771	$126,385	$126,385	$252,771	$252,771	$252,771	$252,771	$252,771	$293,481	$252,771
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Net Installed Cost	$594,862	$684,995	$437,056	$275,729	$593,956	$523,060	$633,176	$536,884	$533,087	$1,447,860	$166,516
Federal & State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$594,862	$684,995	$437,056	$275,729	$593,956	$523,060	$633,176	$536,884	$533,087	$1,447,860	$166,516
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: UTENS Revenue Requirement	$83,408	$83,408	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403	$46,403
Cost: Hydrogen Cost	$190,362	$182,636	$117,046	$113,065	$ -	$ -	$ -	$ -	$ -	$ -	$206,051
Cost: RNG Production Cost	$1,269,864	$1,269,864	$931,564	$931,564	$ -	$ -	$ -	$ -	$ -	$ -	$1,269,864
Cost: Lost Utility Revenue - Base Distribution	$405,758	$344,312	$260,558	$239,779	$383,903	$250,169	$436,987	$408,427	$374,987	$1,018,313	$181,616
Cost: Lost Utility Revenue - Pipeline and Storage Fixed Costs	$67,811	$82,186	$40,918	$60,976	$70,007	$60,896	$73,576	$68,055	$58,492	$160,061	$44,704
Cost: Increased Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Cost ($)	**$2,864,837**	**$2,900,172**	**$1,959,930**	**$1,793,901**	**$1,347,040**	**$1,133,298**	**$1,442,912**	**$1,312,540**	**$1,265,740**	**$2,966,118**	**$2,167,925**
Benefit/Cost Ratio	**0.26**	**0.26**	**0.25**	**0.29**	**0.28**	**0.26**	**0.36**	**0.55**	**0.54**	**0.42**	**0.28**

II. RG&E Scenario and LTP Modeling Outputs

A. Summary Outputs

Table D-47: RG&E CLCPA Scenarios Model Output

	RGE CLCPA Full			RGE CLCPA Hybrid		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,349	n/a	n/a	4,349	n/a
Weatherization						
Residential	$ 130	(248)	$84	$ 133	(248)	$85
Commercial	$548	(66)	$128	$550	(66)	$129
Municipal	$548	(25)	$49	$550	(25)	$49
Electrification						
Residential	$1,503	(1,110)	$ 4,401	$742	(914)	$ 2,420
Commercial	$ 2,023	(236)	$ 1,362	$ 1,264	(391)	$ 1,785
Municipal	$ 2,151	(57)	$333	$ 1,310	(94)	$430
Industrial						
Process Energy Efficiency	$293	(39)	$46	$294	(39)	$46
Space Heating Electrification	$ 2,312	(10)	$55	$ 1,322	(19)	$75
Carbon Capture	$489	(18)	$29	$489	(18)	$29
Utility Thermal Energy Networks	$ 9,577	(6)	$99	$ 9,469	(6)	$98
RNG						
RNG (within Service Territory)	$216	(370)	$493	$216	(370)	$493
RNG (outside NY)	$263	(194)	$319	$263	(194)	$319
Hydrogen Enriched Natural Gas	$237	(145)	$153	$237	(142)	$143
Scenario Total	$829	1,825		$589	1,822	
Change from Ref Case	n/a	(2,524)	$ 7,550	n/a	(2,527)	$ 6,100
% Change from Ref Case		-58%			-58%	
% Change from 1990 Level		-65%			-65%	

Table D-48: RG&E Delayed Achievement Scenarios Model Output

	RGE Delayed Full			RGE Delayed Hybrid		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,349	n/a	n/a	4,349	n/a
Weatherization						
Residential	$130	(124)	$ 42	$133	(124)	$ 43
Commercial	$548	(33)	$ 64	$550	(33)	$ 64
Municipal	$548	(13)	$ 25	$550	(13)	$ 25
Electrification						
Residential	$1,527	(813)	$ 3,181	$640	(836)	$ 1,946
Commercial	$2,026	(152)	$ 870	$503	(149)	$ 299
Municipal	$2,154	(71)	$ 423	$509	(51)	$ 103
Industrial						
Process Energy Efficiency	$304	(22)	$ 25	$305	(22)	$ 25
Space Heating Electrification	$2,317	(7)	$ 35	$452	(7)	$ 9
Carbon Capture	$489	(9)	$ 14	$489	(9)	$ 14
Utility Thermal Energy Networks	$9,515	(4)	$ 55	$9,411	(4)	$ 55
RNG						
RNG (within Service Territory)	$208	(275)	$ 383	$208	(275)	$ 383
RNG (outside NY)	$257	(97)	$ 174	$257	(97)	$ 174
Hydrogen Enriched Natural Gas	$231	(126)	$ 94	$231	(124)	$ 89
Scenario Total	$862	2,605		$439	2,606	
Change from Ref Case	n/a	(1,744)	$ 5,385	n/a	(1,743)	$ 3,229
% Change from Ref Case		-40%			-40%	
% Change from 1990 Level		-50%			-50%	

Table D-49: RG&E CRA 1 and 2 Model Output

	RGE CRA 1			RGE CRA 2		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,349	n/a	n/a	4,349	n/a
Weatherization						
Residential	$ 126	(248)	$ 81	$ 122	(248)	$ 79
Commercial	$ 545	(66)	$ 127	$ 542	(66)	$ 127
Municipal	$ 545	(25)	$ 49	$ 542	(25)	$ 49
Electrification						
Residential	$ 1,310	(884)	$ 2,967	$ 1,112	(756)	$ 2,125
Commercial	$ 1,515	(168)	$ 722	$ 1,338	(137)	$ 510
Municipal	$ 1,592	(53)	$ 230	$ 1,380	(45)	$ 164
Industrial						
Process Energy Efficiency	$ 313	(49)	$ 55	$ 312	(49)	$ 55
Space Heating Electrification	$ 1,630	(7)	$ 27	$ 1,401	(6)	$ 20
Carbon Capture	$ -	-	$ -	$ -	-	$ -
Utility Thermal Energy Networks	$ 9,504	(4)	$ 55	$ 9,392	(4)	$ 54
RNG						
RNG (within Service Territory)	$ -	-	$ -	$ -	-	$ -
RNG (outside NY)	$ -	-	$ -	$ -	-	$ -
Hydrogen Enriched Natural Gas	$ -	-	$ -	$ -	-	$ -
Scenario Total	$ 1,065	2,846		$ 890	3,014	
Change from Ref Case	n/a	(1,503)	$ 4,314	n/a	(1,335)	$ 3,183
% Change from Ref Case		-35%			-31%	
% Change from 1990 Level		-45%			-47%	

Table D-50: RG&E CRA 3 and 4 Model Output

	RGE CRA 3			RGE CRA 4		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,349	n/a	n/a	4,349	n/a
Weatherization						
Residential	$ 96	(248)	$ 62	$ 49	(248)	$ 32
Commercial	$ 520	(66)	$ 121	$ 481	(66)	$ 112
Municipal	$ 520	(25)	$ 47	$ 481	(25)	$ 43
Electrification						
Residential	$ 1,273	(945)	$ 3,054	$ 1,055	(1,123)	$ 3,098
Commercial	$ 1,493	(185)	$ 770	$ 1,448	(242)	$ 979
Municipal	$ 1,579	(58)	$ 246	$ 1,531	(58)	$ 238
Industrial						
Process Energy Efficiency	$ 307	(49)	$ 54	$ 298	(49)	$ 53
Space Heating Electrification	$ 1,609	(8)	$ 29	$ 1,554	(11)	$ 38
Carbon Capture	$ -	-	$ -	$ -	-	$ -
Utility Thermal Energy Networks	$ 9,467	(4)	$ 55	$ 9,399	(4)	$ 55
RNG						
RNG (within Service Territory)	$ -	-	$ -	$ -	-	$ -
RNG (outside NY)	$ -	-	$ -	$ -	-	$ -
Hydrogen Enriched Natural Gas	$ -	-	$ -	$ -	-	$ -
Scenario Total	$ 1,047	2,761		$ 941	2,524	
Change from Ref Case	n/a	(1,588)	$ 4,438	n/a	(1,825)	$ 4,647
% Change from Ref Case		-37%			-42%	
% Change from 1990 Level		-47%			-52%	

Table D-51: RG&E CRA 5 and 6 Model Output

	RGE CRA 5			RGE CRA		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,349	n/a	n/a	4,349	n/a
Weatherization						
Residential	$ 29	(255)	$ 20	$ 51	(368)	$ 67
Commercial	$ 454	(66)	$ 108	$ 499	(66)	$ 118
Municipal	$ 454	(25)	$ 42	$ 499	(25)	$ 45
Electrification						
Residential	$ 903	(897)	$ 2,155	$ 883	(1,291)	$ 4,490
Commercial	$ 1,332	(185)	$ 706	$ 1,243	(586)	$ 2,951
Municipal	$ 1,408	(58)	$ 225	$ 1,300	(113)	$ 575
Industrial						
Process Energy Efficiency	$ 293	(49)	$ 52	$ 303	(49)	$ 54
Space Heating Electrification	$ 1,489	(8)	$ 28	$ 1,363	(26)	$ 118
Carbon Capture	$ -	-	$ -	$ -	-	$ -
Utility Thermal Energy Networks	$ 9,051	(4)	$ 54	$ 9,247	(4)	$ 55
RNG						
RNG (within Service Territory)	$ -	-	$ -	$ -	-	$ -
RNG (outside NY)	$ -	-	$ -	$ -	-	$ -
Hydrogen Enriched Natural Gas	$ -	-	$ -	$ -	-	$ -
Scenario Total	$ 790	2,801		$ 863	1,822	
Change from Ref Case	n/a	(1,548)	$ 3,390	n/a	(2,527)	$ 8,472
% Change from Ref Case		-36%			-58%	
% Change from 1990 Level		-46%			-65%	

Table D-52: RG&E Long Term Plan Scenario Model Output

	RGE LTP		
	$/MT CO2e	2043 CO2e (000s MT)	Total Cost NPV ($M)
Reference Case	n/a	4,349	n/a
Weatherization			
Residential	$ 118	(248)	$ 76
Commercial	$ 538	(66)	$ 126
Municipal	$ 538	(25)	$ 48
Electrification			
Residential	$ 713	(497)	$ 933
Commercial	$ 560	(63)	$ 112
Municipal	$ 572	(20)	$ 35
Industrial			
Process Energy Efficiency	$ 291	(39)	$ 45
Space Heating Electrification	$ 513	(3)	$ 3
Carbon Capture	$ 489	(18)	$ 29
Utility Thermal Energy Networks	$ 9,397	(4)	$ 55
RNG			
RNG (within Service Territory)	$ 216	(370)	$ 493
RNG (outside NY)	$ 263	(194)	$ 319
Hydrogen Enriched Natural Gas	$ 235	(195)	$ 174
Scenario Total	$ 350	2,608	
Change from Ref Case	n/a	(1,741)	$ 2,447
% Change from Ref Case		-40%	
% Change from 1990 Level		-50%	

B. GHG Emission Reduction by Decarbonization Action.

Figure D-19: RG&E CLCPA Full Electrification CO2e Emissions (Million MT)

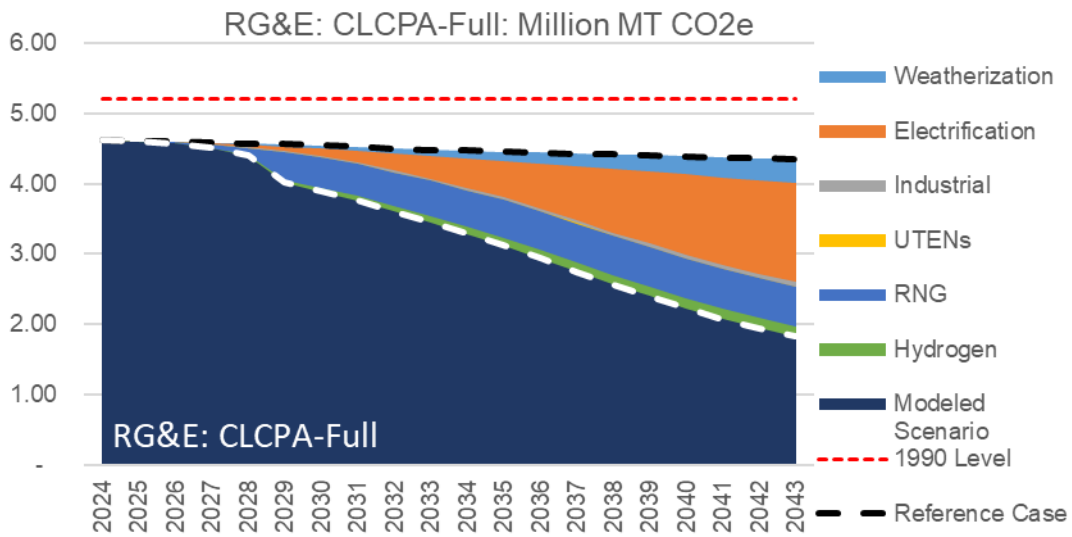


Table D-53: RG&E CLCPA Full Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.01)	(0.03)	(0.07)	(0.11)	(0.17)	(0.24)	(0.32)	(0.41)	(0.52)	(0.64)	(0.77)	(0.91)	(1.02)	(1.14)	(1.24)	(1.32)	(1.40)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.07)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
RNG	-	-	(0.02)	(0.05)	(0.09)	(0.40)	(0.43)	(0.46)	(0.48)	(0.50)	(0.52)	(0.54)	(0.55)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)
Hydrogen	-	-	-	-	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.09)	(0.10)	(0.11)	(0.12)	(0.12)	(0.13)	(0.13)	(0.14)	(0.14)	(0.14)	(0.15)
Modeled Scenario	4.61	4.60	4.57	4.50	4.40	4.02	3.89	3.76	3.61	3.45	3.29	3.12	2.94	2.75	2.56	2.40	2.23	2.08	1.95	1.82
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-20: RG&E CLCPA Hybrid Electrification CO2e Emissions (Million MT)

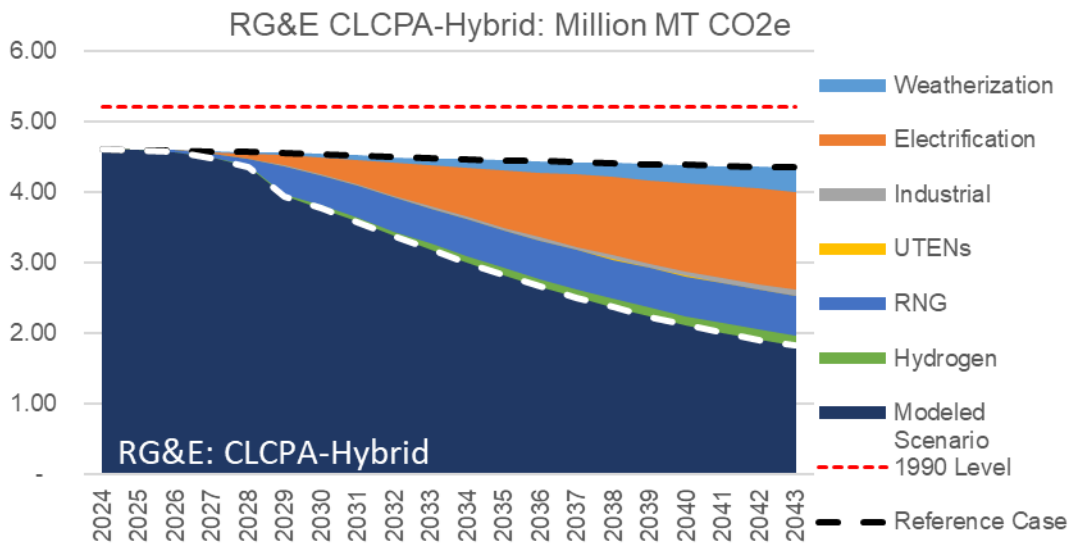


Table D-54: RG&E CLCPA Hybrid Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.02)	(0.07)	(0.14)	(0.24)	(0.35)	(0.47)	(0.59)	(0.70)	(0.82)	(0.92)	(1.02)	(1.11)	(1.19)	(1.26)	(1.32)	(1.36)	(1.40)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)	(0.08)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
RNG	-	-	(0.02)	(0.05)	(0.09)	(0.40)	(0.43)	(0.46)	(0.48)	(0.50)	(0.52)	(0.54)	(0.55)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)
Hydrogen	-	-	-	-	(0.02)	(0.03)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.11)	(0.11)	(0.12)	(0.12)	(0.13)	(0.13)	(0.14)	(0.14)
Modeled Scenario	4.61	4.60	4.57	4.49	4.36	3.94	3.77	3.57	3.38	3.18	3.00	2.82	2.66	2.50	2.36	2.23	2.11	2.01	1.91	1.82
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-21: RG&E Delayed Achievement Full Electrification CO2e Emissions (Million MT)

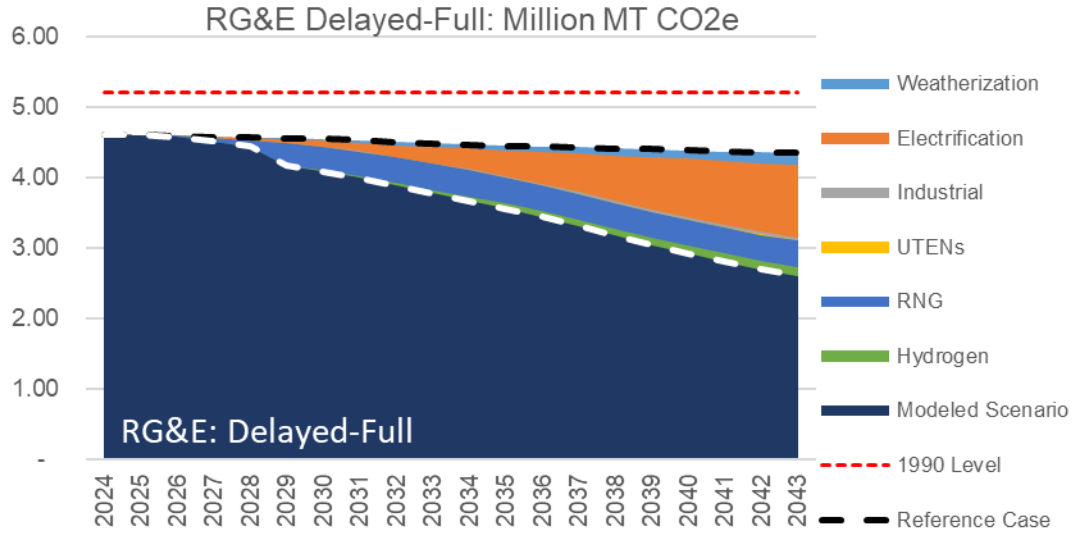


Table D-55: RG&E Delayed Achievement Full Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.11)	(0.13)	(0.14)	(0.15)	(0.17)
Electrification	-	-	-	(0.01)	(0.02)	(0.05)	(0.08)	(0.12)	(0.17)	(0.23)	(0.29)	(0.37)	(0.45)	(0.55)	(0.65)	(0.75)	(0.83)	(0.91)	(0.98)	(1.04)
Industrial	-	-	-	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	(0.02)	(0.05)	(0.10)	(0.32)	(0.34)	(0.35)	(0.36)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)
Hydrogen	-	-	-	-	-	-	(0.01)	(0.03)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.10)	(0.11)	(0.11)	(0.12)	(0.13)
Modeled Scenario	4.61	4.60	4.57	4.51	4.44	4.17	4.09	3.99	3.88	3.77	3.67	3.56	3.44	3.31	3.17	3.04	2.92	2.80	2.70	2.60
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-22: RG&E Delayed Achievement Hybrid Electrification CO2e Emissions (Million MT)

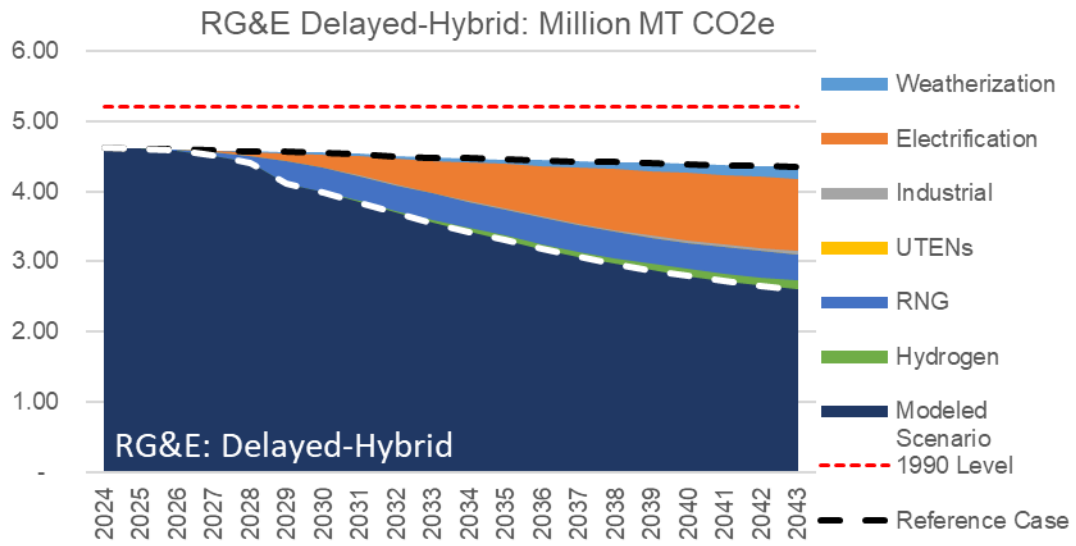


Table D-56: RG&E Delayed Achievement Hybrid Electrification Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.04)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.11)	(0.13)	(0.14)	(0.15)	(0.17)
Electrification	-	-	-	(0.02)	(0.05)	(0.11)	(0.18)	(0.27)	(0.36)	(0.45)	(0.54)	(0.63)	(0.72)	(0.80)	(0.86)	(0.92)	(0.96)	(0.99)	(1.02)	(1.04)
Industrial	-	-	-	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	(0.02)	(0.05)	(0.10)	(0.32)	(0.34)	(0.35)	(0.36)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)
Hydrogen	-	-	-	-	-	-	(0.01)	(0.02)	(0.04)	(0.05)	(0.06)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)	(0.10)	(0.11)	(0.12)	(0.12)
Modeled Scenario	4.61	4.60	4.57	4.50	4.40	4.11	3.98	3.84	3.69	3.55	3.42	3.30	3.18	3.06	2.96	2.87	2.79	2.72	2.66	2.61
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-23: RG&E CRA 1 CO2e Emissions (Million MT)

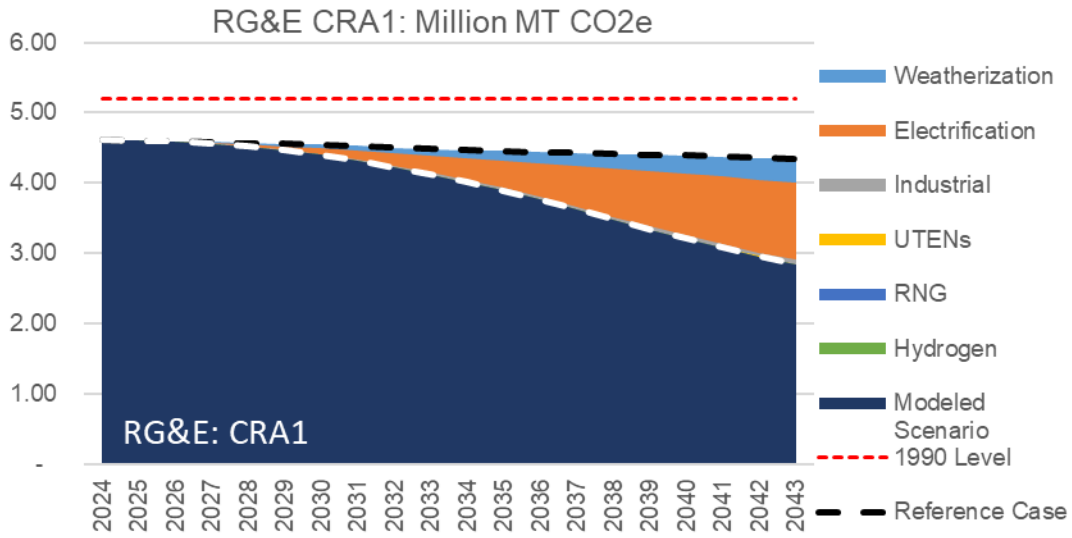


Table D-57: RG&E CRA 1 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.01)	(0.02)	(0.05)	(0.08)	(0.13)	(0.18)	(0.24)	(0.31)	(0.39)	(0.48)	(0.58)	(0.69)	(0.79)	(0.88)	(0.96)	(1.04)	(1.10)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.61	4.60	4.60	4.56	4.52	4.47	4.40	4.32	4.22	4.12	4.01	3.90	3.77	3.63	3.48	3.34	3.21	3.08	2.96	2.85
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-24: RG&E CRA 2 CO2e Emissions (Million MT)

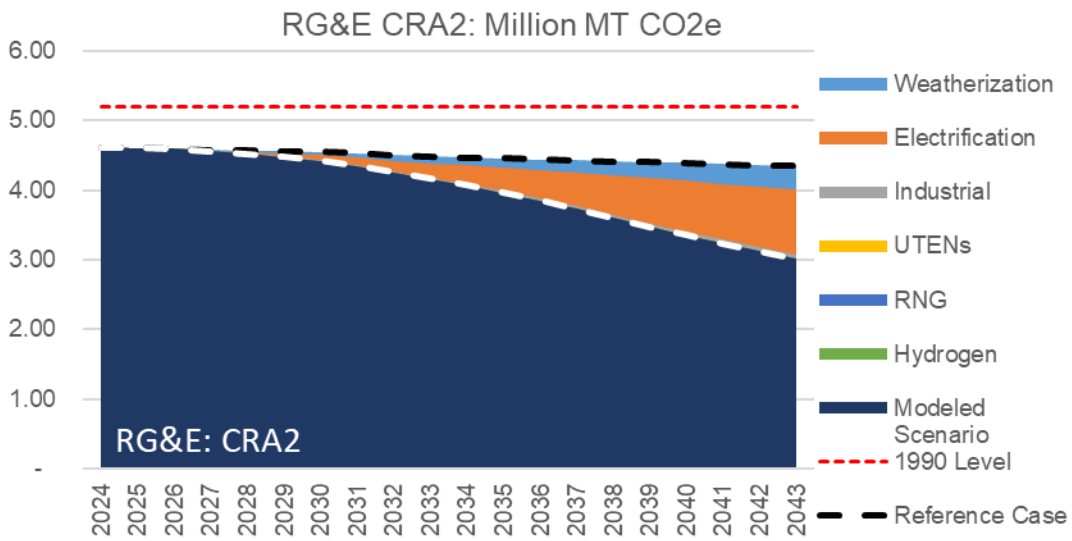


Table D-58: RG&E CRA 2 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.01)	(0.02)	(0.04)	(0.07)	(0.11)	(0.15)	(0.20)	(0.26)	(0.33)	(0.40)	(0.48)	(0.57)	(0.66)	(0.73)	(0.81)	(0.87)	(0.94)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.61	4.60	4.60	4.56	4.52	4.47	4.42	4.34	4.25	4.16	4.07	3.96	3.85	3.73	3.60	3.47	3.36	3.23	3.12	3.01
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-25: RG&E CRA 3 CO2e Emissions (Million MT)

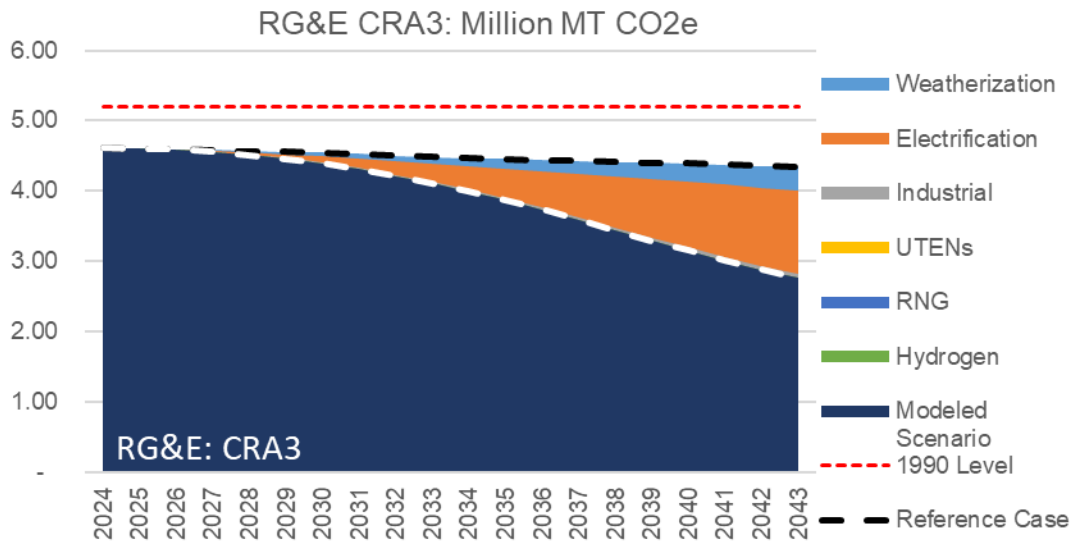


Table D-59: RG&E CRA 3 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.01)	(0.03)	(0.05)	(0.09)	(0.13)	(0.19)	(0.26)	(0.33)	(0.42)	(0.51)	(0.62)	(0.73)	(0.84)	(0.94)	(1.03)	(1.11)	(1.19)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.61	4.60	4.60	4.56	4.52	4.46	4.40	4.32	4.21	4.11	4.00	3.87	3.74	3.59	3.44	3.29	3.15	3.01	2.88	2.76
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-26: RG&E CRA 4 CO2e Emissions (Million MT)

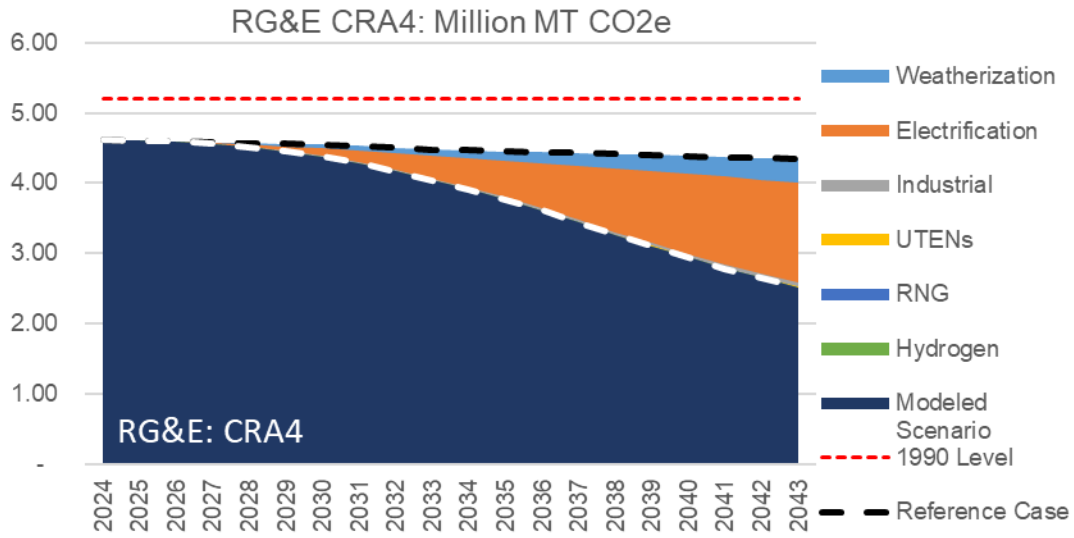


Table D-60: RG&E CRA 4 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.01)	(0.03)	(0.07)	(0.11)	(0.17)	(0.24)	(0.32)	(0.41)	(0.52)	(0.64)	(0.77)	(0.91)	(1.02)	(1.14)	(1.25)	(1.34)	(1.42)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.61	4.60	4.60	4.56	4.51	4.45	4.38	4.28	4.17	4.04	3.91	3.77	3.61	3.44	3.26	3.11	2.95	2.78	2.65	2.52
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-27: RG&E CRA 5 CO2e Emissions (Million MT)

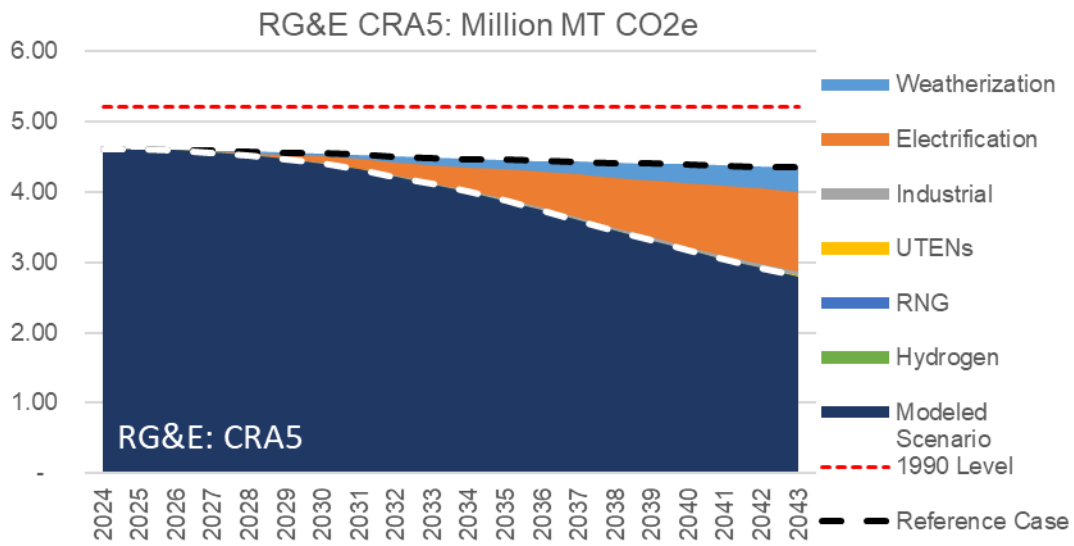


Table D-61: RG&E CRA 5 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.21)	(0.23)	(0.26)	(0.29)	(0.32)	(0.35)
Electrification	-	-	-	(0.01)	(0.03)	(0.05)	(0.09)	(0.13)	(0.19)	(0.25)	(0.33)	(0.41)	(0.51)	(0.61)	(0.72)	(0.82)	(0.91)	(1.00)	(1.07)	(1.14)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.61	4.60	4.60	4.56	4.52	4.46	4.40	4.32	4.21	4.11	4.00	3.87	3.74	3.59	3.44	3.31	3.17	3.03	2.92	2.80
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-28: RG&E CRA 6 CO2e Emissions (Million MT)

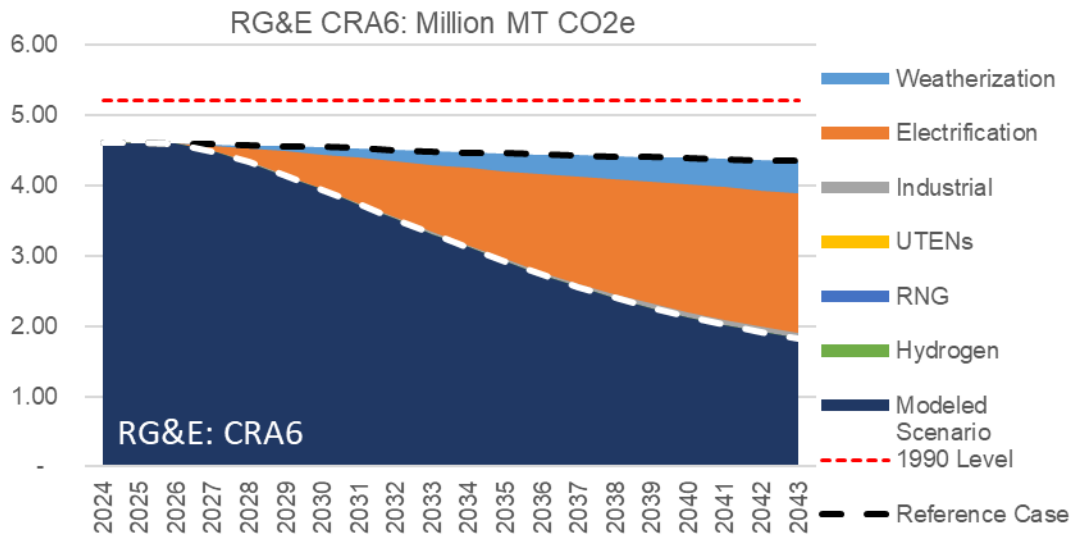


Table D-62: RG&E CRA 6 Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.02)	(0.04)	(0.08)	(0.11)	(0.14)	(0.17)	(0.19)	(0.22)	(0.25)	(0.27)	(0.30)	(0.32)	(0.35)	(0.37)	(0.40)	(0.43)	(0.46)
Electrification	-	-	-	(0.07)	(0.19)	(0.34)	(0.49)	(0.64)	(0.79)	(0.95)	(1.10)	(1.25)	(1.40)	(1.53)	(1.64)	(1.74)	(1.83)	(1.89)	(1.94)	(1.99)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modeled Scenario	4.61	4.60	4.60	4.48	4.33	4.13	3.93	3.73	3.52	3.31	3.11	2.92	2.72	2.55	2.40	2.25	2.13	2.01	1.91	1.82
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

Figure D-29: RG&E Long Term Plan CO2e Emissions (Million MT)

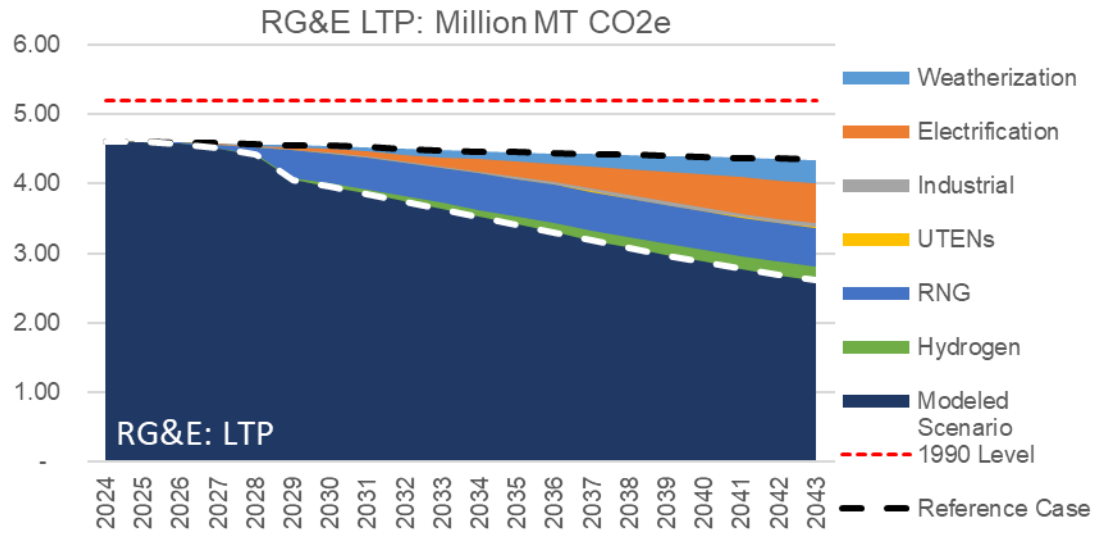


Table D-63: RG&E Long Term Plan Changes in CO2e Emissions vs Reference Case (Million MT)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Weatherization	-	-	-	(0.01)	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.10)	(0.12)	(0.14)	(0.16)	(0.18)	(0.20)	(0.23)	(0.25)	(0.28)	(0.31)	(0.34)
Electrification	-	-	-	(0.00)	(0.01)	(0.03)	(0.05)	(0.07)	(0.10)	(0.13)	(0.17)	(0.22)	(0.27)	(0.32)	(0.38)	(0.43)	(0.48)	(0.52)	(0.55)	(0.58)
Industrial	-	-	-	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
UTENs	-	-	-	-	-	-	-	-	-	-	-	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RNG	-	-	(0.02)	(0.05)	(0.09)	(0.40)	(0.43)	(0.46)	(0.48)	(0.50)	(0.52)	(0.54)	(0.55)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)	(0.56)
Hydrogen	-	-	-	-	(0.02)	(0.03)	(0.05)	(0.06)	(0.08)	(0.09)	(0.11)	(0.12)	(0.13)	(0.14)	(0.15)	(0.16)	(0.17)	(0.18)	(0.19)	(0.19)
Modeled Scenario	4.61	4.60	4.57	4.51	4.42	4.06	3.95	3.85	3.74	3.63	3.52	3.41	3.30	3.19	3.08	2.97	2.87	2.77	2.69	2.61
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21

C. GHG Emissions Reductions

Figure D-30: RG&E CO2e Emissions by Scenario (Million MT)

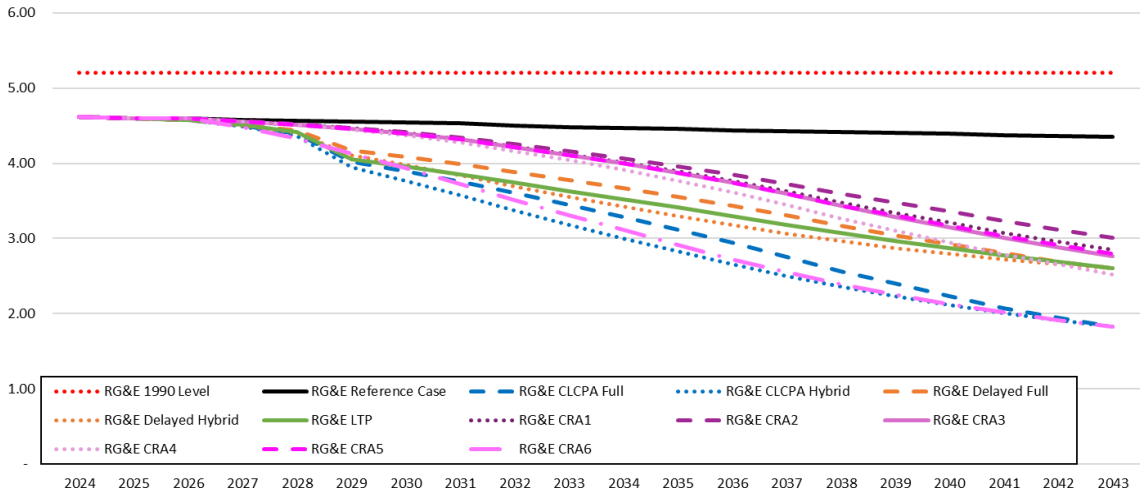


Table D-64: RG&E CO2e Emissions by Scenario (Million MT)

Million MT CO2e	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
1990 Level	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21
Reference Case	4.61	4.60	4.60	4.58	4.57	4.56	4.55	4.53	4.50	4.48	4.47	4.45	4.44	4.43	4.41	4.40	4.39	4.37	4.36	4.35
CLCPA Full	4.61	4.60	4.57	4.50	4.40	4.02	3.89	3.76	3.61	3.45	3.29	3.12	2.94	2.75	2.56	2.40	2.23	2.08	1.95	1.82
CLCPA Hybrid	4.61	4.60	4.57	4.49	4.36	3.94	3.77	3.57	3.38	3.18	3.00	2.82	2.66	2.50	2.36	2.23	2.11	2.01	1.91	1.82
Delayed Full	4.61	4.60	4.57	4.51	4.44	4.17	4.09	3.99	3.88	3.77	3.67	3.56	3.44	3.31	3.17	3.04	2.92	2.80	2.70	2.60
Delayed Hybrid	4.61	4.60	4.57	4.50	4.40	4.11	3.98	3.84	3.69	3.55	3.42	3.30	3.18	3.06	2.96	2.87	2.79	2.72	2.66	2.61
CRA 1	4.61	4.60	4.60	4.56	4.52	4.47	4.40	4.32	4.22	4.12	4.01	3.90	3.77	3.63	3.48	3.34	3.21	3.08	2.96	2.85
CRA 2	4.61	4.60	4.60	4.56	4.52	4.47	4.42	4.34	4.25	4.16	4.07	3.96	3.85	3.73	3.60	3.47	3.36	3.23	3.12	3.01
CRA 3	4.61	4.60	4.60	4.56	4.52	4.46	4.40	4.32	4.21	4.11	4.00	3.87	3.74	3.59	3.44	3.29	3.15	3.01	2.88	2.76
CRA 4	4.61	4.60	4.60	4.56	4.51	4.45	4.38	4.28	4.17	4.04	3.91	3.77	3.61	3.44	3.26	3.11	2.95	2.78	2.65	2.52
CRA 5	4.61	4.60	4.60	4.56	4.52	4.46	4.40	4.32	4.21	4.11	4.00	3.87	3.74	3.59	3.44	3.31	3.17	3.03	2.92	2.80
CRA 6	4.61	4.60	4.60	4.48	4.33	4.13	3.93	3.73	3.52	3.31	3.11	2.92	2.72	2.55	2.40	2.25	2.13	2.01	1.91	1.82
LTP	4.61	4.60	4.57	4.51	4.42	4.06	3.95	3.85	3.74	3.63	3.52	3.41	3.30	3.19	3.08	2.97	2.87	2.77	2.69	2.61

D. Annual Decarbonization Policy Cost

Figure D-31: RG&E Annual Decarbonization Policy Cost 2024-2043 ($M)

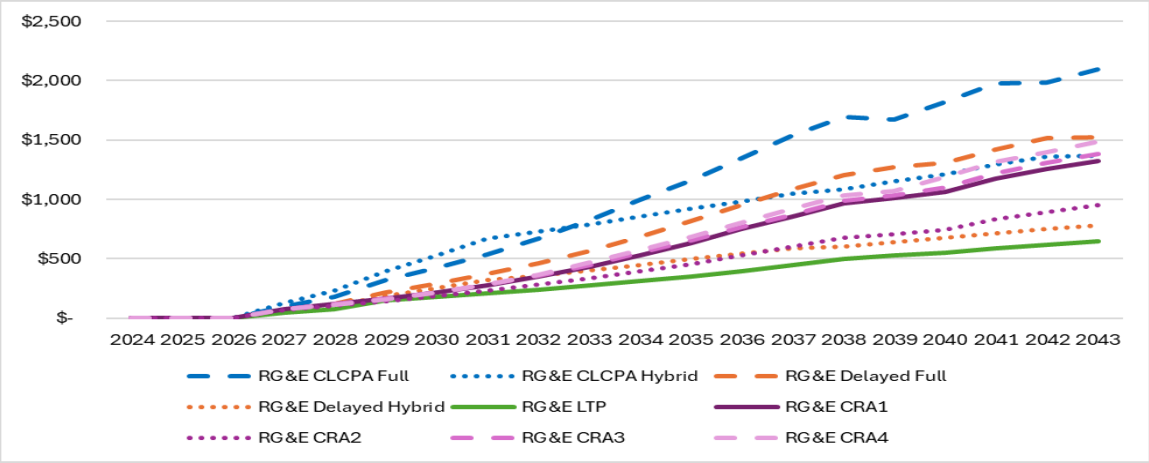


Table D-65: RG&E Annual Decarbonization Policy Cost 2024-2043 ($M)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
CLCPA Full	$0	$0	$4	$101	$180	$319	$424	$538	$672	$829	$997	$1160	$1344	$1536	$1692	$1675	$1822	$1973	$1985	$2094
CLCPA Hybrid	$0	$0	$4	$126	$232	$399	$530	$667	$727	$790	$857	$923	$980	$1045	$1087	$1156	$1213	$1294	$1358	$1370
Delayed Full	$0	$0	$4	$68	$123	$220	$291	$371	$462	$567	$687	$819	$954	$1088	$1206	$1271	$1305	$1419	$1514	$1523
Delayed Hybrid	$0	$0	$4	$58	$104	$191	$252	$319	$360	$404	$450	$497	$548	$588	$600	$637	$675	$715	$756	$783
CRA 1	$0	$0	$0	$74	$118	$166	$220	$280	$350	$432	$527	$636	$751	$856	$968	$1008	$1065	$1174	$1253	$1321
CRA 2	$0	$0	$0	$68	$105	$144	$187	$232	$281	$335	$393	$455	$529	$601	$681	$711	$748	$832	$896	$953
CRA 3	$0	$0	$0	$75	$119	$167	$222	$285	$359	$447	$551	$653	$764	$872	$989	$1036	$1100	$1217	$1306	$1384
CRA 4	$0	$0	$0	$74	$115	$161	$216	$283	$365	$467	$577	$682	$804	$924	$1036	$1074	$1189	$1317	$1401	$1488
CRA 5	$0	$0	$0	$68	$101	$138	$178	$224	$278	$341	$416	$502	$593	$673	$760	$754	$829	$914	$965	$1020
CRA 6	$0	$0	$0	$402	$603	$827	$907	$986	$1047	$1110	$1177	$1243	$1304	$1247	$1292	$1350	$1397	$1450	$1492	$1478
LTP	$0	$0	$4	$50	$74	$150	$181	$209	$241	$275	$312	$350	$399	$445	$498	$527	$550	$590	$622	$645

E. Nonparticipant Typical Monthly Bill

Figure D-32: RG&E Residential Nonparticipant Typical Monthly Gas Bill ($)

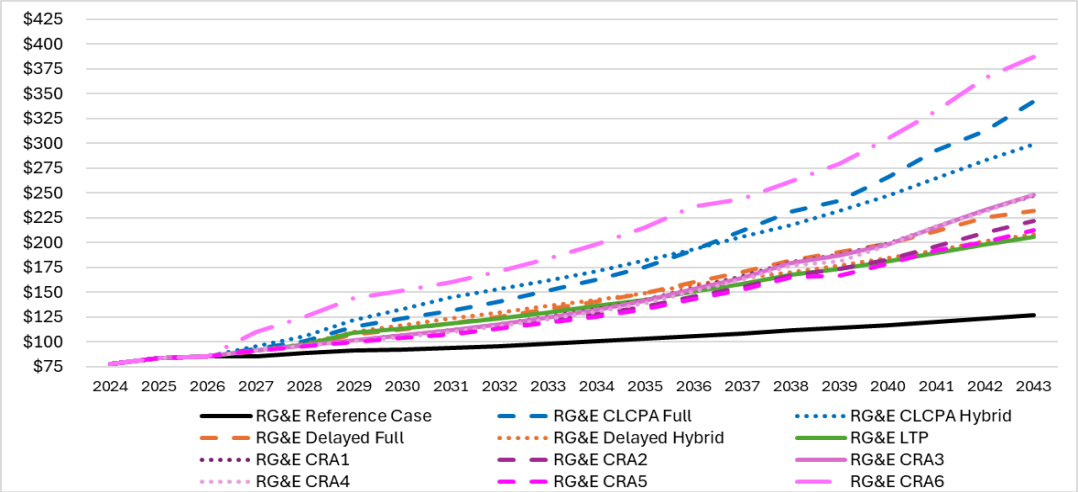


Table D-66: RG&E Residential Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$77	$84	$85	$86	$88	$91	$92	$94	$96	$98	$100	$103	$106	$108	$111	$114	$117	$120	$123	$126
CLCPA Full	$77	$84	$85	$93	$101	$115	$123	$131	$140	$151	$162	$175	$192	$211	$231	$242	$266	$293	$312	$342
CLCPA Hybrid	$77	$84	$85	$95	$105	$122	$133	$144	$153	$162	$171	$182	$193	$206	$218	$232	$247	$265	$283	$299
Delayed Full	$77	$84	$85	$90	$97	$107	$113	$118	$125	$132	$140	$148	$159	$170	$182	$190	$199	$211	$225	$232
Delayed Hybrid	$77	$84	$85	$91	$98	$110	$116	$124	$130	$136	$142	$149	$157	$164	$170	$176	$185	$192	$202	$208
CRA 1	$77	$84	$85	$91	$96	$102	$106	$111	$118	$125	$133	$142	$154	$165	$180	$188	$199	$216	$233	$247
CRA 2	$77	$84	$85	$91	$96	$101	$105	$109	$115	$121	$128	$135	$145	$155	$167	$174	$183	$196	$210	$222
CRA 3	$77	$84	$85	$91	$97	$102	$106	$111	$117	$124	$132	$141	$153	$164	$179	$187	$198	$216	$233	$248
CRA 4	$77	$84	$85	$91	$96	$101	$105	$110	$115	$122	$130	$139	$151	$163	$177	$181	$197	$217	$231	$249
CRA 5	$77	$84	$85	$91	$96	$100	$104	$108	$113	$119	$125	$133	$143	$153	$165	$166	$178	$192	$201	$213
CRA 6	$77	$84	$85	$110	$125	$143	$151	$160	$171	$184	$198	$215	$236	$243	$261	$279	$304	$332	$365	$387
LTP	$77	$84	$85	$91	$97	$109	$114	$118	$124	$130	$136	$142	$150	$158	$167	$173	$181	$189	$198	$205

Figure D-33: RG&E Non Residential General Service Nonparticipant Typical Monthly Gas Bill ($)

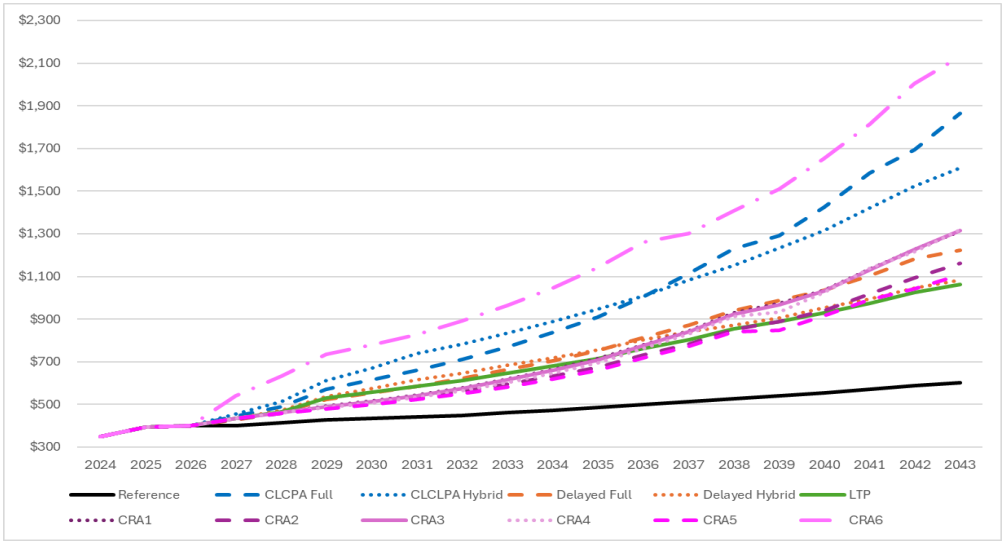


Table D-67: RG&E Non Residential General Service Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$349	$393	$399	$401	$415	$427	$433	$440	$450	$461	$473	$485	$498	$512	$526	$540	$555	$571	$586	$602
CLCPA Full	$349	$393	$402	$444	$488	$570	$614	$658	$711	$771	$836	$909	$1,004	$1,115	$1,230	$1,292	$1,426	$1,585	$1,693	$1,865
CLCPA Hybrid	$349	$393	$402	$456	$513	$610	$671	$737	$783	$833	$887	$946	$1,009	$1,083	$1,150	$1,232	$1,315	$1,420	$1,522	$1,610
Delayed Full	$349	$393	$402	$429	$463	$523	$552	$584	$621	$662	$705	$752	$813	$872	$940	$987	$1,036	$1,105	$1,183	$1,222
Delayed Hybrid	$349	$393	$402	$434	$473	$538	$575	$616	$648	$682	$716	$754	$802	$839	$871	$906	$952	$993	$1,046	$1,081
CRA 1	$349	$393	$399	$433	$463	$491	$516	$544	$579	$619	$663	$713	$780	$846	$930	$973	$1,036	$1,133	$1,227	$1,311
CRA 2	$349	$393	$399	$432	$459	$485	$506	$531	$561	$595	$632	$674	$731	$784	$852	$889	$941	$1,018	$1,094	$1,163
CRA 3	$349	$393	$399	$434	$463	$490	$514	$542	$576	$615	$658	$708	$774	$840	$924	$967	$1,030	$1,130	$1,227	$1,316
CRA 4	$349	$393	$399	$434	$461	$486	$508	$533	$565	$603	$645	$694	$762	$830	$911	$933	$1,026	$1,136	$1,215	$1,320
CRA 5	$349	$393	$399	$433	$457	$481	$500	$522	$550	$583	$619	$660	$717	$771	$841	$846	$915	$991	$1,041	$1,107
CRA 6	$349	$393	$399	$541	$632	$736	$778	$828	$891	$963	$1,044	$1,141	$1,261	$1,303	$1,406	$1,508	$1,653	$1,814	$2,005	$2,129
LTP	$349	$393	$402	$433	$464	$531	$558	$583	$613	$646	$680	$714	$761	$802	$854	$887	$930	$975	$1,025	$1,064

Figure D-34: RG&E Large Firm Transportation Nonparticipant Typical Monthly Gas Bill ($)

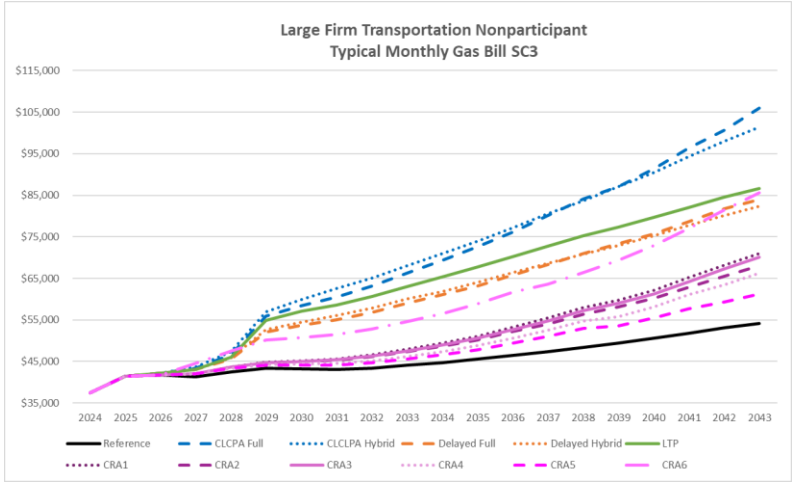


Table D-68: RG&E Large Firm Transportation Nonparticipant Typical Monthly Gas Bill ($)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case	$37,421	$41,451	$41,734	$41,306	$42,552	$43,344	$43,221	$43,107	$43,418	$44,046	$44,703	$45,528	$46,420	$47,370	$48,447	$49,413	$50,583	$51,837	$53,052	$54,214
CLCPA Full	$37,421	$41,451	$42,191	$43,337	$46,658	$55,868	$58,446	$60,557	$63,193	$66,197	$69,346	$72,537	$76,203	$80,198	$84,099	$87,070	$91,424	$96,428	$100,712	$105,963
CLCPA Hybrid	$37,421	$41,451	$42,191	$43,631	$47,290	$56,889	$59,913	$62,547	$65,097	$67,984	$70,984	$73,990	$77,144	$80,591	$83,723	$87,021	$90,455	$94,315	$98,037	$101,392
Delayed Full	$37,421	$41,451	$42,197	$43,005	$45,598	$52,117	$53,644	$55,009	$56,856	$59,038	$61,016	$63,217	$65,763	$68,280	$71,037	$73,297	$75,747	$78,686	$81,721	$84,015
Delayed Hybrid	$37,421	$41,451	$42,197	$43,124	$45,879	$52,607	$54,380	$56,042	$57,863	$59,994	$61,896	$63,999	$66,350	$68,579	$70,767	$72,872	$75,281	$77,711	$80,198	$82,285
CRA 1	$37,421	$41,451	$41,734	$42,073	$43,665	$44,861	$45,207	$45,632	$46,564	$47,895	$49,352	$51,099	$53,235	$55,408	$58,025	$59,807	$62,133	$65,193	$68,199	$71,035
CRA 2	$37,421	$41,451	$41,734	$42,034	$43,578	$44,713	$44,985	$45,322	$46,148	$47,355	$48,664	$50,235	$52,158	$54,074	$56,415	$58,073	$60,188	$62,876	$65,530	$67,996
CRA 3	$37,421	$41,451	$41,734	$42,089	$43,622	$44,758	$45,042	$45,403	$46,267	$47,528	$48,911	$50,582	$52,638	$54,729	$57,264	$58,967	$61,224	$64,241	$67,228	$70,079
CRA 4	$37,421	$41,451	$41,734	$42,107	$43,405	$44,311	$44,369	$44,504	$45,142	$46,177	$47,335	$48,780	$50,618	$52,499	$54,669	$55,759	$58,196	$61,062	$63,453	$66,208
CRA 5	$37,421	$41,451	$41,734	$42,068	$43,315	$44,157	$44,137	$44,177	$44,703	$45,612	$46,617	$47,871	$49,467	$51,036	$52,979	$53,624	$55,550	$57,693	$59,381	$61,241
CRA 6	$37,421	$41,451	$41,734	$44,613	$47,470	$50,197	$50,806	$51,531	$52,822	$54,565	$56,515	$58,886	$61,700	$63,562	$66,467	$69,369	$72,938	$77,030	$81,491	$85,612
LTP	$37,421	$41,451	$42,191	$43,071	$46,086	$54,926	$57,051	$58,651	$60,706	$63,053	$65,425	$67,678	$70,254	$72,758	$75,296	$77,352	$79,686	$82,114	$84,512	$86,603

F. Annual Design Day Demand

Table D-69: RG&E Annual Design Day Demand 2024-2043 (Mcf/d)

Design Day Demand, MCF/d	Reference Case	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5	CRA 6	LTP
2024	491,642	491,642	491,642	491,642	491,642	491,642	491,642	491,642	491,642	491,642	491,642	491,642
2025	490,391	490,391	490,391	490,391	490,391	490,391	490,391	490,391	490,391	490,391	490,391	490,391
2026	490,363	490,363	490,363	490,363	490,363	490,363	490,363	490,363	490,363	490,363	490,363	490,363
2027	489,165	485,776	487,323	487,110	488,104	486,476	487,463	486,128	485,776	486,233	474,778	487,463
2028	487,858	479,162	483,787	482,430	485,401	481,254	484,203	480,212	479,159	480,525	452,633	484,208
2029	486,582	470,679	479,898	476,473	482,397	474,848	480,719	472,768	470,672	473,393	424,409	480,740
2030	485,319	460,336	475,635	469,234	479,070	467,258	476,989	463,794	460,321	464,837	396,871	477,038
2031	483,105	447,224	470,036	459,783	474,460	457,553	472,049	452,367	447,199	453,932	369,063	472,141
2032	479,700	431,183	463,068	447,929	468,569	445,545	465,654	438,305	431,145	440,472	340,763	465,809
2033	477,397	414,539	457,020	435,978	463,689	433,546	460,093	423,921	414,486	426,726	314,193	460,332
2034	475,748	396,886	451,448	423,505	459,373	421,137	454,917	408,792	396,816	412,288	288,852	455,265
2035	474,187	377,608	445,678	409,865	454,948	407,684	449,449	392,283	377,517	396,538	264,038	449,935
2036	472,646	356,808	439,748	395,239	450,558	393,373	443,830	374,582	356,800	379,680	240,292	444,484
2037	471,096	334,523	433,622	379,420	445,956	378,006	437,815	355,493	334,490	361,535	220,235	438,670
2038	469,609	311,705	427,317	363,309	441,369	362,182	431,663	335,614	311,751	342,708	203,703	432,739
2039	468,160	293,029	420,967	347,661	436,721	348,102	425,328	317,148	293,044	327,428	189,026	426,545
2040	466,749	274,304	414,715	334,763	432,369	336,695	418,920	301,026	274,392	312,156	174,844	420,300
2041	464,572	254,552	407,754	320,724	427,295	323,746	411,420	282,965	253,710	295,075	159,666	413,051
2042	463,050	238,930	401,509	307,693	423,134	312,870	404,476	266,648	237,312	281,185	145,335	406,433
2043	461,971	223,724	395,745	297,330	419,462	303,515	397,669	251,552	221,049	267,431	132,395	400,022

G. Annual Gas Throughput by Sector

Table D-70: RG&E CLCPA Scenarios Gas Throughput by Customer Segment (Mcf)

	RG&E CLCPA-Full					RG&E CLCPA-Hybrid				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847
2025	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613
2026	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777
2027	25,746,083	13,976,609	12,461,599	2,531,176	54,715,467	25,651,068	13,907,079	12,459,237	2,514,779	54,532,163
2028	25,340,640	13,893,129	12,373,084	2,464,500	54,071,353	25,057,372	13,685,463	12,365,996	2,415,579	53,524,410
2029	24,818,822	13,785,807	12,291,452	2,360,111	53,256,192	24,257,847	13,373,685	12,277,275	2,263,203	52,172,011
2030	24,182,049	13,639,704	12,205,323	2,246,589	52,273,665	23,259,549	12,960,368	12,181,695	2,087,268	50,488,880
2031	23,332,390	13,454,860	12,111,542	2,133,973	51,032,766	21,972,627	12,450,249	12,076,099	1,899,155	48,398,131
2032	22,248,963	13,235,546	12,018,401	2,012,516	49,515,427	20,587,965	11,943,967	11,972,058	1,711,848	46,215,839
2033	21,140,265	12,995,134	11,928,927	1,887,633	47,951,959	19,308,356	11,453,951	11,872,599	1,530,453	44,165,359
2034	19,977,167	12,726,402	11,839,534	1,757,752	46,300,855	18,099,705	10,971,989	11,774,136	1,353,080	42,198,909
2035	18,709,557	12,425,950	11,751,447	1,621,603	44,508,557	16,907,026	10,493,643	11,677,893	1,178,130	40,256,692
2036	17,332,481	12,095,253	11,665,043	1,482,228	42,575,006	15,720,294	10,117,821	11,584,249	1,050,301	38,472,665
2037	15,845,812	11,737,542	11,579,937	1,337,094	40,500,386	14,533,378	9,832,008	11,492,817	922,286	36,780,489
2038	14,236,713	11,405,168	11,497,626	1,214,621	38,354,127	13,508,526	9,547,852	11,405,094	796,563	35,258,035
2039	12,810,796	11,193,197	11,417,067	1,106,013	36,527,073	12,573,447	9,265,143	11,320,038	671,718	33,830,346
2040	11,389,262	10,972,183	11,337,162	994,281	34,692,888	11,771,208	8,985,038	11,236,551	546,536	32,539,334
2041	9,983,388	10,677,037	11,255,228	866,813	32,782,467	11,042,761	8,630,802	11,151,035	401,670	31,226,268
2042	8,856,448	10,447,361	11,170,494	742,414	31,216,717	10,388,090	8,342,035	11,062,719	260,092	30,052,937
2043	7,743,710	10,232,201	11,093,876	644,922	29,714,709	9,798,389	8,098,293	10,984,776	154,101	29,035,559

Table D-71: RG&E Delayed Achievement Scenarios Gas Throughput by Customer Segment (Mcf)

	RG&E Delayed-Full					RG&E Delayed-Hybrid				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847
2025	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613
2026	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777
2027	25,815,121	14,011,905	12,481,006	2,538,659	54,846,690	25,695,769	13,987,601	12,480,406	2,531,434	54,695,210
2028	25,524,022	13,974,258	12,411,472	2,477,473	54,387,224	25,167,965	13,901,707	12,409,671	2,456,061	53,935,405
2029	25,161,259	13,923,223	12,348,404	2,376,608	53,809,494	24,455,465	13,779,380	12,344,804	2,334,694	52,914,342
2030	24,727,441	13,843,729	12,280,418	2,264,690	53,116,278	23,565,352	13,606,956	12,274,416	2,196,959	51,643,683
2031	24,123,088	13,735,633	12,204,345	2,151,817	52,214,883	22,407,354	13,386,187	12,195,342	2,054,257	50,043,140
2032	23,325,121	13,602,979	12,128,477	2,028,318	51,084,895	21,158,394	13,162,578	12,117,046	1,912,395	48,350,413
2033	22,540,831	13,458,866	12,055,848	1,899,694	49,955,239	20,021,760	12,948,925	12,042,559	1,776,478	46,789,722
2034	21,739,727	13,295,759	11,982,871	1,764,475	48,782,831	18,963,691	12,737,363	11,968,297	1,644,613	45,313,964
2035	20,869,891	13,109,903	11,910,774	1,621,501	47,512,069	17,929,262	12,523,786	11,895,486	1,515,198	43,863,732
2036	19,925,824	12,902,383	11,839,935	1,473,935	46,142,077	16,909,893	12,308,900	11,824,504	1,433,077	42,476,374
2037	18,903,098	12,676,008	11,769,971	1,319,371	44,668,447	15,896,545	12,162,816	11,754,970	1,350,770	41,165,102
2038	17,794,643	12,435,591	11,702,382	1,212,354	43,144,970	15,054,948	12,081,592	11,688,383	1,270,756	40,095,678
2039	16,628,610	12,304,776	11,636,130	1,102,609	41,672,125	14,316,761	12,001,813	11,623,703	1,191,618	39,133,896
2040	15,661,677	12,169,259	11,570,116	988,922	40,389,973	13,714,414	11,924,640	11,559,834	1,112,145	38,311,032
2041	14,701,673	11,959,610	11,501,310	855,076	39,017,669	13,192,961	11,773,335	11,493,172	1,020,999	37,480,467
2042	13,771,776	11,815,430	11,428,934	724,545	37,740,684	12,755,281	11,687,499	11,422,940	932,695	36,798,416
2043	13,021,140	11,683,029	11,363,692	621,592	36,689,453	12,397,603	11,615,783	11,360,286	873,284	36,246,957

Table D-72: RG&E CRA 1 and 2 Gas Throughput by Customer Segment (Mcf)

	RG&E CRA 1					RG&E CRA 2				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847
2025	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613
2026	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777
2027	25,775,162	13,984,887	12,461,884	2,531,570	54,753,503	25,787,781	13,988,533	12,461,986	2,532,736	54,771,036
2028	25,427,596	13,917,938	12,373,015	2,465,681	54,184,230	25,465,668	13,928,833	12,373,321	2,469,163	54,236,985
2029	24,992,028	13,835,341	12,290,389	2,362,471	53,480,231	25,068,541	13,857,034	12,291,001	2,369,399	53,585,975
2030	24,469,314	13,722,062	12,202,628	2,250,524	52,644,528	24,597,346	13,758,037	12,203,647	2,262,000	52,821,030
2031	23,760,390	13,578,010	12,106,575	2,139,875	51,584,850	23,952,793	13,631,678	12,108,104	2,156,972	51,849,546
2032	22,842,743	13,407,295	12,010,522	2,020,779	50,281,339	23,111,841	13,481,982	12,012,662	2,044,531	50,651,017
2033	21,924,074	13,223,090	11,917,497	1,898,650	48,963,311	22,282,134	13,322,032	11,920,351	1,930,052	49,454,569
2034	20,974,351	13,017,951	11,823,914	1,771,917	47,588,132	21,433,514	13,144,282	11,827,583	1,811,917	48,217,297
2035	19,942,228	12,788,225	11,730,998	1,639,309	46,100,759	20,514,285	12,944,971	11,735,585	1,688,808	46,883,649
2036	18,822,828	12,535,109	11,639,126	1,503,868	44,500,930	19,519,103	12,725,179	11,644,732	1,563,715	45,452,729
2037	17,612,146	12,261,533	11,547,912	1,363,062	42,784,653	18,443,407	12,487,715	11,554,639	1,434,050	43,919,811
2038	16,302,029	11,972,442	11,458,854	1,245,310	40,978,634	17,278,413	12,237,394	11,466,804	1,322,569	42,305,179
2039	14,976,016	11,814,061	11,370,909	1,141,817	39,302,803	16,093,121	12,088,659	11,380,184	1,222,127	40,784,091
2040	13,823,840	11,650,759	11,282,978	1,035,593	37,793,170	15,024,824	11,935,691	11,293,680	1,119,171	39,373,366
2041	12,616,992	11,405,799	11,191,465	911,486	36,125,742	13,908,489	11,701,742	11,203,696	1,000,757	37,814,684
2042	11,498,498	11,218,782	11,095,597	787,116	34,599,992	12,847,588	11,526,408	11,109,459	882,294	36,365,749
2043	10,456,662	11,036,882	11,006,155	686,288	33,185,988	11,832,553	11,356,616	11,021,712	787,721	34,998,603

Table D-73: RG&E CRA 3 and 4 Gas Throughput by Customer Segment (Mcf)

	RG&E CRA 3					RG&E CRA 4				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847
2025	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613
2026	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777
2027	25,770,670	13,983,656	12,461,828	2,531,176	54,747,331	25,746,083	13,976,609	12,461,599	2,531,176	54,715,467
2028	25,414,151	13,914,246	12,372,846	2,464,500	54,165,744	25,340,640	13,893,129	12,372,160	2,464,500	54,070,429
2029	24,965,185	13,827,958	12,290,051	2,360,111	53,443,305	24,818,822	13,785,807	12,288,679	2,360,111	53,253,419
2030	24,424,638	13,709,756	12,202,064	2,246,589	52,583,048	24,182,049	13,639,704	12,199,778	2,246,589	52,268,120
2031	23,693,531	13,559,552	12,105,730	2,133,973	51,492,786	23,332,390	13,454,860	12,102,300	2,133,973	51,023,523
2032	22,749,511	13,381,453	12,009,339	2,012,516	50,152,819	22,248,963	13,235,546	12,004,537	2,012,516	49,501,563
2033	21,800,238	13,188,634	11,915,920	1,887,633	48,792,426	21,140,265	12,995,134	11,909,517	1,887,633	47,932,550
2034	20,815,638	12,973,650	11,821,886	1,757,752	47,368,927	19,977,167	12,726,402	11,813,654	1,757,752	46,274,975
2035	19,744,368	12,732,850	11,728,463	1,621,603	45,827,284	18,709,557	12,425,950	11,718,173	1,621,603	44,475,283
2036	18,581,563	12,467,428	11,636,028	1,482,228	44,167,247	17,333,924	12,095,253	11,623,451	1,482,228	42,534,856
2037	17,323,235	12,180,316	11,544,195	1,337,094	42,384,840	15,847,254	11,737,542	11,529,102	1,337,094	40,450,993
2038	15,961,250	11,876,458	11,454,460	1,214,621	40,506,789	14,239,598	11,405,168	11,436,624	1,214,621	38,296,009
2039	14,579,164	11,702,080	11,365,783	1,106,013	38,753,040	12,813,681	11,193,197	11,344,973	1,106,013	36,457,864
2040	13,366,726	11,521,550	11,277,064	994,281	37,159,620	11,393,590	10,972,183	11,253,053	994,281	34,613,106
2041	12,095,441	11,258,131	11,184,706	862,960	35,401,237	9,916,665	10,665,389	11,157,264	862,960	32,602,278
2042	10,908,344	11,051,425	11,087,937	730,971	33,778,677	8,739,517	10,412,416	11,056,837	730,971	30,939,740
2043	9,793,757	10,849,055	10,997,558	622,207	32,262,576	7,577,038	10,163,273	10,962,765	622,207	29,325,282

Table D-74: RG&E CRA 5 and 6 Gas Throughput by Customer Segment (Mcf)

	RG&E CRA 5					RG&E CRA 6				
	Residential	Commercial	Industrial	Municipal	Total Throughput	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847
2025	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613
2026	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777
2027	25,773,641	13,983,656	12,461,828	2,531,176	54,750,302	25,080,015	13,684,150	12,452,109	2,476,423	53,692,696
2028	25,423,030	13,914,246	12,372,846	2,464,500	54,174,623	23,736,689	13,181,352	12,348,892	2,332,002	51,598,936
2029	24,982,930	13,827,958	12,290,051	2,360,111	53,461,050	22,022,874	12,534,637	12,247,346	2,128,164	48,933,021
2030	24,454,279	13,709,756	12,202,064	2,246,589	52,612,689	20,365,681	11,890,513	12,141,293	1,924,439	46,321,927
2031	23,738,042	13,559,552	12,105,730	2,133,973	51,537,297	18,664,519	11,248,240	12,027,580	1,730,682	43,671,020
2032	22,809,750	13,381,453	12,009,339	2,012,516	50,213,059	16,894,696	10,611,245	11,914,495	1,536,946	40,957,383
2033	21,873,413	13,188,634	11,915,920	1,887,633	48,865,601	15,257,829	9,992,000	11,805,069	1,348,424	38,403,322
2034	20,900,245	12,973,650	11,821,886	1,757,752	47,453,534	13,718,898	9,382,327	11,695,714	1,163,308	35,960,246
2035	19,840,210	12,732,850	11,728,463	1,621,603	45,923,127	12,222,368	8,777,819	11,587,656	980,074	33,567,916
2036	18,689,820	12,467,428	11,636,028	1,482,228	44,275,504	10,759,198	8,209,023	11,481,271	807,273	31,256,765
2037	17,446,083	12,180,316	11,544,195	1,337,094	42,507,688	9,320,049	7,884,922	11,376,174	681,775	29,262,921
2038	16,099,069	11,876,458	11,454,460	1,214,621	40,644,608	8,117,494	7,562,479	11,273,863	558,569	27,512,404
2039	14,892,117	11,702,080	11,365,783	1,106,013	39,065,993	7,091,576	7,241,482	11,173,294	436,240	25,942,592
2040	13,684,897	11,521,550	11,277,064	994,281	37,477,791	6,244,810	6,923,090	11,073,370	313,574	24,554,844
2041	12,434,465	11,258,131	11,184,706	862,960	35,740,261	5,484,815	6,530,567	10,970,492	170,698	23,156,572
2042	11,399,962	11,051,425	11,087,937	730,971	34,270,295	4,803,192	6,203,512	10,863,890	31,138	21,901,732
2043	10,379,859	10,849,055	10,997,558	622,207	32,848,678	4,106,017	5,969,524	10,770,878	(67,179)	20,779,241

Table D-75: RG&E Long Term Plan Gas Throughput by Customer Segment (Mcf)

	RG&E LTP				
	Residential	Commercial	Industrial	Municipal	Total Throughput
2024	26,210,677	13,929,728	12,506,149	2,672,293	55,318,847
2025	26,035,961	13,995,948	12,538,923	2,623,780	55,194,613
2026	26,000,158	14,036,433	12,549,646	2,590,541	55,176,777
2027	25,813,757	13,995,815	12,462,263	2,535,064	54,806,898
2028	25,543,032	13,950,708	12,375,075	2,476,156	54,344,971
2029	25,222,138	13,900,835	12,295,434	2,383,396	53,801,803
2030	24,851,457	13,831,107	12,211,959	2,285,340	53,179,863
2031	24,330,645	13,741,362	12,121,496	2,191,984	52,385,488
2032	23,635,198	13,635,617	12,032,337	2,093,536	51,396,688
2033	22,972,346	13,526,935	11,947,508	1,995,351	50,442,140
2034	22,311,526	13,407,744	11,863,423	1,895,791	49,478,485
2035	21,600,357	13,274,246	11,781,309	1,793,511	48,449,423
2036	20,832,747	13,127,473	11,701,541	1,691,470	47,353,230
2037	20,003,373	12,970,178	11,623,735	1,587,045	46,184,331
2038	19,102,689	12,807,114	11,549,387	1,497,457	44,956,647
2039	18,191,213	12,721,291	11,477,454	1,417,098	43,807,056
2040	17,378,314	12,636,128	11,406,840	1,335,786	42,757,069
2041	16,568,448	12,476,833	11,334,196	1,248,199	41,627,677
2042	15,832,847	12,383,007	11,258,753	1,163,154	40,637,762
2043	15,154,696	12,299,732	11,191,135	1,104,477	39,750,039

H. Annual Gas Throughput by Fuel Type

Table D-76: RG&E CLCPA Scenarios Natural Gas Annual Usage by Fuel Type

	RG&E CLCPA-Full				RG&E CLCPA-Hybrid			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	55,318,847	-	-	-	55,318,847	-	-	-
2025	55,194,613	-	-	-	55,194,613	-	-	-
2026	55,072,440	51,884	52,454	-	55,072,440	51,884	52,454	-
2027	54,454,909	155,651	104,907	-	54,271,604	155,651	104,907	-
2028	53,390,342	311,303	157,361	212,348	52,845,546	311,303	157,361	210,200
2029	47,420,170	3,615,190	1,802,538	418,294	46,344,505	3,615,190	1,802,538	409,778
2030	45,906,869	3,683,870	2,067,062	615,865	44,143,111	3,683,870	2,067,062	594,837
2031	44,352,267	3,752,550	2,126,289	801,660	41,759,019	3,752,550	2,126,289	760,274
2032	42,536,400	3,821,230	2,185,516	972,281	39,301,602	3,821,230	2,185,516	907,491
2033	40,687,409	3,889,910	2,244,743	1,129,897	36,990,033	3,889,910	2,244,743	1,040,673
2034	38,765,471	3,958,590	2,303,970	1,272,824	34,776,289	3,958,590	2,303,970	1,160,060
2035	36,770,082	4,027,270	2,313,093	1,398,113	32,651,800	4,027,270	2,313,093	1,264,530
2036	34,654,917	4,095,950	2,319,866	1,504,273	30,697,572	4,095,950	2,319,866	1,359,277
2037	32,419,469	4,164,630	2,326,640	1,589,648	28,845,659	4,164,630	2,326,640	1,443,560
2038	30,183,713	4,181,426	2,333,413	1,655,574	27,221,369	4,181,426	2,333,413	1,521,826
2039	28,269,036	4,198,222	2,340,187	1,719,628	25,699,395	4,198,222	2,340,187	1,592,542
2040	26,365,359	4,211,659	2,346,960	1,768,909	24,321,751	4,211,659	2,346,960	1,658,963
2041	24,417,540	4,211,659	2,353,734	1,799,534	22,946,902	4,211,659	2,353,734	1,713,973
2042	22,814,350	4,211,659	2,355,310	1,835,398	21,719,125	4,211,659	2,355,310	1,766,843
2043	21,284,828	4,211,659	2,355,310	1,862,912	20,648,352	4,211,659	2,355,310	1,820,237

Table D-77: RG&E Delayed Achievement Scenarios Natural Gas Annual Usage by Fuel Type

	RG&E Delayed-Full				RG&E Delayed-Hybrid			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	55,318,847	-	-	-	55,318,847	-	-	-
2025	55,194,613	-	-	-	55,194,613	-	-	-
2026	55,071,115	53,209	52,454	-	55,071,115	53,209	52,454	-
2027	54,582,156	159,627	104,907	-	54,430,675	159,627	104,907	-
2028	53,910,609	319,255	157,361	-	53,458,790	319,255	157,361	-
2029	49,843,495	2,896,298	1,069,701	-	48,948,342	2,896,298	1,069,701	-
2030	48,860,281	2,949,507	1,139,612	166,878	47,392,313	2,949,507	1,139,612	162,251
2031	47,741,076	3,002,716	1,142,999	328,092	45,582,979	3,002,716	1,142,999	314,446
2032	46,401,096	3,055,925	1,146,386	481,488	43,692,388	3,055,925	1,146,386	455,714
2033	45,068,546	3,109,134	1,149,773	627,787	41,942,809	3,109,134	1,149,773	588,006
2034	43,754,221	3,109,134	1,153,160	766,317	40,339,845	3,109,134	1,153,160	711,825
2035	42,350,904	3,109,134	1,156,546	895,485	38,771,339	3,109,134	1,156,546	826,712
2036	40,858,406	3,109,134	1,159,933	1,014,604	37,273,320	3,109,134	1,159,933	933,987
2037	39,273,672	3,109,134	1,163,320	1,122,322	35,858,379	3,109,134	1,163,320	1,034,269
2038	37,649,595	3,109,134	1,166,707	1,219,534	34,686,524	3,109,134	1,166,707	1,133,313
2039	36,084,366	3,109,134	1,170,093	1,308,531	33,625,882	3,109,134	1,170,093	1,228,786
2040	34,712,285	3,109,134	1,173,480	1,395,074	32,705,191	3,109,134	1,173,480	1,323,228
2041	33,261,787	3,109,134	1,176,867	1,469,881	31,782,538	3,109,134	1,176,867	1,411,927
2042	31,913,679	3,109,134	1,177,655	1,540,216	31,009,896	3,109,134	1,177,655	1,501,731
2043	30,790,535	3,109,134	1,177,655	1,612,129	30,367,503	3,109,134	1,177,655	1,592,666

Table D-78: RG&E CRA 1 and 2 Natural Gas Annual Usage by Fuel Type

	RG&E CRA 1				RG&E CRA 2			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	55,318,847	-	-	-	55,318,847	-	-	-
2025	55,194,613	-	-	-	55,194,613	-	-	-
2026	55,176,777	-	-	-	55,176,777	-	-	-
2027	54,753,503	-	-	-	54,771,036	-	-	-
2028	54,184,230	-	-	-	54,236,985	-	-	-
2029	53,480,231	-	-	-	53,585,975	-	-	-
2030	52,644,528	-	-	-	52,821,030	-	-	-
2031	51,584,850	-	-	-	51,849,546	-	-	-
2032	50,281,339	-	-	-	50,651,017	-	-	-
2033	48,963,311	-	-	-	49,454,569	-	-	-
2034	47,588,132	-	-	-	48,217,297	-	-	-
2035	46,100,759	-	-	-	46,883,649	-	-	-
2036	44,500,930	-	-	-	45,452,729	-	-	-
2037	42,784,653	-	-	-	43,919,811	-	-	-
2038	40,978,634	-	-	-	42,305,179	-	-	-
2039	39,302,803	-	-	-	40,784,091	-	-	-
2040	37,793,170	-	-	-	39,373,366	-	-	-
2041	36,125,742	-	-	-	37,814,684	-	-	-
2042	34,599,992	-	-	-	36,365,749	-	-	-
2043	33,185,988	-	-	-	34,998,603	-	-	-

Table D-79: RG&E CRA 3 and 4 Natural Gas Annual Usage by Fuel Type

	RG&E CRA 3				RG&E CRA 4			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	55,318,847	-	-	-	55,318,847	-	-	-
2025	55,194,613	-	-	-	55,194,613	-	-	-
2026	55,176,777	-	-	-	55,176,777	-	-	-
2027	54,747,331	-	-	-	54,715,467	-	-	-
2028	54,165,744	-	-	-	54,070,429	-	-	-
2029	53,443,305	-	-	-	53,253,419	-	-	-
2030	52,583,048	-	-	-	52,268,120	-	-	-
2031	51,492,786	-	-	-	51,023,523	-	-	-
2032	50,152,819	-	-	-	49,501,563	-	-	-
2033	48,792,426	-	-	-	47,932,550	-	-	-
2034	47,368,927	-	-	-	46,274,975	-	-	-
2035	45,827,284	-	-	-	44,475,283	-	-	-
2036	44,167,247	-	-	-	42,534,856	-	-	-
2037	42,384,840	-	-	-	40,450,993	-	-	-
2038	40,506,789	-	-	-	38,296,009	-	-	-
2039	38,753,040	-	-	-	36,457,864	-	-	-
2040	37,159,620	-	-	-	34,613,106	-	-	-
2041	35,401,237	-	-	-	32,602,278	-	-	-
2042	33,778,677	-	-	-	30,939,740	-	-	-
2043	32,262,576	-	-	-	29,325,282	-	-	-

Table D-80 RG&E CRA 5 and 6 Natural Gas Annual Usage by Fuel Type

	RG&E CRA 5				RG&E CRA 6			
	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	55,318,847	-	-	-	55,318,847	-	-	-
2025	55,194,613	-	-	-	55,194,613	-	-	-
2026	55,176,777	-	-	-	55,176,777	-	-	-
2027	54,750,302	-	-	-	53,692,696	-	-	-
2028	54,174,623	-	-	-	51,598,936	-	-	-
2029	53,461,050	-	-	-	48,933,021	-	-	-
2030	52,612,689	-	-	-	46,321,927	-	-	-
2031	51,537,297	-	-	-	43,671,020	-	-	-
2032	50,213,059	-	-	-	40,957,383	-	-	-
2033	48,865,601	-	-	-	38,403,322	-	-	-
2034	47,453,534	-	-	-	35,960,246	-	-	-
2035	45,923,127	-	-	-	33,567,916	-	-	-
2036	44,275,504	-	-	-	31,256,765	-	-	-
2037	42,507,688	-	-	-	29,262,921	-	-	-
2038	40,644,608	-	-	-	27,512,404	-	-	-
2039	39,065,993	-	-	-	25,942,592	-	-	-
2040	37,477,791	-	-	-	24,554,844	-	-	-
2041	35,740,261	-	-	-	23,156,572	-	-	-
2042	34,270,295	-	-	-	21,901,732	-	-	-
2043	32,848,678	-	-	-	20,779,241	-	-	-

Table D-81: RG&E Long Term Plan Natural Gas Annual Usage by Fuel Type

RG&E LTP	Conventional Natural Gas	Renewable Natural Gas (in jurisdiction)	Renewable Natural Gas (OH, PA)	Hydrogen Enriched Natural Gas
2024	55,318,847	-	-	-
2025	55,194,613	-	-	-
2026	55,072,440	51,884	52,454	-
2027	54,546,340	155,651	104,907	-
2028	53,662,885	311,303	157,361	213,423
2029	47,961,496	3,615,190	1,802,538	422,579
2030	46,802,390	3,683,870	2,067,062	626,541
2031	45,683,739	3,752,550	2,126,289	822,910
2032	44,380,720	3,821,230	2,185,516	1,009,221
2033	43,118,914	3,889,910	2,244,743	1,188,574
2034	41,855,747	3,958,590	2,303,970	1,360,178
2035	40,587,136	4,027,270	2,313,093	1,521,925
2036	39,263,993	4,095,950	2,319,866	1,673,421
2037	37,879,902	4,164,630	2,326,640	1,813,159
2038	36,500,368	4,181,426	2,333,413	1,941,440
2039	35,205,239	4,198,222	2,340,187	2,063,408
2040	34,016,696	4,211,659	2,346,960	2,181,753
2041	32,775,207	4,211,659	2,353,734	2,287,077
2042	31,678,667	4,211,659	2,355,310	2,392,125
2043	30,687,717	4,211,659	2,355,310	2,495,353

I. Annual Customer Counts by Sector

Table D-82: RG&E CLCPA Scenarios Annual Customer Counts 2024-2043

	RG&E CLCPA-Full					RG&E CLCPA-Hybrid				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527	303,378	21,390	429	1,330	326,527
2027	302,022	21,323	414	1,344	325,103	303,378	21,377	414	1,348	326,517
2028	299,316	21,203	398	1,353	322,271	303,378	21,365	398	1,365	326,506
2029	295,274	21,030	382	1,341	318,027	303,378	21,353	382	1,365	326,478
2030	289,918	20,803	367	1,324	312,412	303,378	21,341	367	1,365	326,451
2031	283,276	20,524	351	1,304	305,456	303,378	21,329	351	1,365	326,423
2032	275,387	20,193	335	1,280	297,196	303,378	21,317	335	1,365	326,395
2033	266,294	19,811	320	1,252	287,678	303,378	21,305	320	1,365	326,368
2034	256,048	19,379	304	1,221	276,952	303,378	21,293	304	1,365	326,340
2035	244,680	18,899	288	1,186	265,052	303,354	21,281	288	1,365	326,288
2036	232,275	18,370	273	1,147	252,065	303,330	21,269	273	1,365	326,237
2037	218,896	17,795	257	1,105	238,053	303,306	21,256	257	1,365	326,184
2038	204,613	17,265	241	1,075	223,194	303,282	21,244	241	1,365	326,132
2039	193,528	16,963	226	1,054	211,771	303,258	21,232	226	1,365	326,081
2040	182,772	16,639	210	1,030	200,651	303,234	21,220	210	1,365	326,029
2041	172,016	16,315	194	997	189,523	303,210	21,208	194	1,365	325,977
2042	165,389	15,991	179	965	182,524	303,186	21,196	179	1,365	325,926
2043	158,761	15,676	163	934	175,534	303,162	21,184	163	1,365	325,874

Table D-83: RG&E Delayed Achievement Scenarios Annual Customer Counts 2024-2043

	RG&E Delayed-Full					RG&E Delayed-Hybrid				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527	303,378	21,390	429	1,330	326,527
2027	302,441	21,343	414	1,343	325,541	303,378	21,377	414	1,348	326,517
2028	300,570	21,264	398	1,349	323,581	303,378	21,365	398	1,365	326,506
2029	297,771	21,151	382	1,333	320,637	303,378	21,353	382	1,365	326,478
2030	294,055	21,005	367	1,312	316,739	303,378	21,341	367	1,365	326,451
2031	289,436	20,825	351	1,286	311,899	303,378	21,329	351	1,365	326,423
2032	283,932	20,613	335	1,255	306,135	303,378	21,317	335	1,365	326,395
2033	277,565	20,368	320	1,220	299,472	303,378	21,305	320	1,365	326,368
2034	270,359	20,090	304	1,179	291,933	303,378	21,293	304	1,365	326,340
2035	262,318	19,782	288	1,134	283,522	303,354	21,281	288	1,365	326,288
2036	253,521	19,442	273	1,085	274,320	303,354	21,269	273	1,365	326,261
2037	243,952	19,070	257	1,032	264,310	303,330	21,256	257	1,365	326,208
2038	233,695	18,669	241	1,005	253,610	303,330	21,244	241	1,365	326,180
2039	222,738	18,475	226	977	242,417	303,306	21,232	226	1,365	326,129
2040	215,109	18,268	210	947	234,533	303,306	21,220	210	1,365	326,101
2041	207,455	18,060	194	905	226,614	303,282	21,208	194	1,365	326,049
2042	200,145	17,852	179	863	219,039	303,282	21,196	179	1,365	326,022
2043	195,532	17,648	163	822	214,165	303,258	21,184	163	1,365	325,970

Table D-84: RG&E CRA 1 and 2 Annual Customer Counts 2024-2043

	RG&E CRA 1					RG&E CRA 2				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527	303,378	21,390	429	1,330	326,527
2027	302,559	21,347	414	1,345	325,665	303,378	21,377	414	1,348	326,517
2028	300,925	21,274	398	1,356	323,953	303,378	21,365	398	1,365	326,506
2029	298,485	21,172	382	1,347	321,385	303,378	21,353	382	1,365	326,478
2030	295,252	21,040	367	1,335	317,993	303,378	21,341	367	1,365	326,451
2031	291,246	20,878	351	1,320	313,795	303,378	21,329	351	1,365	326,423
2032	286,491	20,687	335	1,302	308,814	303,378	21,317	335	1,365	326,395
2033	281,014	20,468	320	1,281	303,083	303,378	21,305	320	1,365	326,368
2034	274,850	20,220	304	1,258	296,632	303,378	21,293	304	1,365	326,340
2035	268,010	19,945	288	1,232	289,476	303,354	21,281	288	1,365	326,288
2036	260,583	19,644	273	1,204	281,704	303,354	21,269	273	1,365	326,261
2037	252,563	19,315	257	1,173	273,309	303,330	21,256	257	1,365	326,208
2038	244,045	18,963	241	1,156	264,405	303,330	21,244	241	1,365	326,180
2039	235,807	18,866	226	1,147	256,047	303,306	21,232	226	1,365	326,129
2040	230,804	18,762	210	1,138	250,915	303,306	21,220	210	1,365	326,101
2041	225,420	18,652	194	1,122	245,388	303,282	21,208	194	1,365	326,049
2042	221,858	18,535	179	1,105	241,677	303,282	21,196	179	1,365	326,022
2043	219,911	18,414	163	1,088	239,575	303,258	21,184	163	1,365	325,970

Table D-85: RG&E CRA 3 and 4 Annual Customer Counts 2024-2043

	RG&E CRA 3					RG&E CRA 4				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527	303,378	21,390	429	1,330	326,527
2027	302,294	21,337	414	1,344	325,388	302,022	21,323	414	1,344	325,103
2028	300,130	21,244	398	1,353	323,124	299,316	21,203	398	1,353	322,271
2029	296,894	21,111	382	1,341	319,727	295,274	21,030	382	1,341	318,027
2030	292,600	20,937	367	1,324	315,229	289,918	20,803	367	1,324	312,412
2031	287,268	20,725	351	1,304	309,648	283,276	20,524	351	1,304	305,456
2032	280,921	20,473	335	1,280	303,009	275,387	20,193	335	1,280	297,196
2033	273,588	20,182	320	1,252	295,342	266,294	19,811	320	1,252	287,678
2034	265,302	19,853	304	1,221	286,680	256,048	19,379	304	1,221	276,952
2035	256,075	19,486	288	1,186	277,035	244,680	18,899	288	1,186	265,052
2036	245,996	19,082	273	1,147	266,498	232,299	18,370	273	1,147	252,089
2037	235,059	18,642	257	1,105	255,063	218,920	17,795	257	1,105	238,077
2038	223,358	18,167	241	1,075	242,842	204,661	17,265	241	1,075	223,242
2039	211,672	17,937	226	1,054	230,889	193,576	16,963	226	1,054	211,819
2040	202,956	17,691	210	1,030	221,887	182,844	16,639	210	1,030	200,723
2041	193,594	17,427	194	995	212,210	171,379	16,293	194	995	188,861
2042	185,788	17,147	179	959	204,072	164,339	15,924	179	959	181,401
2043	179,332	16,856	163	920	197,271	157,276	15,544	163	920	173,903

Table D-86: RG&E CRA 5 and 6 Annual Customer Counts 2024-2043

	RG&E CRA 5					RG&E CRA 6				
	Residential	Commercial	Industrial	Municipal	Total	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527	303,378	21,390	429	1,330	326,527
2027	302,022	21,337	414	1,344	325,117	293,735	20,763	414	1,311	316,223
2028	299,316	21,244	398	1,353	322,311	279,481	19,841	398	1,273	300,993
2029	295,274	21,111	382	1,341	318,107	260,886	18,636	382	1,201	281,105
2030	289,918	20,937	367	1,324	312,546	242,823	17,456	367	1,130	261,776
2031	283,276	20,725	351	1,304	305,656	225,267	16,302	351	1,061	242,981
2032	275,387	20,473	335	1,280	297,475	208,196	15,172	335	993	224,697
2033	266,294	20,182	320	1,252	288,048	191,591	14,065	320	927	206,903
2034	256,048	19,853	304	1,221	277,425	175,429	12,981	304	862	189,576
2035	244,680	19,486	288	1,186	265,640	159,669	11,918	288	799	172,674
2036	232,299	19,082	273	1,147	252,801	144,339	10,934	273	740	156,286
2037	218,920	18,642	257	1,105	238,924	129,374	10,422	257	710	140,763
2038	204,661	18,167	241	1,075	224,144	119,516	9,912	241	680	130,348
2039	193,576	17,937	226	1,054	212,792	112,862	9,402	226	650	123,139
2040	182,844	17,691	210	1,030	201,774	106,233	8,891	210	619	115,953
2041	171,379	17,427	194	995	189,995	99,579	8,381	194	578	108,732
2042	164,339	17,147	179	959	182,624	92,950	7,870	179	536	101,536
2043	157,276	16,856	163	920	175,215	86,296	7,519	163	504	94,482

Table D-87: RG&E Long Term Plan Annual Customer Counts 2024-2043

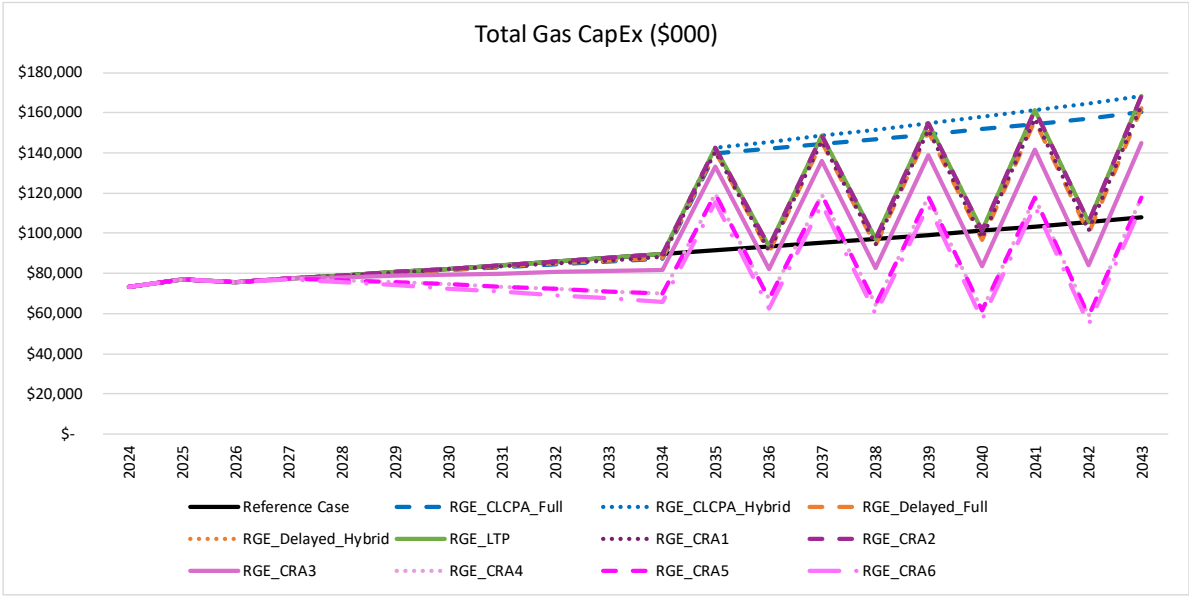
	RG&E LTP				
	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527
2027	303,378	21,377	414	1,348	326,517
2028	303,378	21,365	398	1,365	326,506
2029	303,378	21,353	382	1,365	326,478
2030	303,378	21,341	367	1,365	326,451
2031	303,378	21,329	351	1,365	326,423
2032	303,378	21,317	335	1,365	326,395
2033	303,378	21,305	320	1,365	326,368
2034	303,378	21,293	304	1,365	326,340
2035	303,354	21,281	288	1,365	326,288
2036	303,354	21,269	273	1,365	326,261
2037	303,330	21,256	257	1,365	326,208
2038	303,330	21,244	241	1,365	326,180
2039	303,306	21,232	226	1,365	326,129
2040	303,306	21,220	210	1,365	326,101
2041	303,282	21,208	194	1,365	326,049
2042	303,282	21,196	179	1,365	326,022
2043	303,258	21,184	163	1,365	325,970

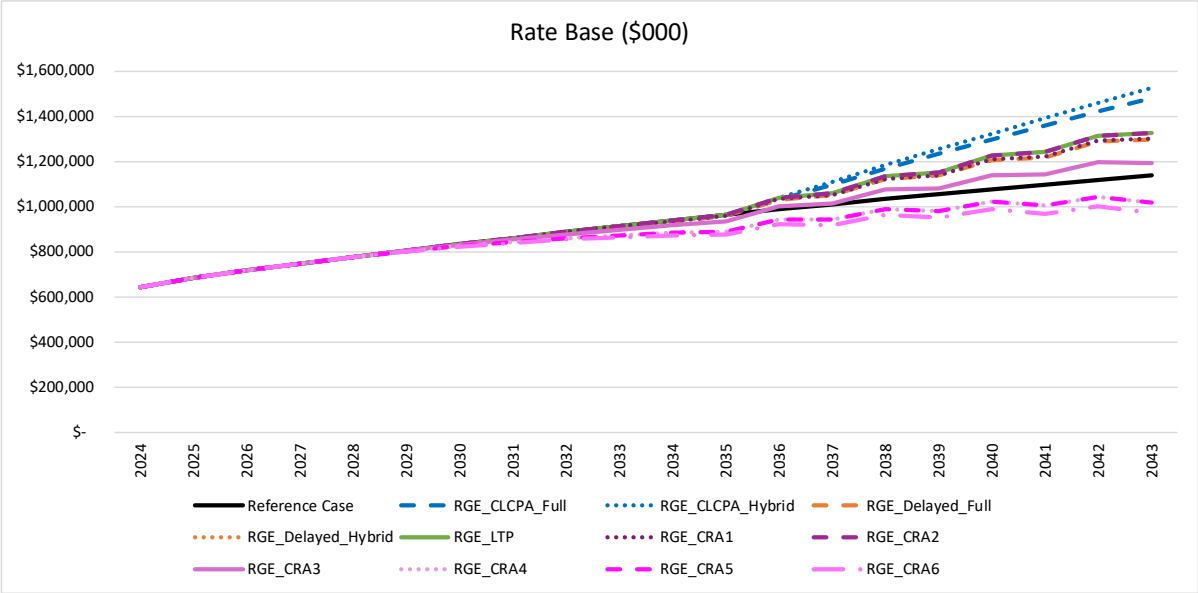
J. Capital Expenditures and Rate Base

Table D-88: RG&E Capital Expenditures and Rate Base by Scenario

($Million)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Reference Case																				
CapEx	$73	$77	$76	$77	$79	$81	$82	$84	$86	$88	$89	$91	$93	$95	$97	$99	$101	$103	$106	$108
Rate Base	$643	$684	$718	$748	$778	$806	$834	$861	$888	$914	$939	$964	$988	$1,011	$1,034	$1,056	$1,078	$1,098	$1,118	$1,137
RGE_CLCPA_Full																				
CapEx	$73	$77	$76	$77	$79	$80	$82	$83	$85	$86	$87	$140	$142	$144	$147	$149	$152	$154	$157	$160
Rate Base	$643	$684	$718	$748	$777	$806	$833	$860	$886	$911	$935	$957	$1,029	$1,099	$1,167	$1,233	$1,297	$1,360	$1,422	$1,482
RGE_CLCPA_Hybrid																				
CapEx	$73	$77	$76	$77	$79	$81	$82	$84	$86	$88	$89	$142	$145	$149	$152	$155	$158	$161	$165	$168
Rate Base	$643	$684	$718	$748	$778	$806	$834	$861	$888	$914	$939	$964	$1,038	$1,111	$1,182	$1,253	$1,323	$1,391	$1,458	$1,524
RGE_Delayed_Full																				
CapEx	$73	$77	$76	$77	$79	$80	$82	$83	$85	$86	$88	$141	$91	$146	$94	$151	$97	$156	$100	$162
Rate Base	$643	$684	$718	$748	$777	$806	$833	$860	$886	$912	$936	$959	$1,032	$1,051	$1,122	$1,138	$1,207	$1,219	$1,286	$1,295
RGE_Delayed_Hybrid																				
CapEx	$73	$77	$76	$77	$79	$81	$82	$84	$86	$88	$89	$142	$93	$149	$97	$155	$101	$161	$106	$168
Rate Base	$643	$684	$718	$748	$778	$806	$834	$861	$888	$914	$939	$964	$1,038	$1,060	$1,133	$1,152	$1,225	$1,241	$1,312	$1,325
RGE_CRA1																				
CapEx	$73	$77	$76	$77	$79	$80	$82	$84	$85	$87	$88	$141	$91	$146	$94	$151	$98	$157	$101	$164
Rate Base	$643	$684	$718	$748	$777	$806	$834	$860	$887	$912	$936	$960	$1,032	$1,053	$1,123	$1,140	$1,209	$1,222	$1,291	$1,300
RGE_CRA2																				
CapEx	$73	$77	$76	$77	$79	$81	$82	$84	$86	$88	$89	$142	$93	$149	$97	$155	$101	$161	$106	$168
Rate Base	$643	$684	$718	$748	$778	$806	$834	$861	$888	$914	$939	$964	$1,038	$1,060	$1,133	$1,152	$1,225	$1,241	$1,312	$1,325
RGE_CRA3																				
CapEx	$73	$77	$76	$77	$78	$79	$79	$80	$81	$81	$82	$133	$82	$136	$83	$139	$84	$142	$84	$145
Rate Base	$643	$684	$718	$748	$777	$805	$831	$855	$878	$899	$918	$935	$1,001	$1,013	$1,075	$1,082	$1,140	$1,142	$1,197	$1,193
RGE_CRA4																				
CapEx	$73	$77	$76	$77	$76	$75	$74	$73	$72	$71	$70	$120	$67	$119	$64	$118	$61	$118	$59	$118
Rate Base	$643	$684	$718	$748	$777	$803	$825	$844	$861	$874	$884	$890	$944	$942	$990	$981	$1,022	$1,005	$1,041	$1,016
RGE_CRA5																				
CapEx	$73	$77	$76	$77	$76	$75	$74	$73	$72	$71	$70	$120	$67	$119	$64	$118	$61	$118	$59	$118
Rate Base	$643	$684	$718	$748	$777	$803	$825	$844	$861	$874	$884	$891	$944	$943	$990	$981	$1,022	$1,005	$1,041	$1,017
RGE_CRA6																				
CapEx	$73	$77	$76	$77	$76	$74	$72	$71	$69	$68	$66	$115	$63	$114	$60	$114	$57	$114	$54	$114
Rate Base	$643	$684	$718	$748	$777	$801	$822	$840	$854	$864	$871	$874	$924	$919	$963	$950	$988	$968	$1,001	$974
RGE_LTP																				
CapEx	$73	$77	$76	$77	$79	$81	$82	$84	$86	$88	$89	$142	$93	$149	$97	$155	$101	$161	$106	$168
Rate Base	$643	$684	$718	$748	$778	$806	$834	$861	$888	$914	$939	$964	$1,038	$1,060	$1,133	$1,152	$1,225	$1,241	$1,312	$1,325

Figure D-35: RG&E Capital Expenditures and Rate Base by Scenario





K. BCA Results

Table D-89: RG&E SCT Results

	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5	CRA 6	LTP
	Discount Rate	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**
Benefit Cost Analysis	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%
Societal Cost Test	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
Benefit: Avoided Gas Commodity Costs	$(473,765)	$(512,767)	$(319,395)	$(363,013)	$(217,930)	$(183,877)	$(231,742)	$(270,062)	$(227,584)	$(519,126)	$(352,378)
Benefit: Avoided Gas System O&M and CapEx Revenue Requirement	$(11,280)	$ (6)	$(7,967)	$ (4)	$(6,783)	$ (4)	$(111,903)	$(295,380)	$(295,276)	$(313,449)	$ (4)
Benefit: Avoided Pipeline and Storage Fixed Costs	$ -	$ -	$ -	$ -	$(11,484)	$(11,484)	$(22,467)	$(61,860)	$(61,860)	$(61,860)	$(15,994)
Benefit: Avoided Emissions, Societal Cost	$(932,530)	$(1,059,348)	$(631,379)	$(744,939)	$(435,969)	$(387,562)	$(455,115)	$(530,850)	$(451,447)	$(1,005,365)	$(705,732)
Total Benefit ($)	**$(1,417,575)**	**$(1,572,121)**	**$(958,741)**	**$(1,107,956)**	**$(672,165)**	**$(582,927)**	**$(821,228)**	**$(1,158,151)**	**$(1,036,167)**	**$(1,899,800)**	**$(1,074,108)**
Cost: Incremental Electricity Cost	$3,234,015	$2,259,126	$2,343,863	$1,789,976	$2,353,212	$1,356,915	$2,610,490	$3,181,010	$2,075,289	$4,959,770	$789,011
Cost: Weatherization Cost	$315,911	$315,911	$157,955	$157,955	$315,911	$315,911	$315,911	$315,911	$319,671	$391,695	$315,911
Federal &State Incentive	$74,672	$74,672	$37,336	$37,336	$74,672	$74,672	$74,672	$74,672	$77,005	$125,038	$74,672
Utility Incentive	$233,201	$233,201	$116,600	$116,600	$233,201	$233,201	$233,201	$233,201	$236,209	$293,828	$233,201
Participant Customer	$8,038	$8,038	$4,019	$4,019	$8,038	$8,038	$8,038	$8,038	$6,457	$(27,171)	$8,038
Cost: Net Installed Cost	$3,220,325	$2,785,420	$2,367,322	$807,434	$1,828,153	$1,652,874	$1,824,635	$1,724,840	$1,527,146	$3,962,609	$461,884
Federal & State Incentive	$610,060	$654,062	$440,969	$584,021	$526,705	$522,308	$527,331	$618,299	$612,332	$1,066,027	$308,935
Utility Incentive	$658,750	$690,479	$482,349	$324,682	$516,462	$464,386	$549,480	$556,494	$503,498	$1,197,056	$168,473
Participant Customer	$1,951,514	$1,440,879	$1,444,004	$(101,269)	$784,987	$666,181	$747,824	$550,048	$411,316	$1,699,525	$(15,523)
Cost: UTENS Revenue Requirement	$94,964	$94,964	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837
Cost: Hydrogen Cost	$188,243	$175,832	$116,650	$110,145	$ -	$ -	$ -	$ -	$ -	$ -	$213,931
Cost: RNG Production Cost	$981,727	$981,727	$673,402	$673,402	$ -	$ -	$ -	$ -	$ -	$ -	$981,727
Cost: Lost Utility Revenue - Base Distribution	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Lost Utility Revenue - Pipeline and Storage Fixed Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Increased Emissions, Societal Cost	$9,999	$12,645	$7,069	$9,751	$7,396	$5,551	$7,988	$9,937	$6,560	$23,550	$3,172
Total Cost ($)	**$8,045,184**	**$6,625,625**	**$5,719,098**	**$3,601,500**	**$4,557,509**	**$3,384,088**	**$4,811,861**	**$5,284,535**	**$3,981,503**	**$9,390,460**	**$2,818,472**
Benefit/Cost Ratio	**0.18**	**0.24**	**0.17**	**0.31**	**0.15**	**0.17**	**0.17**	**0.22**	**0.26**	**0.20**	**0.38**

Table D-90: RG&E UCT Results

	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5	CRA 6	LTP
	Discount Rate	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**
Benefit Cost Analysis	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%
Utility Cost Test	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
Benefit: Avoided Gas Commodity Costs	$(473,765)	$(512,767)	$(319,395)	$(363,013)	$(217,930)	$(183,877)	$(231,742)	$(270,062)	$(227,584)	$(519,126)	$(352,378)
Benefit: Avoided Gas System O&M and CapEx Revenue Requirement	$(11,280)	$ (6)	$(7,967)	$ (4)	$(6,783)	$ (4)	$(111,903)	$(295,380)	$(295,276)	$(313,449)	$ (4)
Benefit: Avoided Pipeline and Storage Fixed Costs	$ -	$ -	$ -	$ -	$(11,484)	$(11,484)	$(22,467)	$(61,860)	$(61,860)	$(61,860)	$(15,994)
Benefit: Avoided Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Benefit ($)	**$(485,046)**	**$(512,773)**	**$(327,362)**	**$(363,016)**	**$(236,197)**	**$(195,365)**	**$(366,113)**	**$(627,301)**	**$(584,720)**	**$(894,435)**	**$(368,376)**
Cost: Incremental Electricity Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Weatherization Cost	$233,201	$233,201	$116,600	$116,600	$233,201	$233,201	$233,201	$233,201	$236,209	$293,828	$233,201
Federal &State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$233,201	$233,201	$116,600	$116,600	$233,201	$233,201	$233,201	$233,201	$236,209	$293,828	$233,201
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Net Installed Cost	$658,750	$690,479	$482,349	$324,682	$516,462	$464,386	$549,480	$556,494	$503,498	$1,197,056	$168,473
Federal & State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$658,750	$690,479	$482,349	$324,682	$516,462	$464,386	$549,480	$556,494	$503,498	$1,197,056	$168,473
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: UTENS Revenue Requirement	$94,964	$94,964	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837
Cost: Hydrogen Cost	$188,243	$175,832	$116,650	$110,145	$ -	$ -	$ -	$ -	$ -	$ -	$213,931
Cost: RNG Production Cost	$981,727	$981,727	$673,402	$673,402	$ -	$ -	$ -	$ -	$ -	$ -	$981,727
Cost: Lost Utility Revenue - Base Distribution	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Lost Utility Revenue - Pipeline and Storage Fixed Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Increased Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Cost ($)	**$2,156,885**	**$2,176,202**	**$1,441,838**	**$1,277,667**	**$802,500**	**$750,424**	**$835,518**	**$842,531**	**$792,544**	**$1,543,721**	**$1,650,168**
Benefit/Cost Ratio	**0.22**	**0.24**	**0.23**	**0.28**	**0.29**	**0.26**	**0.44**	**0.74**	**0.74**	**0.58**	**0.22**

Table D-91: RG&E RIM Results

	CLCPA Full	CLCPA Hybrid	Delayed Full	Delayed Hybrid	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5	CRA 6	LTP
	Discount Rate	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**	**Discount Rate**
Benefit Cost Analysis	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%
Ratepayer Impact Measure	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**	**NPV ($)**
Benefit: Avoided Gas Commodity Costs	$(473,765)	$(512,767)	$(319,395)	$(363,013)	$(217,930)	$(183,877)	$(231,742)	$(270,062)	$(227,584)	$(519,126)	$(352,378)
Benefit: Avoided Gas System O&M and CapEx Revenue Requirement	$(11,280)	$(6)	$(7,967)	$(4)	$(6,783)	$(4)	$(111,903)	$(295,380)	$(295,276)	$(313,449)	$(4)
Benefit: Avoided Pipeline and Storage Fixed Costs	$-	$-	$-	$-	$(11,484)	$(11,484)	$(22,467)	$(61,860)	$(61,860)	$(61,860)	$(15,994)
Benefit: Avoided Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Benefit ($)	**$(485,046)**	**$(512,773)**	**$(327,362)**	**$(363,016)**	**$(236,197)**	**$(195,365)**	**$(366,113)**	**$(627,301)**	**$(584,720)**	**$(894,435)**	**$(368,376)**
Cost: Incremental Electricity Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Weatherization Cost	$233,201	$233,201	$116,600	$116,600	$233,201	$233,201	$233,201	$233,201	$236,209	$293,828	$233,201
Federal &State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$233,201	$233,201	$116,600	$116,600	$233,201	$233,201	$233,201	$233,201	$236,209	$293,828	$233,201
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: Net Installed Cost	$658,750	$690,479	$482,349	$324,682	$516,462	$464,386	$549,480	$556,494	$503,498	$1,197,056	$168,473
Federal & State Incentive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Incentive	$658,750	$690,479	$482,349	$324,682	$516,462	$464,386	$549,480	$556,494	$503,498	$1,197,056	$168,473
Participant Customer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost: UTENS Revenue Requirement	$94,964	$94,964	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$52,837	$ 52,837	$52,837
Cost: Hydrogen Cost	$188,243	$175,832	$116,650	$110,145	$-	$-	$-	$-	$ -	$ -	$213,931
Cost: RNG Production Cost	$981,727	$981,727	$673,402	$673,402	$-	$-	$-	$-	$ -	$ -	$981,727
Cost: Lost Utility Revenue - Base Distribution	$490,263	$404,762	$351,656	$307,200	$370,698	$244,965	$419,657	$492,591	$436,032	$970,438	$183,574
Cost: Lost Utility Revenue - Pipeline and Storage Fixed Costs	$76,456	$90,033	$51,389	$73,170	$62,569	$55,861	$65,129	$76,634	$63,614	$140,529	$42,239
Cost: Increased Emissions, Societal Cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Cost ($)	**$2,723,605**	**$2,670,997**	**$1,844,883**	**$1,658,037**	**$1,235,767**	**$1,051,249**	**$1,320,304**	**$1,411,756**	**$1,292,190**	**$2,654,688**	**$1,875,981**
Benefit/Cost Ratio	**0.18**	**0.19**	**0.18**	**0.22**	**0.19**	**0.19**	**0.28**	**0.44**	**0.45**	**0.34**	**0.20**

Appendix E:

Reference Case Documentation

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

April 26, 2024

Avangrid

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CONTENTS

Appendix E: Reference Case Documentation

The Reference Case represents the Companies' baseline, business-as-usual expectations over the next 20 years (2024-2043) and does not include the impact of CLCPA actions that have not yet been planned or implemented. The Reference Case forecast addresses total gas distribution system (i.e., associated with retail sales customers plus transportation customers) demand, supply and GHG emissions since NYSEG and RG&E's distribution systems are built and used to deliver gas to both retail sales and transportation customers, regardless of what entity is responsible for procuring the natural gas.

I. Demand Forecast

NYSEG and RG&E separately forecast monthly demand and number of customers for four customer segments: residential, commercial, industrial, and municipal customers. The Companies generally use the same forecasting methodology but use historical data and economic variables specific to their individual service territories.

A. Number of Customer Accounts by Segment

For both NYSEG and RG&E, the Reference Case monthly number of customers for each customer segment is forecasted using exponential smoothing. Exponential smoothing is a time-series technique that uses weighted averages of historical data to project recent trends and seasonal shapes into the future. The Companies' exponential smoothing models rely on historical data from January 2018 through April 2023. Monthly values are averaged to produce annual values. Forecasted customer counts are then adjusted to remove new residential and commercial customers starting in 2026 and new municipal customers starting in 2029, to reflect that new buildings will be fully electrified consistent with 2023 legislation. Table E-1 (below the discussion of demand) presents the Reference Case annual customer accounts for each customer sector for NYSEG and RG&E.

B. Annual Demand by Segment

For both NYSEG and RG&E, monthly Reference Case demand for each customer segment is forecasted using econometric models. Econometric models use historical relationships between the dependent variable and one or more independent variables to develop forecasts for the future. The models use Moody's economic data for upstate New York for NYSEG and Moody's economic data for the Rochester-MSA for RG&E. The model start dates and independent variables vary as explained below.

The Companies' existing gas energy efficiency rebate programs have had measurable impacts on customer usage. Historically the Companies' gas demand forecasts have been adjusted to account for reductions in annual demand expected from energy efficiency measures accumulating in the future.

However, many of the Companies' existing energy efficiency programs are being eliminated.[1] Therefore, the Reference Case contains residential energy efficiency adjustment only for 2025, and the commercial energy efficiency adjustment was reduced to eliminate impacts from cooking appliances after 2025. The energy efficiency adjustment to the Reference Case does not include adjustments for programs targeting building envelope improvements.

1. Residential Demand

The Reference Case residential demand forecast is determined by multiplying the forecasted number of customers by the forecasted use per customer (Dth/customer). Forecasted residential use per customer is developed using econometric models. The NYSEG residential use per customer econometric model starts in February 2010 and includes weather, price, trend, and consumption days as independent variables. The RG&E residential use per customer econometric model starts in January 2000 and includes price, a one month lagged dependent variable, and weather as independent variables.

The resulting demand forecast for 2024 and 2025 is adjusted to account for expected gas usage reductions from the Companies' existing energy efficiency programs, as stated above. The out of model adjustment for energy efficiency to residential demand ends after 2025 to reflect the Commission's July 2023 Order.[2]

2. Commercial Demand

The Reference Case commercial demand forecast is developed using econometric models. The NYSEG commercial demand econometric model starts in January 2010 and includes weather, price, and non-manufacturing employment as independent variables. The RG&E commercial demand econometric model starts in January 2010 and includes price, a one-month lagged dependent variable, and total employment as independent variables.[3]

As stated above, the resulting commercial demand forecast is adjusted to account for expected gas usage reductions from the Companies' existing energy efficiency programs. The out of model adjustment for commercial energy efficiency is reduced after 2025 by 8% and 3% for NYSEG and RG&E, respectively, to account for the elimination of rebates for efficient cooking equipment per the Commission's July 2023 Order.

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1 CASE 14-M-0094 and CASE 18-M-0084 – Order Directing Energy Efficiency and Building Electrification Proposals, July 20, 2023.

2 CASE 14-M-0094 and CASE 18-M-0084 – Order Directing Energy Efficiency and Building Electrification Proposals, July 20, 2023.

3 The RG&E commercial demand data is weather normalized prior to modeling.

3. Industrial Demand

The Reference Case industrial demand forecast is developed using econometric models. The NYSEG industrial demand econometric model starts in January 1996 and includes weather, price, manufacturing employment, trend, and a one-month lagged dependent variable as independent variables. The RG&E industrial demand econometric model starts in January 2000 and includes price, a one month lagged dependent variable, and manufacturing employment as independent variables.[4]

As stated above, the resulting industrial demand forecast is adjusted to account for expected gas usage reductions from the Companies' existing energy efficiency programs. The out of model adjustment for industrial energy efficiency is not affected by the Commission's July 2023 Order.

4. Municipal Demand

The Reference Case municipal demand forecast is developed using econometric models. The NYSEG municipal demand econometric model starts in January 2000 and includes weather and price as independent variables. The RG&E municipal demand econometric model starts in January 2010 and includes price, a one month lagged dependent variable, and population as independent variables.[5]

The resulting municipal demand forecast is adjusted to account for expected gas usage reductions from the Companies' existing energy efficiency programs, as stated above. The out of model adjustment for municipal energy efficiency is not affected by the Commission's July 2023 Order.

Table E-2 presents the Reference Case annual demand forecast for each customer sector for NYSEG and RG&E.

[4] The RG&E industrial demand data is weather normalized prior to modeling.

[5] The RG&E municipal demand data is weather normalized prior to modeling.

Table E-1

NYSEG Reference Case Annual Account Projection by Sector

	Residential	Commercial	Industrial	Municipal	Total
2024	242,752	26,893	447	2,848	272,940
2025	243,918	26,862	429	2,857	274,066
2026	243,918	26,831	411	2,865	274,025
2027	243,918	26,800	394	2,874	273,986
2028	243,918	26,769	376	2,883	273,946
2029	243,918	26,739	358	2,883	273,898
2030	243,918	26,708	340	2,883	273,849
2031	243,918	26,677	323	2,883	273,801
2032	243,918	26,646	305	2,883	273,752
2033	243,918	26,615	287	2,883	273,703
2034	243,918	26,584	269	2,883	273,654
2035	243,918	26,554	251	2,883	273,606
2036	243,918	26,523	234	2,883	273,558
2037	243,918	26,492	216	2,883	273,509
2038	243,918	26,461	198	2,883	273,460
2039	243,918	26,430	180	2,883	273,411
2040	243,918	26,399	162	2,883	273,362
2041	243,918	26,369	145	2,883	273,315
2042	243,918	26,338	127	2,883	273,266
2043	243,918	26,307	109	2,883	273,217

RG&E Reference Case Annual Account Projection by Sector

	Residential	Commercial	Industrial	Municipal	Total
2024	301,877	21,414	461	1,295	325,047
2025	303,378	21,402	445	1,313	326,538
2026	303,378	21,390	429	1,330	326,527
2027	303,378	21,377	414	1,348	326,517
2028	303,378	21,365	398	1,365	326,506
2029	303,378	21,353	382	1,365	326,478
2030	303,378	21,341	367	1,365	326,451
2031	303,378	21,329	351	1,365	326,423
2032	303,378	21,317	335	1,365	326,395
2033	303,378	21,305	320	1,365	326,368
2034	303,378	21,293	304	1,365	326,340
2035	303,378	21,281	288	1,365	326,312
2036	303,378	21,269	273	1,365	326,285
2037	303,378	21,256	257	1,365	326,256
2038	303,378	21,244	241	1,365	326,228
2039	303,378	21,232	226	1,365	326,201
2040	303,378	21,220	210	1,365	326,173
2041	303,378	21,208	194	1,365	326,145
2042	303,378	21,196	179	1,365	326,118
2043	303,378	21,184	163	1,365	326,090

Table E-2
NYSEG Reference Case Annual Demand Forecast by Sector (Dth)

	Residential	Commercial	Industrial	Municipal	Total
2024	22,242,389	14,904,631	11,890,772	5,788,753	54,826,544
2025	22,030,825	14,969,500	11,817,034	5,779,331	54,596,690
2026	21,881,225	14,983,311	11,702,951	5,764,087	54,331,574
2027	21,730,500	14,980,833	11,581,325	5,745,484	54,038,142
2028	21,579,239	14,987,043	11,456,265	5,725,020	53,747,567
2029	21,428,533	14,995,400	11,329,581	5,687,702	53,441,216
2030	21,277,091	14,995,154	11,200,647	5,647,947	53,120,838
2031	21,124,826	14,987,146	11,071,039	5,608,064	52,791,074
2032	20,971,595	14,974,499	10,940,204	5,570,093	52,456,390
2033	20,817,630	14,966,813	10,810,526	5,530,316	52,125,285
2034	20,663,563	14,956,421	10,680,414	5,490,728	51,791,126
2035	20,509,858	14,941,425	10,550,768	5,453,225	51,455,277
2036	20,356,249	14,921,285	10,421,471	5,414,074	51,113,079
2037	20,202,513	14,898,938	10,292,773	5,375,146	50,769,369
2038	20,048,637	14,876,890	10,165,587	5,338,239	50,429,352
2039	19,894,464	14,855,230	10,039,195	5,299,735	50,088,625
2040	19,740,083	14,835,166	9,913,277	5,261,443	49,749,969
2041	19,585,426	14,815,520	9,788,221	5,225,075	49,414,242
2042	19,430,374	14,796,067	9,663,233	5,187,147	49,076,821
2043	19,274,770	14,774,879	9,538,156	5,149,426	48,737,232

RG&E Reference Case Annual Demand Forecast by Sector (Dth)

	Residential	Commercial	Industrial	Municipal	Total
2024	26,996,997	14,347,620	12,881,334	2,752,462	56,978,412
2025	26,817,040	14,415,827	12,915,091	2,702,494	56,850,451
2026	26,780,162	14,457,526	12,926,136	2,668,257	56,832,081
2027	26,708,978	14,475,876	12,875,660	2,633,617	56,694,131
2028	26,623,293	14,498,838	12,824,537	2,598,391	56,545,059
2029	26,557,812	14,526,079	12,780,358	2,531,223	56,395,473
2030	26,512,322	14,541,988	12,731,389	2,461,486	56,247,185
2031	26,382,130	14,546,298	12,674,354	2,399,425	56,002,207
2032	26,140,001	14,543,022	12,617,796	2,334,887	55,635,707
2033	25,998,578	14,545,467	12,564,843	2,273,311	55,382,199
2034	25,925,458	14,545,658	12,511,802	2,212,918	55,195,836
2035	25,866,785	14,539,484	12,459,939	2,152,222	55,018,430
2036	25,811,725	14,527,790	12,409,646	2,094,157	54,843,318
2037	25,757,853	14,513,170	12,360,530	2,035,902	54,667,455
2038	25,703,953	14,500,257	12,314,141	1,980,007	54,498,359
2039	25,650,109	14,488,834	12,269,411	1,925,016	54,333,370
2040	25,597,370	14,480,095	12,225,210	1,869,678	54,172,353
2041	25,546,427	14,394,999	12,177,822	1,813,501	53,932,750
2042	25,497,280	14,377,337	12,126,442	1,759,631	53,760,690
2043	25,449,018	14,369,999	12,081,957	1,732,942	53,633,915

C. Design Day Demand

Design day demand is forecasted by applying annual growth from the annual demand forecast to the estimated design day demand for 2024. The design day demand forecast is presented in Table E-3.

Table E-3
Reference Case Annual Design Day Demand (Dth/Day)

	NYSEG	RG&E
2024[6]	456,944	506,391
2025	454,740	505,103
2026	452,330	505,073
2027	449,647	503,840
2028	446,991	502,494
2029	444,203	501,180
2030	441,282	499,878
2031	438,269	497,598
2032	435,207	494,091
2033	432,180	491,719
2034	429,123	490,021
2035	426,046	488,413
2036	422,910	486,825
2037	419,760	485,229
2038	416,642	483,697
2039	413,518	482,205
2040	410,412	480,752
2041	407,333	478,509
2042	404,237	476,941
2043	401,119	475,830

[6] NYSEG RG&E 2023-2024 Winter Supply Plan, Case 23-M-0230, July 19, 2023, Table 2.

II. Supply Forecast

Tables E-4 and E-5 summarize NYSEG and RG&E's firm peak day capacity by major source, as well as identify marketer supplies.

Table E-4
NYSEG Reference Case Forecast: Firm Peak Day Capacity by Source

				Marketer Provided Supplies:		
	Flowing Supplies	Storage	CNG	Mandatory Retail Access Capacity	Grandfathered Retail Access Capacity	**Total**
2024[7]	228,119	205,560	1,050	63,500	6,406	504,635
2025	228,119	205,560	1,050	63,500	6,406	504,635
2026	228,119	205,560	1,050	63,500	6,406	504,635
2027	228,119	205,560	1,050	63,500	6,406	504,635
2028	228,119	205,560	1,050	63,500	6,406	504,635
2029	228,119	205,560	1,050	63,500	6,406	504,635
2030	228,119	205,560	1,050	63,500	6,406	504,635
2031	228,119	205,560	1,050	63,500	6,406	504,635
2032	228,119	205,560	1,050	63,500	6,406	504,635
2033	228,119	205,560	1,050	63,500	6,406	504,635
2034	228,119	205,560	1,050	63,500	6,406	504,635
2035	228,119	205,560	1,050	63,500	6,406	504,635
2036	228,119	205,560	1,050	63,500	6,406	504,635
2037	228,119	205,560	1,050	63,500	6,406	504,635
2038	228,119	205,560	1,050	63,500	6,406	504,635
2039	228,119	205,560	1,050	63,500	6,406	504,635
2040	228,119	205,560	1,050	63,500	6,406	504,635
2041	228,119	205,560	1,050	63,500	6,406	504,635
2042	228,119	205,560	1,050	63,500	6,406	504,635
2043	228,119	205,560	1,050	63,500	6,406	504,635

[7] Source: NYSEG RG&E 2023-2024 Winter Supply Plan September 2023 Update, Case 23-M-0230, September 1, 2023, Table 1.

Table E-5
RG&E Reference Case Forecast: Firm Peak Day Capacity by Source

				Marketer Provided Supplies:		
	Flowing Supplies	Storage	Winter Peaking	Mandatory Retail Access Capacity	Grandfathered Retail Access Capacity	**Total**
2024[8]	226,100	179,000	40,000	73,618	11,104	529,822
2025	226,100	179,000	40,000	73,618	11,104	529,822
2026	226,100	179,000	40,000	73,618	11,104	529,822
2027	226,100	179,000	40,000	73,618	11,104	529,822
2028	226,100	179,000	40,000	73,618	11,104	529,822
2029	226,100	179,000	40,000	73,618	11,104	529,822
2030	226,100	179,000	40,000	73,618	11,104	529,822
2031	226,100	179,000	40,000	73,618	11,104	529,822
2032	226,100	179,000	40,000	73,618	11,104	529,822
2033	226,100	179,000	40,000	73,618	11,104	529,822
2034	226,100	179,000	40,000	73,618	11,104	529,822
2035	226,100	179,000	40,000	73,618	11,104	529,822
2036	226,100	179,000	40,000	73,618	11,104	529,822
2037	226,100	179,000	40,000	73,618	11,104	529,822
2038	226,100	179,000	40,000	73,618	11,104	529,822
2039	226,100	179,000	40,000	73,618	11,104	529,822
2040	226,100	179,000	40,000	73,618	11,104	529,822
2041	226,100	179,000	40,000	73,618	11,104	529,822
2042	226,100	179,000	40,000	73,618	11,104	529,822
2043	226,100	179,000	40,000	73,618	11,104	529,822

[8] Source: NYSEG RG&E 2023-2024 Winter Supply Plan September 2023 Update, Case 23-M-0230, September 1, 2023, Table 1.

III. GHG Emissions

Greenhouse gases ("GHG") are gases in the earth's atmosphere that trap heat and contribute to rising temperatures on earth. Emissions are estimated for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). This analysis estimates emissions from Scope 1, Scope 2, and Scope 3 sources. Total emissions are the sum of Scope 1, 2, and 3 emissions.

Reference Case GHG emissions are calculated for the 20-year analysis period using the Reference Case demand, supply, and system characteristics forecast. GHG emissions are also reported for 1990 since 1990 levels of emissions are the baseline from which reductions are measured.

A. Global Warming Potential

A Global Warming Potential ("GWP") is used to weigh the global warming impact of different GHGs to calculate total emissions on a carbon dioxide equivalent basis because it is helpful to have a single measure of emissions rather than three separate measures for each GHG. Specifically, Global Warming Potential factors are used to convert CO_2, CH_4, and N_2O into carbon dioxide equivalents (CO_2e). All CO2e values calculated in the LTP analysis and presented in the report and appendices use the Intergovernmental Panel on Climate Change ("IPCC") AR5 20-Year GWPs, as shown in Table E-6.

Formula:

$$(GWP(CO_2) * Mass\ of\ CO_2) + (GWP(CH_4) * Mass\ of\ CH_4) + \left(GWP(N_2O) * Mass\ of\ N_2O\right) = Mass\ of\ CO_2e$$

Table E-6
Global Warming Potential Factors

Gas	AR5 100-Year	AR5 20-Year
CO_2	1	1
CH_4	28	84
N_2O	265	264

Source: IPCC Climate Change 2014 Synthesis Report Box 3.2 Table 1

B. Common Conversion Factors

The common conversion factors in Table E-7 are used throughout analysis to compute GHG emissions. Emissions presented in this analysis are computed in metric tons (MT).

Table E-7
Common Conversion Factors

1000	kg	=	1	MT
2204.62	lbs.	=	1	MT
1.033	MMBtu	=	1	MCF

C. Scope 1 Emissions

1. Methodology

Scope 1 emissions include emissions from operating NYSEG and RG&E's distribution, transmission, and gathering segments. Emissions related to mains, services, meters, and various other sources are calculated.[9] Reference Case emissions are computed on a CO_2, CH_4, and N_2O basis for 1990 as well as for 2024-2043.

Mains and services related emissions were computed using a density and volumetric approach to derive the mass of emissions. Meter emissions were computed by multiplying the total number of meters by customer segment by the applicable emission factor. Emissions from other sources were calculated in a similar manner by applying appropriate emission factors to the appropriate quantities.

The tables below detail the methane and carbon dioxide calculations for mains and services. The tables display an input of one mile or service. The emission mass per mile is calculated by multiplying down the column. The general formulas for a mile of main or one service:

$$\mathbf{1.}\ \boldsymbol{Methane}\ (\boldsymbol{kg}) = Distance\ (miles) * Emission\ Factor\left(\frac{\frac{cf}{hr}}{mile\ or\ service}\right) * Time(hr) * Density\left(\frac{kg}{cf}\right)$$

$$\mathbf{2.}\ \boldsymbol{Carbon\ Dioxide}(\boldsymbol{kg}) = Distance(miles) * Emission\ Factor\left(\frac{\frac{cf}{hr}}{mile\ or\ service}\right) * Time\ (hr) * Mole\ Fraction\ (CO_2) * Density\left(\frac{kg}{cf}\right)$$

Tables E-8 and E-9 report emissions assumptions per mile of main by pipe material and Tables E-10 and E-11 report emissions assumptions per service by pipe material.

[9] Scope 1 other emissions include those associated with pipeline leaks, pressure relief values, blowdowns, and dig-ins, as well as emissions associated with the Companies' fleet, buildings, LDC M&R, and LDC small combustion.

Table E-8
Methane Emissions Assumptions per Mile of Main by Pipe Material

Material	Unprotected Steel	Protected Steel	Plastic	Cast/Wrought Iron
Mile	1.000	1.000	1.000	1.000
Emission Factor (cf/hr./mile)	12.580	0.350	1.130	27.250
Time (hours)	8760.000	8760.000	8760.000	8760.000
Density CH4 (kg/cf)	0.019	0.019	0.019	0.019
CH4 (kg)	**2115.855**	**58.867**	**190.057**	**4583.232**
CH4 (MT)	**2.116**	**0.059**	**0.190**	**4.583**

Source: 40 CFR Part 98, Table W-7 ('Default Methane Emission Factors for Natural Gas Distribution')

Table E-9
Carbon Dioxide Emissions Assumptions per Mile of Main by Pipe Material

	Unprotected Steel	Protected Steel	Plastic	Cast/Wrought Iron
Mile	1.000	1.000	1.000	1.000
Emission Factor (cf/hr./mile)	12.580	0.350	1.130	27.250
Time (hours)	8760.000	8760.000	8760.000	8760.000
Mole Fraction (CO2)	0.011	0.011	0.011	0.011
Density CH4 (kg/cf)	0.053	0.053	0.053	0.053
CO2 (kg)	**63.762**	**1.774**	**5.727**	**138.118**
CO2 (MT)	**0.064**	**0.002**	**0.006**	**0.138**

Table E-10
Methane Emissions Assumptions Per Service by Pipe Material

Material	Unprotected Steel	Protected Steel	Plastic	Copper
Emission Factor (cf/hr/service)	0.190	0.020	0.001	.030
Time(hours)	8760.000	8760.000	8760.000	8760.000
Density CH4 (kg/cf)	0.019	0.019	0.019	0.019
CH4 (kg)	**31.956**	**3.364**	**0.168**	**5.046**
CH4 (MT)	**0.032**	**0.003**	**0.000**	**0.005**

Source: 40 CFR Part 98, Table W-7 ('Default Methane Emission Factors for Natural Gas Distribution')

Table E-11
Carbon Dioxide Emissions Calculation Per Service by Pipe Material

Material	Unprotected Steel	Protected Steel	Plastic	Copper
Emission Factor (cf/hr./service)	0.190	0.020	0.001	.030
Time (hours)	8760.000	8760.000	8760.000	8760.000
Mole Fraction (CO2)	0.011	0.011	0.011	0.011
Density CH4 (kg/cf)	0.053	0.053	0.053	0.053
CO2 (kg)	**0.963**	**0.101**	**0.005**	**0.152**
CO2 (MT)	**0.001**	**0.000**	**0.000**	**0.000**

Table E-12 reports emissions factors per meter by customer segment.

Table E-12
Emissions Factors for Meters by Type

Meter Type	Residential	Commercial	Industrial
Methane (kg/meter)	1.490	23.400	105.000
Carbon Dioxide (kg/meter)	0.040	0.690	3.100

Source: Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2020 (US EPA, April 2022) Annex Table 3.6-2 (CH4) and Table 3.6-12 (CO2)

2. Assumptions, Inputs, Sources – Mains, Services, Meters

Mains and services by type reflect expected changes in the composition of the Company's distribution system over time due to its leak-prone pipe replacement program. Table E-13 reports the forecast of miles of mains by materials.

Table E-13
NYSEG Number of Miles of Mains by Material

	Unprotected Steel	Protected Steel	Plastic	Cast / Wrought Iron	Total Main Miles
1990	599	1,619	324	82	2,624
2024	58	2,105	2,705	3	4,871
2025	48	2,097	2,729	2	4,876
2026	38	2,089	2,753	1	4,881
2027	28	2,081	2,777	-	4,886
2028	18	2,073	2,793	-	4,884
2029	8	2,065	2,801	-	4,874
2030	-	2,057	2,809	-	4,866
2031	-	2,049	2,817	-	4,866
2032	-	2,041	2,825	-	4,866
2033	-	2,033	2,833	-	4,866
2034	-	2,025	2,841	-	4,866
2035	-	2,017	2,849	-	4,866
2036	-	2,009	2,857	-	4,866
2037	-	2,001	2,865	-	4,866
2038	-	1,993	2,873	-	4,866
2039	-	1,985	2,881	-	4,866
2040	-	1,977	2,889	-	4,866
2041	-	1,969	2,897	-	4,866
2042	-	1,961	2,905	-	4,866
2043	-	1,953	2,913	-	4,866

RG&E Number of Miles of Mains by Material

	Unprotected Steel	Protected Steel	Plastic	Cast / Wrought Iron	Total Main Miles
1990	314	2,667	599	420	4,000
2024	30	2,406	2,511	-	4,947
2025	20	2,392	2,535	-	4,947
2026	10	2,378	2,559	-	4,947
2027	-	2,364	2,583	-	4,947
2028	-	2,350	2,597	-	4,947
2029	-	2,336	2,611	-	4,947
2030	-	2,322	2,625	-	4,947
2031	-	2,308	2,639	-	4,947
2032	-	2,294	2,653	-	4,947
2033	-	2,280	2,667	-	4,947
2034	-	2,266	2,681	-	4,947
2035	-	2,252	2,695	-	4,947
2036	-	2,238	2,709	-	4,947
2037	-	2,224	2,723	-	4,947
2038	-	2,210	2,737	-	4,947
2039	-	2,196	2,751	-	4,947
2040	-	2,182	2,765	-	4,947
2041	-	2,168	2,779	-	4,947
2042	-	2,154	2,793	-	4,947
2043	-	2,140	2,807	-	4,947

Table E-14 presents the number of services by material.

Table E-14
NYSEG Number of Services by Material

	Unprotected Steel	Protected Steel	Plastic	Total Services
1990	23,445	63,387	38,523	125,355
2024	11,128	28,750	208,044	247,922
2025	9,274	28,750	210,240	248,264
2026	7,419	28,750	212,438	248,607
2027	5,564	28,750	214,635	248,949
2028	3,709	28,750	216,824	249,284
2029	1,855	28,750	219,012	249,617
2030	0	28,750	221,201	249,951
2031	0	28,750	221,535	250,285
2032	0	28,750	221,868	250,618
2033	0	28,750	222,201	250,951
2034	0	28,750	222,536	251,286
2035	0	28,750	222,870	251,620
2036	0	28,750	223,203	251,953
2037	0	28,750	223,537	252,287
2038	0	28,750	223,870	252,620
2039	0	28,750	224,203	252,953
2040	0	28,750	224,539	253,289
2041	0	28,750	224,872	253,622
2042	0	28,750	225,205	253,955
2043	0	28,750	225,588	254,338

RG&E Number of Services by Material

	Unprotected Steel	Protected Steel	Plastic	Copper	Total Services
1990	20,358	109,096	84,201	12,970	226,625
2024	2,324	71,593	209,509	2,933	286,359
2025	1,550	71,593	212,752	1,956	287,850
2026	775	71,593	214,494	978	287,839
2027	0	71,593	216,236	0	287,829
2028	0	71,593	216,225	0	287,818
2029	0	71,593	216,197	0	287,790
2030	0	71,593	216,170	0	287,763
2031	0	71,593	216,142	0	287,735
2032	0	71,593	216,114	0	287,707
2033	0	71,593	216,087	0	287,680
2034	0	71,593	216,059	0	287,652
2035	0	71,593	216,031	0	287,624
2036	0	71,593	216,004	0	287,597
2037	0	71,593	215,975	0	287,568
2038	0	71,593	215,947	0	287,540
2039	0	71,593	215,920	0	287,513
2040	0	71,593	215,892	0	287,485
2041	0	71,593	215,864	0	287,457
2042	0	71,593	215,837	0	287,430
2043	0	71,593	215,809	0	287,402

Table E-15 presents the number of meters by customer class.

Table E-15
NYSEG Number of Meters by Type

	Outdoor Residential Meters	Commercial Meters[10]	Industrial Meters
1990[11]	82,804	27,538	620
2024	242,752	29,741	447
2025	243,918	29,719	429
2026	243,918	29,696	411
2027	243,918	29,674	394
2028	243,918	29,652	376
2029	243,918	29,622	358
2030	243,918	29,591	340
2031	243,918	29,560	323
2032	243,918	29,529	305
2033	243,918	29,498	287
2034	243,918	29,467	269
2035	243,918	29,437	251
2036	243,918	29,406	234
2037	243,918	29,375	216
2038	243,918	29,344	198
2039	243,918	29,313	180
2040	243,918	29,282	162
2041	243,918	29,252	145
2042	243,918	29,221	127
2043	243,918	29,190	109

RG&E Number of Meters by Type

	Outdoor Residential Meters	Commercial Meters[12]	Industrial Meters
1990[13]	96,942	22,114	769
2024	301,877	22,709	461
2025	303,378	22,715	445
2026	303,378	22,720	429
2027	303,378	22,725	414
2028	303,378	22,730	398
2029	303,378	22,718	382
2030	303,378	22,706	367
2031	303,378	22,694	351
2032	303,378	22,682	335
2033	303,378	22,670	320
2034	303,378	22,658	304
2035	303,378	22,646	288
2036	303,378	22,634	273
2037	303,378	22,621	257
2038	303,378	22,609	241
2039	303,378	22,597	226
2040	303,378	22,585	210
2041	303,378	22,573	194
2042	303,378	22,561	179
2043	303,378	22,549	163

3. Reference Case Scope 1 Emissions Forecast

The Scope 1 emissions estimates in Tables E-16, E-17, E-18, and E-19 are based on the Company's Reference Case forecast of demand, supply, and distribution system characteristics. CO2e estimates reflect the 20-year GWP.

Table E-16
NYSEG Scope 1 Emissions – Mains (MT)

	CO2	CH4	CO2 e
1990	54	1,800	151,263
2024	23	773	64,937
2025	22	751	63,117
2026	22	729	61,298
2027	21	709	59,619
2028	21	691	58,057
2029	20	671	56,367
2030	20	655	55,033
2031	20	656	55,121
2032	20	657	55,210
2033	20	658	55,298
2034	20	659	55,386
2035	20	660	55,474
2036	20	661	55,562
2037	20	662	55,650
2038	20	663	55,739
2039	20	664	55,827
2040	20	665	55,915
2041	20	666	56,003
2042	20	668	56,091
2043	20	669	56,180

[10] Commercial meter counts include municipal meters.

[11] 1990 meter counts are sourced from EIA 176 sales and transport customer counts year 1997. Residential meters are adjusted to account for outdoor meters only.

[12] Commercial meter counts include municipal meters.

[13] RG&E 1990 meter counts based on 1993 Company provided data. Residential meters are adjusted to account for outdoor meters only.

RG&E Scope 1 Emissions – Mains (MT)

	CO2	CH4	CO2 e
1990	86	2,860	240,341
2024	21	682	57,340
2025	20	665	55,876
2026	20	648	54,413
2027	19	630	52,942
2028	19	632	53,096
2029	19	634	53,250
2030	19	636	53,405
2031	19	637	53,559
2032	19	639	53,713
2033	19	641	53,868
2034	19	643	54,022
2035	19	645	54,176
2036	19	647	54,331
2037	20	648	54,485
2038	20	650	54,639
2039	20	652	54,794
2040	20	654	54,948
2041	20	656	55,102
2042	20	658	55,257
2043	20	659	55,411

Table E-17
NYSEG Scope 1 Emissions – Services (MT)

	CO2	CH4	CO2 e
1990	29	969	81,419
2024	15	487	40,950
2025	13	428	36,000
2026	11	370	31,051
2027	9	311	26,102
2028	8	252	21,152
2029	6	193	16,202
2030	4	134	11,253
2031	4	134	11,258
2032	4	134	11,262
2033	4	134	11,267
2034	4	134	11,272
2035	4	134	11,276
2036	4	134	11,281
2037	4	134	11,286
2038	4	134	11,291
2039	4	134	11,295
2040	4	134	11,300
2041	4	135	11,305
2042	4	135	11,309
2043	4	135	11,315

RG&E Scope 1 Emissions – Services (MT)

	CO2	CH4	CO2 e
1990	33	1,097	92,194
2024	11	365	30,683
2025	10	336	28,234
2026	9	307	25,763
2027	8	277	23,293
2028	8	277	23,293
2029	8	277	23,292
2030	8	277	23,292
2031	8	277	23,292
2032	8	277	23,291
2033	8	277	23,291
2034	8	277	23,290
2035	8	277	23,290
2036	8	277	23,290
2037	8	277	23,289
2038	8	277	23,289
2039	8	277	23,288
2040	8	277	23,288
2041	8	277	23,288
2042	8	277	23,287
2043	8	277	23,287

Table E-18
NYSEG Scope 1 Emissions - Meters by Customer Segment (MT)

	Residential			Commercial			Industrial		
	CO2	CH4	CO2 e	CO2	CH4	CO2 e	CO2	CH4	CO2 e
1990	4	123	10,361	19	644	54,148	2	65	5,470
2024	11	361	30,374	20	696	58,479	1	47	3,944
2025	11	363	30,520	20	695	58,436	1	45	3,785
2026	11	363	30,520	20	695	58,391	1	43	3,626
2027	11	363	30,520	20	694	58,348	1	41	3,476
2028	11	363	30,520	20	694	58,304	1	39	3,317
2029	11	363	30,520	20	693	58,245	1	38	3,159
2030	11	363	30,520	20	692	58,184	1	36	3,000
2031	11	363	30,520	20	692	58,124	1	34	2,850
2032	11	363	30,520	20	691	58,063	1	32	2,691
2033	11	363	30,520	20	690	58,002	1	30	2,532
2034	11	363	30,520	20	690	57,941	1	28	2,373
2035	11	363	30,520	20	689	57,882	1	26	2,215
2036	11	363	30,520	20	688	57,821	1	25	2,065
2037	11	363	30,520	20	687	57,760	1	23	1,906
2038	11	363	30,520	20	687	57,699	1	21	1,747
2039	11	363	30,520	20	686	57,638	1	19	1,588
2040	11	363	30,520	20	685	57,577	1	17	1,429
2041	11	363	30,520	20	684	57,518	0	15	1,279
2042	11	363	30,520	20	684	57,457	0	13	1,121
2043	11	363	30,520	20	683	57,396	0	11	962

RG&E Scope 1 Emissions - Meters by Customer Segment (MT)

	Residential			Commercial			Industrial		
	CO2	CH4	CO2 e	CO2	CH4	CO2 e	CO2	CH4	CO2 e
1990	4	144	12,130	15	517	43,483	2	81	6,785
2024	13	450	37,772	16	531	44,652	1	48	4,067
2025	13	452	37,959	16	532	44,664	1	47	3,926
2026	13	452	37,959	16	532	44,674	1	45	3,785
2027	13	452	37,959	16	532	44,684	1	43	3,653
2028	13	452	37,959	16	532	44,694	1	42	3,512
2029	13	452	37,959	16	532	44,670	1	40	3,370
2030	13	452	37,959	16	531	44,647	1	39	3,238
2031	13	452	37,959	16	531	44,623	1	37	3,097
2032	13	452	37,959	16	531	44,599	1	35	2,956
2033	13	452	37,959	16	530	44,576	1	34	2,823
2034	13	452	37,959	16	530	44,552	1	32	2,682
2035	13	452	37,959	16	530	44,529	1	30	2,541
2036	13	452	37,959	16	530	44,505	1	29	2,409
2037	13	452	37,959	16	529	44,479	1	27	2,268
2038	13	452	37,959	16	529	44,456	1	25	2,126
2039	13	452	37,959	16	529	44,432	1	24	1,994
2040	13	452	37,959	16	528	44,409	1	22	1,853
2041	13	452	37,959	16	528	44,385	1	20	1,712
2042	13	452	37,959	16	528	44,361	1	19	1,579
2043	13	452	37,959	16	528	44,338	1	17	1,438

Table E-19
NYSEG Scope 1 Other Emissions (all others) – (MT)[14]

	CO2	CH4	N2O	CO2 e
1990	20,270	1,567	0	151,876
2024	20,273	1,694	0	162,599
2025	20,273	1,695	0	162,625
2026	20,273	1,695	0	162,652
2027	20,273	1,695	0	162,678
2028	20,273	1,695	0	162,686
2029	20,273	1,695	0	162,672
2030	20,273	1,695	0	162,663
2031	20,273	1,695	0	162,676
2032	20,273	1,695	0	162,689
2033	20,274	1,696	0	162,701
2034	20,274	1,696	0	162,714
2035	20,274	1,696	0	162,727
2036	20,274	1,696	0	162,740
2037	20,274	1,696	0	162,753
2038	20,274	1,696	0	162,766
2039	20,274	1,696	0	162,778
2040	20,274	1,697	0	162,791
2041	20,274	1,697	0	162,804
2042	20,274	1,697	0	162,817
2043	20,274	1,697	0	162,832

RG&E Scope 1 Other Emissions (all others) – (MT)[15]

	CO2	CH4	N2O	CO2 e
1990	6,464	1,348	0	119,738
2024	6,466	1,404	0	124,391
2025	6,466	1,404	0	124,444
2026	6,466	1,404	0	124,444
2027	6,466	1,404	0	124,442
2028	6,466	1,404	0	124,442
2029	6,466	1,404	0	124,441
2030	6,466	1,404	0	124,440
2031	6,466	1,404	0	124,439
2032	6,466	1,404	0	124,438
2033	6,466	1,404	0	124,437
2034	6,466	1,404	0	124,436
2035	6,466	1,404	0	124,435
2036	6,466	1,404	0	124,434
2037	6,466	1,404	0	124,433
2038	6,466	1,404	0	124,432
2039	6,466	1,404	0	124,431
2040	6,466	1,404	0	124,430
2041	6,466	1,404	0	124,429
2042	6,466	1,404	0	124,428
2043	6,466	1,404	0	124,427

Table E-20 presents total Scope 1 emissions by source.

Table E-20

NYSEG Scope 1 Total Emissions (Sum of Mains, Services, Meters, and Other) – (MT)

	CO_2	CH_4	N_2O	CO_2 e
1990	20,377	5,169	0	454,536
2024	20,344	4,059	0	361,282
2025	20,342	3,978	0	354,484
2026	20,339	3,895	0	347,537
2027	20,337	3,814	0	340,742
2028	20,334	3,735	0	334,036
2029	20,332	3,653	0	327,165
2030	20,329	3,575	0	320,653
2031	20,329	3,574	0	320,548
2032	20,329	3,573	0	320,434
2033	20,329	3,571	0	320,320
2034	20,329	3,570	0	320,206
2035	20,329	3,569	0	320,094
2036	20,329	3,567	0	319,988
2037	20,329	3,566	0	319,874
2038	20,329	3,565	0	319,760
2039	20,329	3,563	0	319,646
2040	20,329	3,562	0	319,532
2041	20,329	3,561	0	319,429
2042	20,329	3,559	0	319,315
2043	20,329	3,558	0	319,203

RG&E Scope 1 Total Emissions (Sum of Mains, Services, Meters, and Other) – (MT)

	CO_2	CH_4	N_2O	CO_2 e
1990	6,605	6,043	0	514,211
2024	6,528	3,481	0	298,906
2025	6,526	3,435	0	295,104
2026	6,525	3,387	0	291,038
2027	6,523	3,339	0	286,973
2028	6,523	3,339	0	286,995
2029	6,523	3,339	0	286,983
2030	6,523	3,339	0	286,980
2031	6,523	3,339	0	286,969
2032	6,523	3,338	0	286,957
2033	6,523	3,338	0	286,954
2034	6,523	3,338	0	286,942
2035	6,523	3,338	0	286,930
2036	6,523	3,338	0	286,927
2037	6,523	3,338	0	286,913
2038	6,523	3,338	0	286,902
2039	6,523	3,338	0	286,899
2040	6,523	3,338	0	286,887
2041	6,523	3,338	0	286,875
2042	6,523	3,337	0	286,872
2043	6,523	3,337	0	286,860

D. Scope 2 Emissions

1. Methodology

Scope 2 emissions are indirect emissions from purchased electricity for operations. Electric usage was held constant over the 20-year period at 6,058 MWh/year for NYSEG and 4,193 MWh/year for RGE. Annual CO_2, CH_4, and N_2O emissions were computed by multiplying electric usage by projected emissions factors based on EIA's forecasted generation mix for Upstate New York.[16] The projected emission factors are based off current factors provided by the EPA's Power Profiler as shown in Table E-21.

General Formula:

$$CO_2, CH_4, N_2O\ (lbs) = Electric\ Usage\ (MWh) * Emission\ Factor\ (CO_2, CH_4, N_2O)$$

2. Assumptions, Inputs, Sources

Table E-21 presents electric emissions factor for the upstate New York subregion.

Table E-21
2023 Electric Emission Factors – NYUP Subregion – (lbs/MWH)

CO_2	CH_4	N_2O
233.1	0.015	0.002

Source: Environmental Protection Agency eGrid Power Profiler

Table E-22 presents the emissions factor based over the LTP period based on a projection of the electric generation fuel mix.

[16] US EPA eGrid 2021, EIA AEO 2023 Generation Fuel Mix for Upstate NY. Includes emissions associated with imported gas.

Table E-22
Electric Emission Factor for Projected Fuel Mix in Upstate New York – (lbs/MWH)

Electric Generation, Upstate NY (lb/MWh)(2)	CO2	CH4	N2O	CO2e
1990	233.1	0.0	0.0	234.9
2024	252.1	0.5	0.0	294.8
2025	229.2	0.5	0.0	267.9
2026	221.5	0.4	0.0	258.8
2027	189.1	0.4	0.0	220.7
2028	185.9	0.4	0.0	217.0
2029	159.3	0.3	0.0	185.8
2030	194.2	0.4	0.0	226.8
2031	194.2	0.4	0.0	226.7
2032	174.3	0.3	0.0	203.3
2033	169.8	0.3	0.0	198.1
2034	174.3	0.3	0.0	203.4
2035	171.9	0.3	0.0	200.6
2036	136.2	0.3	0.0	158.7
2037	142.6	0.3	0.0	166.2
2038	154.9	0.3	0.0	180.6
2039	147.0	0.3	0.0	171.3
2040	166.3	0.3	0.0	194.0
2041	166.9	0.3	0.0	194.7
2042	167.5	0.3	0.0	195.5
2043	168.5	0.3	0.0	196.5

Source: US EPA eGrid 2020, EIA AEO 2023 Generation Fuel Mix for Upstate NY. Includes emissions associated with imported gas.

3. Reference Case Scope 2 Emissions Forecast

Table E-23 presents the total Scope 2 emissions.

Table E-23
NYSEG Scope 2 Total Emissions – (MT)

	CO2	CH4	N20	CO2 e
1990	640.51	0.04	0.01	645.42
2024	692.71	1.37	0.01	809.94
2025	629.86	1.24	0.01	736.10
2026	608.70	1.20	0.01	711.25
2027	519.47	1.02	0.01	606.49
2028	510.88	1.00	0.01	596.40
2029	437.77	0.85	0.01	510.55
2030	533.65	1.04	0.01	623.14
2031	533.56	1.04	0.01	623.02
2032	478.82	0.93	0.01	558.74
2033	466.53	0.91	0.01	544.32
2034	479.00	0.93	0.01	558.96
2035	472.41	0.92	0.01	551.21
2036	374.22	0.72	0.01	435.95
2037	391.83	0.75	0.01	456.63
2038	425.50	0.82	0.01	496.17
2039	403.81	0.78	0.01	470.70
2040	456.88	0.89	0.01	533.01
2041	458.55	0.89	0.01	534.97
2042	460.33	0.89	0.01	537.07
2043	462.88	0.90	0.01	540.05

RG&E Scope 2 Total Emissions – (MT)

	CO2	CH4	N20	CO2 e
1990	443.34	0.03	0.00	446.74
2024	479.47	0.95	0.00	560.61
2025	435.96	0.86	0.00	509.50
2026	421.32	0.83	0.00	492.30
2027	359.56	0.70	0.00	419.79
2028	353.61	0.69	0.00	412.81
2029	303.01	0.59	0.00	353.38
2030	369.37	0.72	0.00	431.32
2031	369.31	0.72	0.00	431.24
2032	331.42	0.64	0.00	386.74
2033	322.92	0.63	0.00	376.76
2034	331.55	0.64	0.00	386.89
2035	326.98	0.64	0.00	381.53
2036	259.02	0.50	0.00	301.75
2037	271.21	0.52	0.00	316.06
2038	294.52	0.57	0.00	343.43
2039	279.50	0.54	0.00	325.80
2040	316.24	0.61	0.00	368.93
2041	317.39	0.62	0.00	370.29
2042	318.63	0.62	0.00	371.74
2043	320.39	0.62	0.00	373.80

E. Scope 3 Emissions

Scope 3 emissions are indirect emissions resulting from assets not owned or controlled by NYSEG and RG&E but related to NYSEG and RG&E's operations. Scope 3 emissions are comprised of emissions associated with end user combustion and gas imported into NYSEG and RG&E's distribution system ("imported gas").[17]

1. End User Emissions

a. Methodology

Scope 3 end user emissions result from the combustion of natural gas by the Company's end-use customers. End user emissions are estimated using the 40 CFR Part 98, Subpart NN methodology with adjustments to include methane and nitrous oxide components. Emissions are calculated by multiplying total throughput by applicable emission factors.

[17] Note that the term "imported gas" refers to gas imports into NYSEG/RG&E's distribution system, not gas imports from other countries.

Formula:

$$CO_2, CH_4, N_2O\ (kg) = Volume\ (Mcf) * Heating\ Value\ \left(\frac{MMBTu}{Mcf}\right) * Emission\ Factor\ \left(kg\frac{CO_2, CH_4, N_2O}{MMBtu}\right)$$

b. Assumptions, Inputs, Sources

Tables E-24, E-25, and E-26 present the assumptions and results that result in a forecast of Scope 3 end-user emissions.

Table E-24
NYSEG Total Throughput

	Volume (Dth)
1990	49,614,790
2024	54,826,544
2025	54,596,690
2026	54,331,574
2027	54,038,142
2028	53,747,567
2029	53,441,216
2030	53,120,838
2031	52,791,074
2032	52,456,390
2033	52,125,285
2034	51,791,126
2035	51,455,277
2036	51,113,079
2037	50,769,369
2038	50,429,352
2039	50,088,625
2040	49,749,969
2041	49,414,242
2042	49,076,821
2043	48,737,232

RG&E Total Throughput

	Volume (Dth)
1990	51,936,720
2024	56,978,412
2025	56,850,451
2026	56,832,081
2027	56,694,131
2028	56,545,059
2029	56,395,473
2030	56,247,185
2031	56,002,207
2032	55,635,707
2033	55,382,199
2034	55,195,836
2035	55,018,430
2036	54,843,318
2037	54,667,455
2038	54,498,359
2039	54,333,370
2040	54,172,353
2041	53,932,750
2042	53,760,690
2043	53,633,915

Table E-25
End User Emission Factors

CO_2 (kg CO_2/MMBtu)	CH_4 (kg CH_4/MMBtu)	N_2O (kg N_2O/MMBtu)
53.06	0.001	0.0001

Source: Greenhouse Gas Inventory Guidance: Direct Emissions from Stationary Combustion Sources Appendix A-Table A-3

c. Reference Case Scope 3 End-User Emissions Forecast

Table E-26
NYSEG Scope 3 End User Emissions (MT)

	CO_2	CH4	N_2O	CO_2 e
1990	2,640,228	50	5	2,645,722
2024	2,917,570	55	5	2,923,640
2025	2,905,338	55	5	2,911,383
2026	2,891,230	54	5	2,897,246
2027	2,875,615	54	5	2,881,598
2028	2,860,152	54	5	2,866,103
2029	2,843,850	54	5	2,849,767
2030	2,826,801	53	5	2,832,683
2031	2,809,253	53	5	2,815,098
2032	2,791,443	53	5	2,797,251
2033	2,773,823	52	5	2,779,595
2034	2,756,041	52	5	2,761,776
2035	2,738,169	52	5	2,743,866
2036	2,719,959	51	5	2,725,619
2037	2,701,669	51	5	2,707,290
2038	2,683,575	51	5	2,689,159
2039	2,665,443	50	5	2,670,989
2040	2,647,422	50	5	2,652,930
2041	2,629,556	50	5	2,635,028
2042	2,611,601	49	5	2,617,035
2043	2,593,530	49	5	2,598,926

RG&E Scope 3 End User Emissions (MT)

	CO_2	CH4	N_2O	CO_2 e
1990	2,763,789	52	5	2,769,539
2024	3,032,080	57	6	3,038,389
2025	3,025,271	57	6	3,031,565
2026	3,024,293	57	6	3,030,586
2027	3,016,952	57	6	3,023,230
2028	3,009,019	57	6	3,015,280
2029	3,001,059	57	6	3,007,304
2030	2,993,168	56	6	2,999,396
2031	2,980,132	56	6	2,986,333
2032	2,960,629	56	6	2,966,789
2033	2,947,138	56	6	2,953,270
2034	2,937,221	55	6	2,943,333
2035	2,927,781	55	6	2,933,872
2036	2,918,462	55	6	2,924,534
2037	2,909,104	55	5	2,915,157
2038	2,900,105	55	5	2,906,139
2039	2,891,325	54	5	2,897,341
2040	2,882,757	54	5	2,888,755
2041	2,870,007	54	5	2,875,978
2042	2,860,851	54	5	2,866,803
2043	2,854,104	54	5	2,860,043

2. Imported Gas

a. Methodology

Imported Gas emissions are indirect emissions related to producing and transporting gas to NYSEG and RG&E's distribution system. These emissions are categorized as "local and upstream gas". These two segments are computed using the same methodology but different emission factors. Out-of-state upstream production and transmission has much higher emission factors than in-state local production. In addition, Gulf Coast production and transmission has much higher emissions factors than Appalachian Shale production and transmission. It is assumed that all 1990 out-of-state gas was Gulf Coast conventional production, and all 2024-2043 out-of-state gas is Appalachian shale production. The emission factors were converted from the NETL Lifecyle Assessment to account for the use of the 20-Year GWP, and an estimate of gas distribution emissions were removed from the NETL Lifecycle Assessment emissions factors because distribution-related emissions are captured in Scope 1 emissions above.

Formula:

$$CO_2, CH_4, N_2O\ (kg) = Volume\ (Mcf) * Heating\ Value\ \left(\frac{MMBTu}{Mcf}\right) * Emission\ Factor\left(g\frac{CO_2, CH_4, N_2\ O}{MJ}\right)$$

b. Assumptions/Inputs/Sources

As presented in Table E-27, total Reference Case forecasted throughput is allocated into upstream and local gas[18] on a monthly basis using historical ratios.

Table E-27
NYSEG Annual Out-of-State Upstream and In-State Local Gas

	Upstream Gas (Dth)	Local Gas (Dth)	Total (Dth)
1990	49,310,294	304,496	49,614,790
2024	54,535,438	291,107	54,826,544
2025	54,306,840	289,851	54,596,690
2026	54,043,326	288,248	54,331,574
2027	53,751,646	286,496	54,038,142
2028	53,462,811	284,756	53,747,567
2029	53,158,293	282,923	53,441,216
2030	52,839,839	280,999	53,120,838
2031	52,512,057	279,017	52,791,074
2032	52,179,386	277,005	52,456,390
2033	51,850,266	275,019	52,125,285
2034	51,518,117	273,009	51,791,126
2035	51,184,290	270,987	51,455,277
2036	50,844,153	268,927	51,113,079
2037	50,502,511	266,858	50,769,369
2038	50,164,541	264,811	50,429,352
2039	49,825,864	262,761	50,088,625
2040	49,489,246	260,723	49,749,969
2041	49,155,541	258,701	49,414,242
2042	48,820,153	256,668	49,076,821
2043	48,482,610	254,622	48,737,232

[18] Local gas is natural gas produced in the state of New York.

RG&E Annual Out-of-State Upstream and In-State Local Gas

	Upstream Gas (Dth)	Local Gas (Dth)	Total (Dth)
1990	51,912,735	23,985	51,936,720
2024	56,955,777	22,635	56,978,412
2025	56,827,853	22,598	56,850,451
2026	56,809,492	22,589	56,832,081
2027	56,671,606	22,525	56,694,131
2028	56,522,603	22,456	56,545,059
2029	56,373,083	22,389	56,395,473
2030	56,224,860	22,325	56,247,185
2031	55,979,995	22,212	56,002,207
2032	55,613,663	22,044	55,635,707
2033	55,360,269	21,930	55,382,199
2034	55,173,991	21,845	55,195,836
2035	54,996,665	21,765	55,018,430
2036	54,821,632	21,686	54,843,318
2037	54,645,849	21,606	54,667,455
2038	54,476,829	21,530	54,498,359
2039	54,311,915	21,455	54,333,370
2040	54,150,971	21,382	54,172,353
2041	53,911,479	21,271	53,932,750
2042	53,739,496	21,194	53,760,690
2043	53,612,781	21,135	53,633,915

Table E-28
Imported Gas Emission Factors

	Appalachian Shale Basin (g/MJ)	Gulf-Conventional Basin (g/MJ)	In-State Local Gas (Kg/MMBtu)
CO_2	10.66	10.79	0.0020
CH_4	0.1249	0.2877	0.0680
N_2O	0.0001	0.0001	N/A

Source: NETL Lifecyle Assessment 2019 Exhibit E-32; Source: 2021 with adjustments made to the distribution emissions based on the JU GHG Workgroup May 31, 2023 filing Statewide GHG Emissions Report: Summary Report, Table A3

c. Reference Case Scope 3 Imported Gas Emissions Forecast

Table E-29 presents the forecast of Scope 3 emissions.

Table E-29
NYSEG Scope 3 Imported Gas Emissions 2024-2043 (MT)

	CO2	CH4	N2O	CO2 e
1990	563,017	15,030	7	1,827,322
2024	615,175	7,226	7	1,224,073
2025	612,596	7,195	7	1,218,942
2026	609,624	7,160	7	1,213,026
2027	606,334	7,122	7	1,206,478
2028	603,075	7,083	7	1,199,994
2029	599,640	7,043	7	1,193,158
2030	596,048	7,001	7	1,186,009
2031	592,351	6,957	7	1,178,650
2032	588,598	6,913	7	1,171,182
2033	584,885	6,870	7	1,163,793
2034	581,139	6,826	7	1,156,337
2035	577,373	6,781	7	1,148,843
2036	573,536	6,736	7	1,141,207
2037	569,682	6,691	7	1,133,537
2038	565,870	6,646	7	1,125,950
2039	562,050	6,601	7	1,118,346
2040	558,253	6,557	7	1,110,790
2041	554,488	6,512	7	1,103,298
2042	550,705	6,468	7	1,095,769
2043	546,897	6,423	7	1,088,191

RG&E Scope 3 Imported Gas Emissions 2024-2043 (MT)

	CO2	CH4	N2O	CO2 e
1990	592,731	15,803	7	1,922,063
2024	642,477	7,527	8	1,276,787
2025	641,033	7,510	8	1,273,919
2026	640,826	7,508	8	1,273,507
2027	639,271	7,489	8	1,270,416
2028	637,590	7,470	8	1,267,076
2029	635,904	7,450	8	1,263,724
2030	634,232	7,430	8	1,260,401
2031	631,469	7,398	8	1,254,912
2032	627,337	7,350	8	1,246,700
2033	624,479	7,316	8	1,241,019
2034	622,377	7,292	7	1,236,843
2035	620,377	7,268	7	1,232,868
2036	618,403	7,245	7	1,228,944
2037	616,420	7,222	7	1,225,004
2038	614,513	7,199	7	1,221,215
2039	612,653	7,178	7	1,217,518
2040	610,838	7,156	7	1,213,910
2041	608,136	7,125	7	1,208,541
2042	606,196	7,102	7	1,204,686
2043	604,767	7,085	7	1,201,845

Appendix F:

CRA/Stakeholder Final Suggested Scenario List

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

April 26, 2024

Avangrid

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Global Assumptions (to be used for all scenarios)

- Model a 1% annual nominal reduction in heat pump cost, which aligns with the projected cost curve from the NREL Electrification Futures study's Moderate Advancement scenario. *Source*
- Assume zero carbon capture and sequestration for the industrial segment.
- Remove any maximum participation rate used for all customer segments. The resulting GHG emissions reduction will be calculated for these scenarios, and may exceed or fall short of 65%, as determined by the model.
- The prohibition on fossil fuels will be modeled for all new buildings seven stories or smaller using electrification starting in 2026, except for commercial and industrial buildings larger than 100,000 square feet. Starting in 2029, all new buildings should be modeled with electric heating , per the legislation passed in May 2023.
- Remove all hydrogen and RNG systemwide blending.
    - CRA acknowledges these supply-side alternatives may be used in a targeted fashion for difficult-to-electrify industrial customer applications. However, this use for RNG and hydrogen is outside the scope of the specific scenarios CRA is recommending at this time.
- All four scenarios should use the same weatherization (including for industrials) and TENs assumptions as the LTP.
- No incremental costs (relative to reference case) for electrification should be added for new construction for any customer that is prohibited from installing fossil fuel equipment per NYS legislation passed in May 2023.
    - Accordingly, the Reference Case for these three scenarios should remove all residential and commercial gas customer growth starting in 2026 (and therefore there will be no costs or benefits associated with electrifying new construction in the modeling).
        - CRA plans to recommend this change in the Reference Case in its Preliminary Findings Report that will be filed in March 2024.
- Starting in 2028, assume that 0.5% of existing customer conversions of furnace systems and 0.5% of new customers adopt ground-source heat pumps for residential and commercial market segments, each increasing 0.5% annually through 2043
    - Average capital cost of $30,000 before incentives.
    - Model a 45% reduction in annual energy usage compared to customers that use a ccASHP.

  - *Geothermal heat pump assumptions were developed using CRA research and stakeholder input from NY-GEO.*

- The electrification of boilers should be assumed to occur using the same adoption rates as furnaces in all scenarios.

- Please conduct a BCA for each of the new scenarios using each of the SCT, Rate Impact Measure, and Utility Cost Tests.

Suggested Incentives to Model (Scenarios 2, 3, and 4)

- Please model the point-of-sale rebates for LMI customers from the High Efficiency Electric Home Rebate Act for both electrification and weatherization. These rebates should be modeled beginning in 2024.
  - The HEEHRA rebate covers 100% of the costs to electrify and weatherize homes in low-income households and 50% of the costs for moderate-income households up to $14,000. Heat pump unit rebates max out at $8,000 with additional rebates for wiring, circuit breaker panel work, etc., for the max total rebate of $14,000. *Source*
- Non-LMI customers are eligible for a 30% federal tax credit up to $2,000 for heat pumps and $1,200 for weatherization via the 2022 Inflation Reduction Act. *Source*
- Geothermal heat pump system tax credits are also available.
  - Utility point-of-sale rebate through the NYS Clean Heat program: For this specific heat pump sizing, the point-of-sale rebate would be $5,400 per geothermal system.
  - 2022 Inflation Reduction Act for ten years beginning in 2023: 30% tax credit for residential customers and 40% for commercial customers through 2032 (assumes 10% bonus tax credit provision for commercial customers).
  - 25% NY State tax credit up to $5,000 for residential customers.
  - *Source 1*, *Source 2*. *Developed using CRA research and stakeholder input from NY-GEO.*

- For the purposes of these scenarios, please assume these tax credits continue at these levels through 2043. We recognize that under current federal policy, tax credits begin to sunset in 2032, but continued incentives will likely be necessary to support continued adoption of these technologies.
- Please assume tax credits and rebates are available for all eligible customers. In other words, there are no budgetary constraints for these programs.

Suggested Scenario Specific Assumptions

1. Base LTP scenario but utilizes full electrification for customers with furnaces using ccASHPs (electric backup) and assume hybrid systems using conventional ASHPs for customers with boilers:
   - Use the same adoption rate that the Companies currently assume for their Initial LTP.

- Assume that customers with furnaces adopt ccASHPs for the residential, commercial, municipal, and industrial market segments.

- Assume that customers with boilers convert to ASHP systems using mini-split air source heat pumps for residential, commercial, municipal segments assuming same adoption rate as gas furnace conversions.

- Reduction in pipeline and storage capacity fixed costs, decreasing by 0.5% each year starting in 2028 through 2043. Additionally, please be sure to remove the pipeline and storage capacity cost premiums that were added for hydrogen/RNG.

2. Hybrid Heating Scenario utilizing ccASHPs for furnaces for all segments and ASHPs for boilers. Also, please include the following assumptions:

    - Use the same adoption rate that the Companies currently assume for their Initial LTP.

    - Include incentives as a customer benefit for weatherization and heat pumps (ccASHPs, air-source heat pumps, and geothermal heat pumps).

    - Reduction in pipeline and storage capacity fixed costs, decreasing by 0.5% each year starting in 2028 through 2043. Additionally, please be sure to remove the pipeline and storage capacity cost premiums that were added for hydrogen/RNG.

3. Full Electrification Scenario utilizing ccASHPs for all segments (furnaces and boilers):

    - Use the same adoption rate that the Companies currently assume for their Initial LTP.

    - Includes incentives as a customer benefit for weatherization and heat pumps (ccASHPs, air-source heat pumps, and geothermal heat pumps).

    - 1.0% reduction in pipeline and storage capacity fixed costs, decreasing an additional 1.0% each year starting in 2028 through 2043. Additionally, please be sure to remove the pipeline and storage capacity cost premiums that were added for hydrogen/RNG.

    - Introduce strategic downsizing for the natural gas system, using the steps below as a proxy for downsizing.

        - 1.0% reduction in O&M costs, decreasing an additional 1.0% each year starting in 2028 through 2043 due to strategic downsizing of the system**.**

        - 1.0% reduction in CapEx spend, decreasing an additional 1.0% each year starting in 2028 through 2043 due to fewer infrastructure needs.

4. Full Electrification Scenario utilizing ccASHPs for all segments (furnaces and boilers):

    - Use the same adoption rate as the NYSEG/RG&E Initial LTP's "CLCPA Full Electrification Scenario" (this is the only scenario that has a different adoption rate; the first three use

the same adoption rate from the Initial LTP).

- Include incentives as a customer benefit for weatherization and heat pumps (ccASHPs, air-source heat pumps, and geothermal heat pumps).

- Utilize reduced up-front costs for ccASHP system as shown in Table 11 (page 35) of Strategen's Comments on the NYSEG/RG&E Initial LTP (this is the only scenario that utilizes different up-front costs; the first three use the same up-front costs as the Initial LTP's Full Electrification scenarios).

- 3.0% reduction in pipeline and storage capacity fixed costs, decreasing an additional 3.0% each year starting in 2028 through 2043. Additionally, please be sure to remove the pipeline and storage capacity cost premiums that were added for hydrogen/RNG.

- Introduce strategic downsizing for the natural gas system, using the steps below as a proxy for downsizing.

    - 3.0% reduction in O&M costs, decreasing an additional 3.0% each year starting in 2028 through 2043 due to strategic downsizing of the system**.**

    - 3.0% reduction in CapEx spend, decreasing an additional 3.0% each year starting in 2028 through 2043 due to fewer infrastructure needs.

Appendix G:

Revised CRA DR-8 (March 25, 2024)

New York State Electric and Gas

Rochester Gas and Electric

Case 23-G-0437

April 26, 2024

Avangrid

A member of the Iberdrola Group

CRA Charles River Associates

Revised CRA DR-8

Case No: 23-G-0437 **Date:** 3/19/24 (Revised 3/25/24)

1. CRA is requesting two additional scenarios. For both new scenarios, please use all the same assumptions from **CRA/Stakeholder Scenario 4 in the Revised LTP** as a starting point.

   For both new scenarios, please respond by updating all the same charts/graphs that the Revised LTP has for the CRA/Stakeholder Scenarios 1 – 4. In addition to providing these charts/graphs as a response to this data request, CRA requests these two additional scenarios be included in the Companies' Final LTP.

   For the first new scenario (which can be referred to as CRA/Stakeholder Scenario 5), adjust CRA/Stakeholder Scenario 4 for the following assumptions:
   a. Assume that all customers' weatherization occurs prior to electrification, allowing for reduced electric usage and heat pump size
      i. Due to this change, assume that 50% of electrifying customers install a 3-ton heat pump (rather than the 3.5-ton heat pump modeled by the Companies in CRA Scenario 4) at a capital cost of $1,000 less than the 3.5-ton heat pump
   b. In addition to the reductions in CapEx, operating expenses, and fixed pipeline & storage costs, please assume an equal reduction in actual mileage of distribution pipe in the natural gas system, therefore resulting in equivalent emissions reduction due to the calculation of emissions being based on mileage of pipe.
   c. Please model cold-climate ASHP COP improvement over time, consistent with the 2030 and 2040 COP values provided in slide 17 of NYSERDA's "Modeling Managed Building Electrification in New York State" presentation from October 18, 2023. This can be found here. These values are used in NYSERDA's *Integration Analysis*, which derives ASHP annual COP improvement from NREL's 2021 *Electrification Futures Study* "Moderate Advancement" scenario.

2. For the second new scenario (can be referred to as CRA/Stakeholder Scenario 6), please use all the same assumptions as CRA/Stakeholder Scenario 5, except adjust adoption rates such that the emissions reduction is on pace to meet the 2050 CLCPA goal of 85% below 1990 levels, similar to the Companies' existing CLCPA scenarios.

3. Please provide the decarbonization models (BCA included) for these two new scenarios.

4. Footnote 134 of the Revised LTP references the fact that three items identified in the four original CRA/Stakeholder-Driven Scenarios were not modeled and would be included in the Final LTP. These items are as follows:

   a. Changing the Reference Case for the four CRA/Stakeholder scenarios to remove all residential and commercial growth starting 2026
   b. Modeling a subset of residential and commercial furnace electrification customers adopting ground source heat pumps

c. Conducting Rate Impact Measure and Utility Cost Test as additional BCAs

CRA requests the results of the original four stakeholder-driven scenarios in response to this data request, rather than the Final LTP.

5. In the Revised LTP, the Companies provided sensitivities on gas commodity pricing. Please perform sensitivities for all-in electric pricing of +/- 20%.