

November 17, 2021

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
Attention: Filing Center
201 High Street SE, Suite 100
Salem, Oregon 97301-3398

**RE: UM 2178, Natural Gas Fact-Finding Per Executive Order 20-04
NW Natural's Alternative Climate Protection Program Compliance
Scenarios**

Northwest Natural Gas Company, dba NW Natural ("NW Natural" or "Company"), submits its response to the Public Utility Commission of Oregon Staff's ("Commission Staff") request for alternative Climate Protection Program ("CPP") compliance scenarios developed by the Commission Staff. NW Natural is also submitting a PowerPoint presentation summarizing its modeling.

If you have any questions, please do not hesitate to contact me at zachary.kravitz@nwnatural.com or (503) 610-7617 with copies to the following:

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Rates & Regulatory Affairs
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250 SW Taylor Street
Portland, Oregon 97204
Telephone: (503) 610-7330
Fax: (503) 220-2579
eFiling@nwnatural.com

Sincerely,

/s/ Zachary Kravitz

Zachary Kravitz
NW Natural
Senior Director, Rates and Regulatory Affairs

Attachments

OPUC Natural Gas Fact-Finding Staff Alternate Scenarios Addendum

UM 2178, November 17, 2021

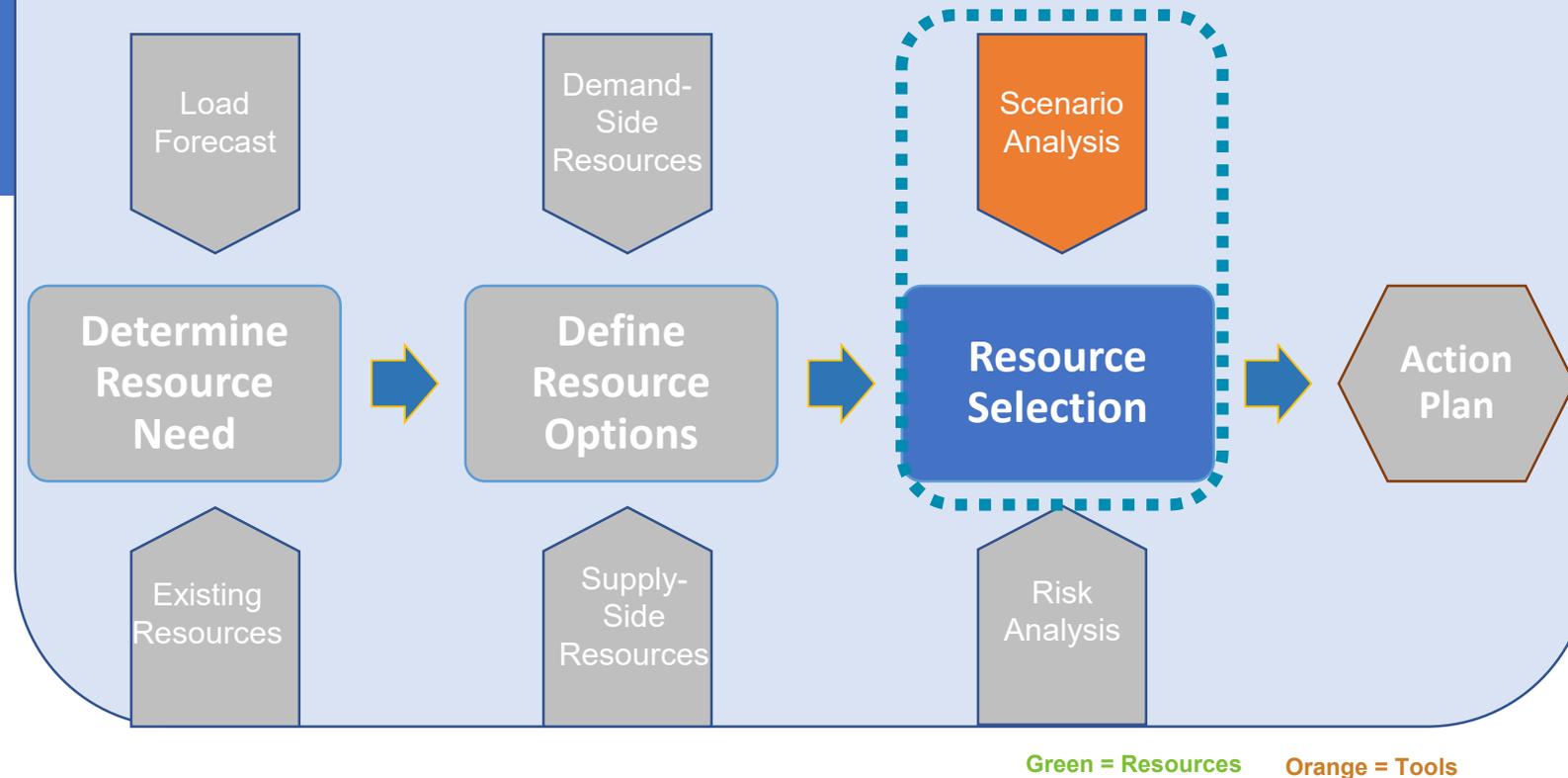


Supplemental Alternative Scenarios Analyzed

OPUC Staff Directed Alternative Scenarios:

- **Alternate Scenario 1- Assumed Aggressive Electrification (including Industrial)**
- **Alternate Scenario 2 – Assumed Aggressive and Rapid Electrification (not including Industrial)**

Planning Environment



OPUC Staff Provided the Following Direction for Two Alternate Scenarios:



Alternate Scenario #1- Accelerated Innovation / Electrification / High Social Cost of Greenhouse Gas

- **Accelerated Innovation:** Assume a 30 percent six-year production tax credit for the production of green hydrogen and syngas for which construction begins before 2026.¹ It is anticipated that projects may be outside the ordinary course of business and would result in near-term and aggressive emission reductions.
- **Higher Cost of GHG:** Assume updates to the social cost of carbon. Beginning in 2026, adjust the CCI price to align with the Social Cost of Carbon's 95th percentile with a three percent discount.² For example, starting in 2026 use the starting value of \$173.
- **Electrification:**
 - Fraction of new buildings (residential and commercial) using gas goes from its present share to zero in 2030 and stays zero thereafter
 - Existing buildings converting to electricity goes from its present share to 90 percent in 2050
 - Light industry converts to 90 percent electricity by 2050

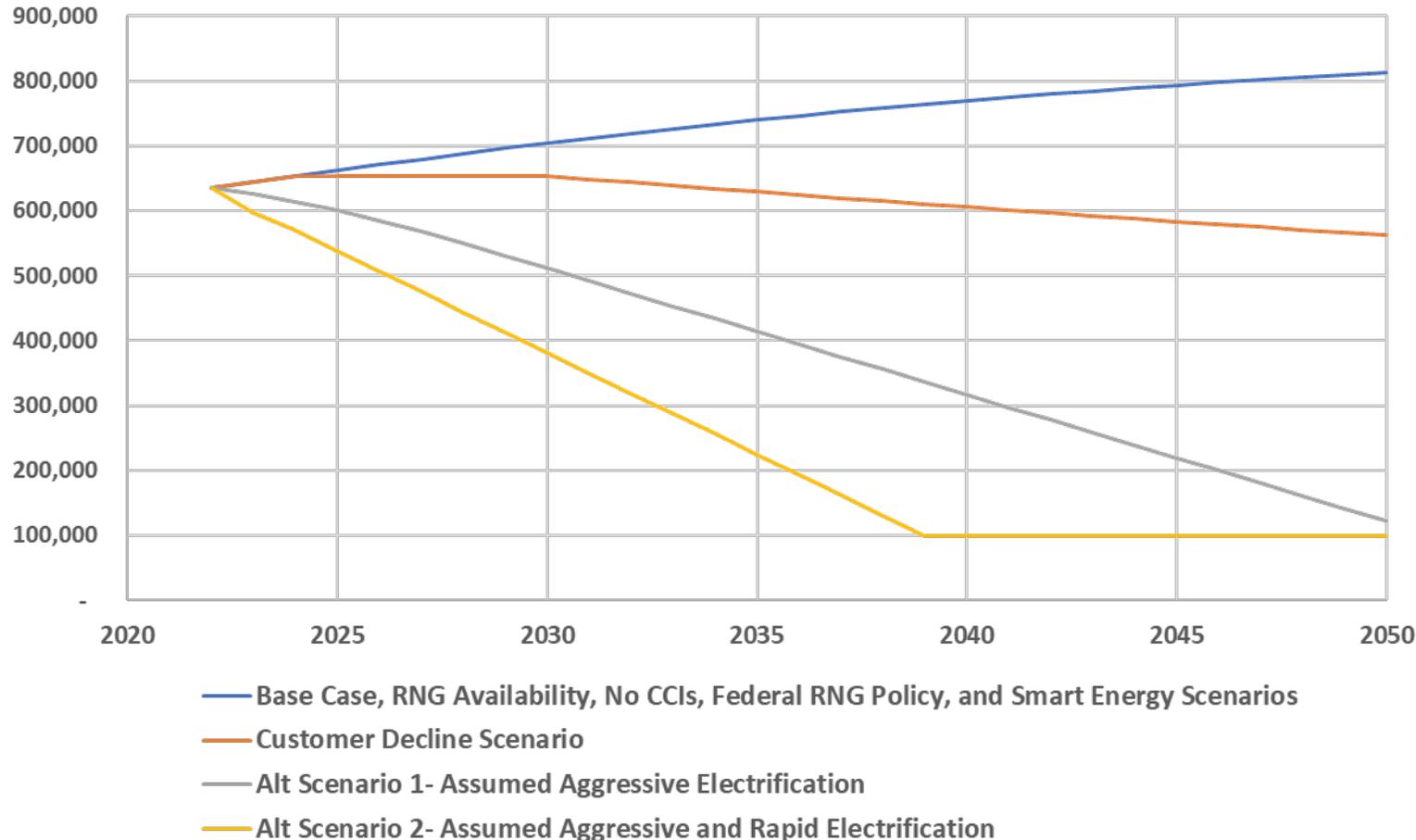
Alternate Scenario #2-Delayed Innovation / Accelerated Electrification

- **Delayed Innovation:** Use a slower energy efficiency technology adoption curve. Gas heat pump water heaters come to market, but there are no gas heat pumps until after 2030 and they assume a traditional s-curve adoption pattern.³
- **Supply Competition:** RNG availability is limited to the percentage of the national RNG resource equal to the company's throughput share of total gas use in the U.S., including power sector use. National RNG resource is ICF's Low Resource Potential for RNG in 2040, namely 1,660 trillion Btu (tBtu) of RNG produced annually for pipeline injection by 2040.⁴
- **Very Rapid Electrification:**
 - The fraction of new buildings (residential and commercial) using gas goes from its present share to zero in 2025 and stays zero thereafter.
 - Fraction of existing buildings converting to electricity goes from its present share to 90 percent by 2040.

Customer Forecast by Scenario



Residential Customers By CPP Compliance Scenario

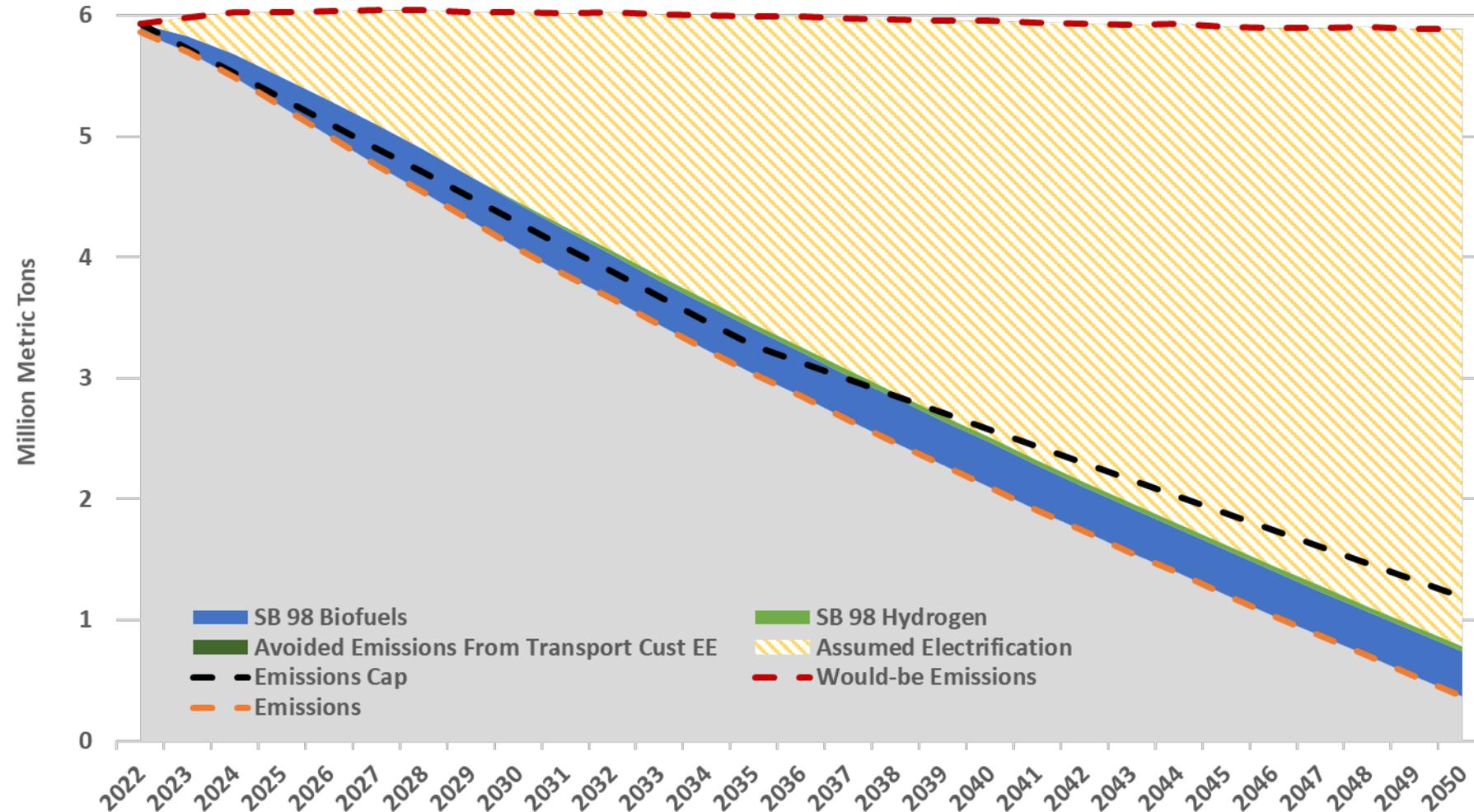


- The biggest difference between the two alternate scenarios and the scenarios presented in September is the expectation relative to the amount of customer NW Natural has. In the two alternate scenarios it is assumed the vast majority of customers leave the system by either 2050 (Alternative Scenario 1) or 2040 (Alternative Scenario 2)
- Commercial Customer Counts Follow the same trajectory

CPP Compliance Under Alternate Scenario 1- Assumed Aggressive Electrification



Alternative Scenario 1 - Assumed Aggressive Electrification



- Deploying the assumptions relative to electrification makes the additional assumptions about hydrogen tax credits and the social cost of carbon irrelevant as the assumed reduction in load from electrification is sufficient to meet CPP obligations
- There is no incremental action that would need to take place to comply with the CPP if electrification were to occur on this massive scale and compressed timeframe, so there are no additional costs that would need to be accrued for compliance
- Given this result, NW Natural will refer to this Scenario as the “Assumed Aggressive Electrification Scenario”
- NW Natural assumed that 90% of all industrial load is electrified by 2050 as there is not a formal definition of “light industry”

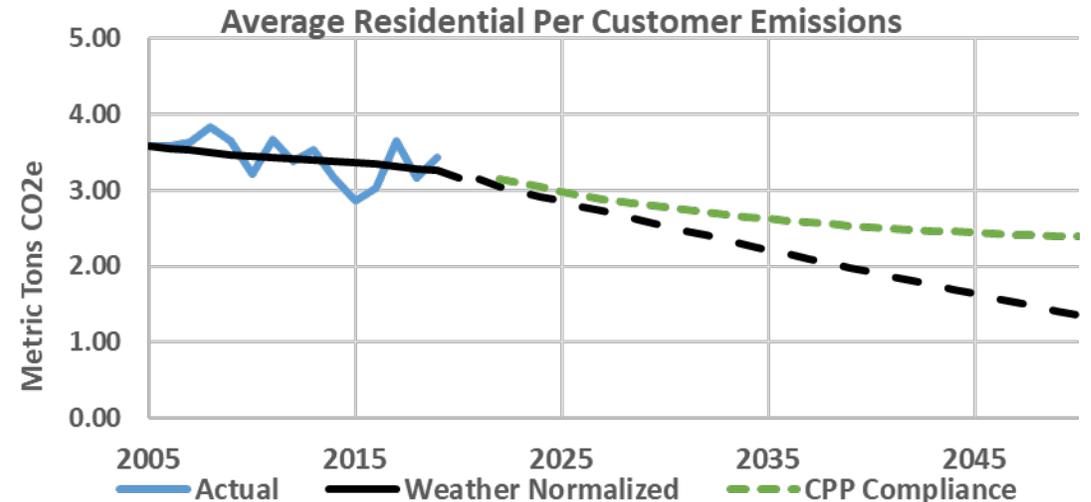
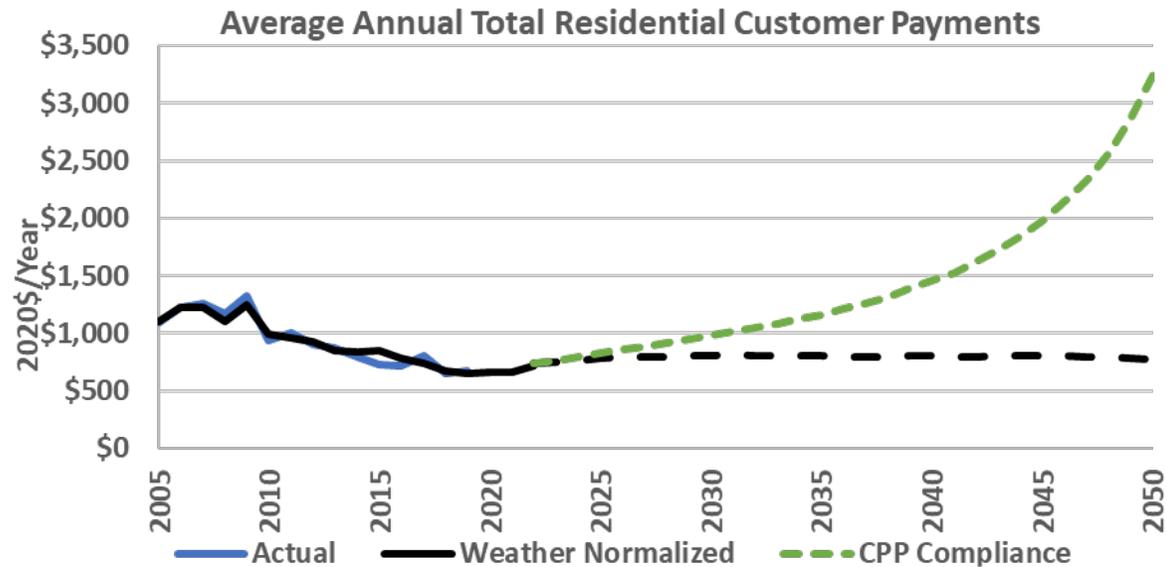
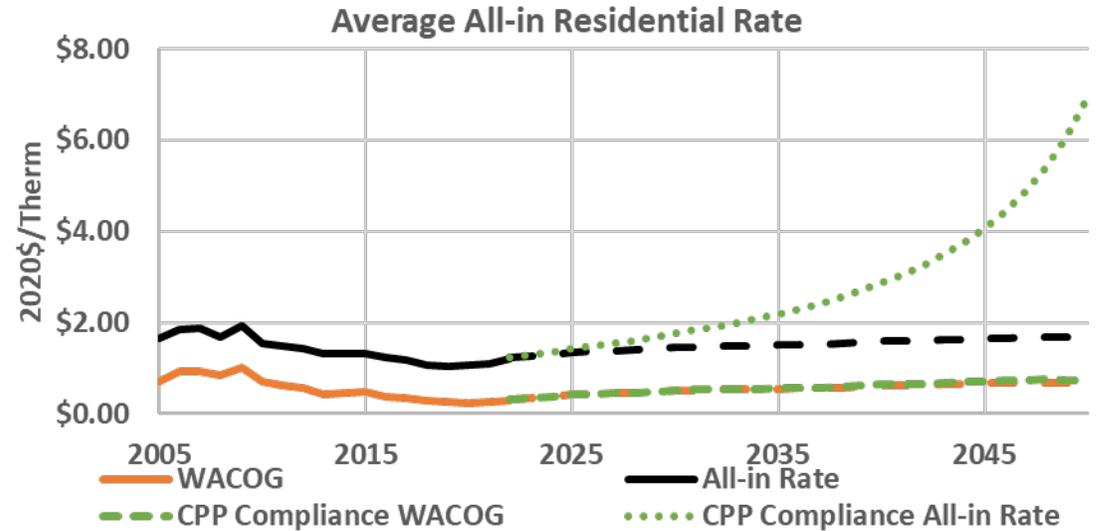
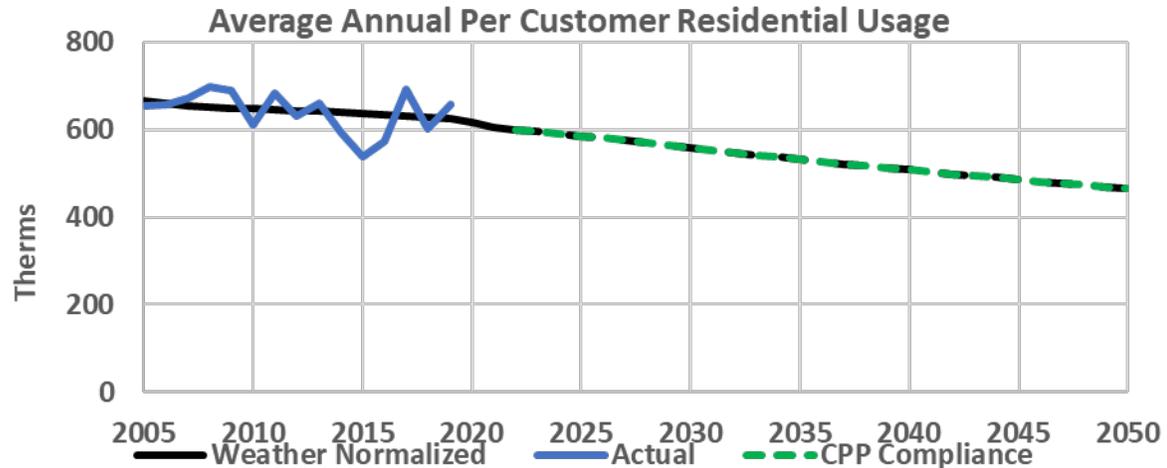
Note on Utility Rates

- At a high level:

$$\text{Utility Rates} = \frac{\text{Costs not tied to energy use} + \text{costs tied to energy use}}{\text{total energy use}}$$

- When energy use falls precipitously, like is assumed in the Staff directed alternate scenarios, the costs not tied to energy use that are difficult to avoid/reduce are spread over a much smaller amount of total energy use and rates increase
- The alternate scenarios shown here direct the utilities to assume 80-90% of customers leave the natural gas system, which means the few customers that would remain would potentially be subject to high rates associated with costs that are not tied to energy use without actions to mitigate this issue
 - This impact on rates under drastically falling energy use is not up for debate, the question is whether it is prudent to assume this level of energy use decline and what the costs would be to the 80-90% of customers that leave the gas system to replace the energy needs they would otherwise rely upon the gas system for

Alternate Scenario 1- Assumed Aggressive Electrification- Residential Results*

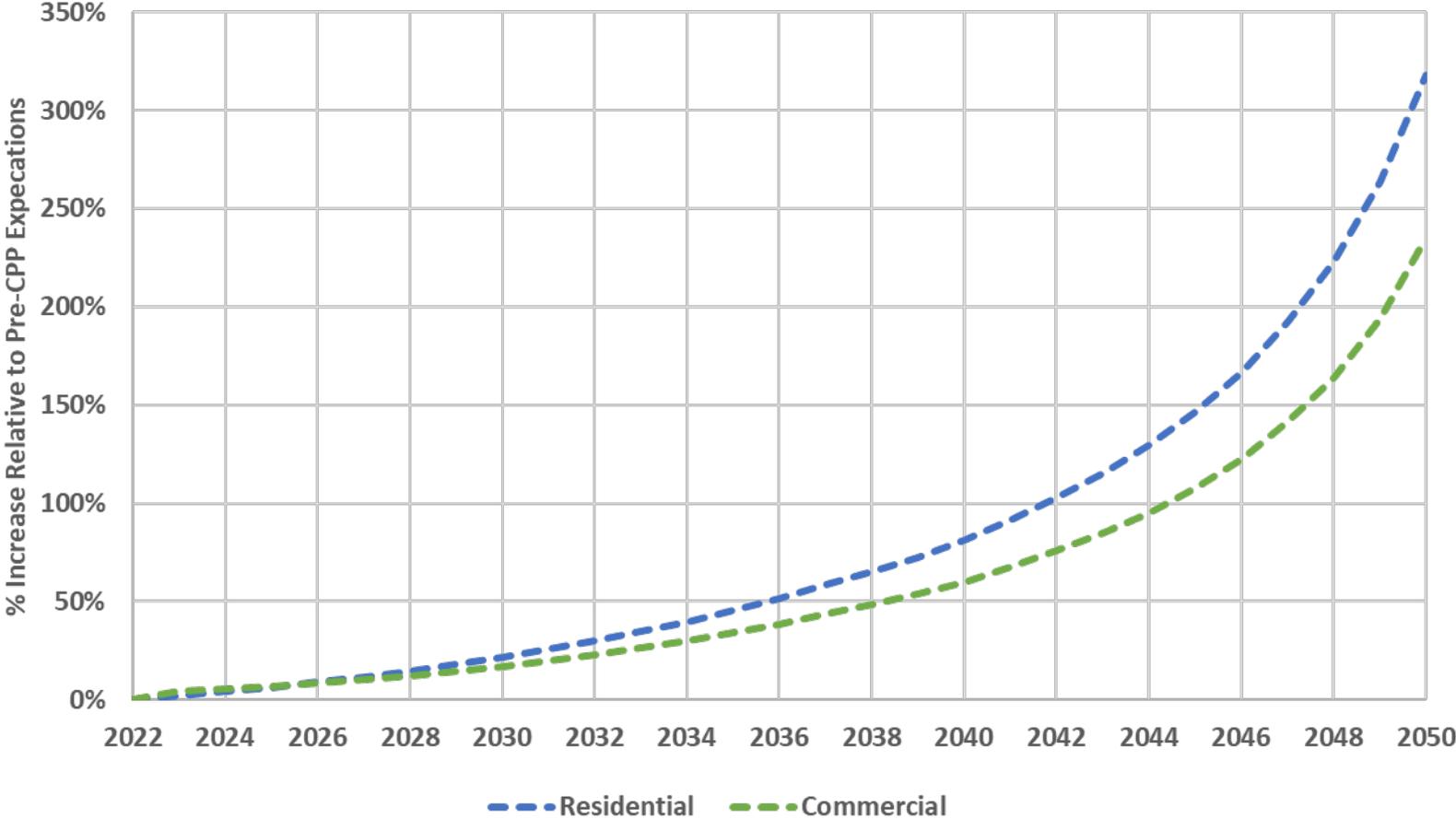


*Note that per customer impacts are applicable to a very small amount of remaining residential customers

Alternate Scenario 1- Assumed Aggressive Electrification- Bill Impacts*



Projected Increase in Total Annual Bills from Assumed Electrification



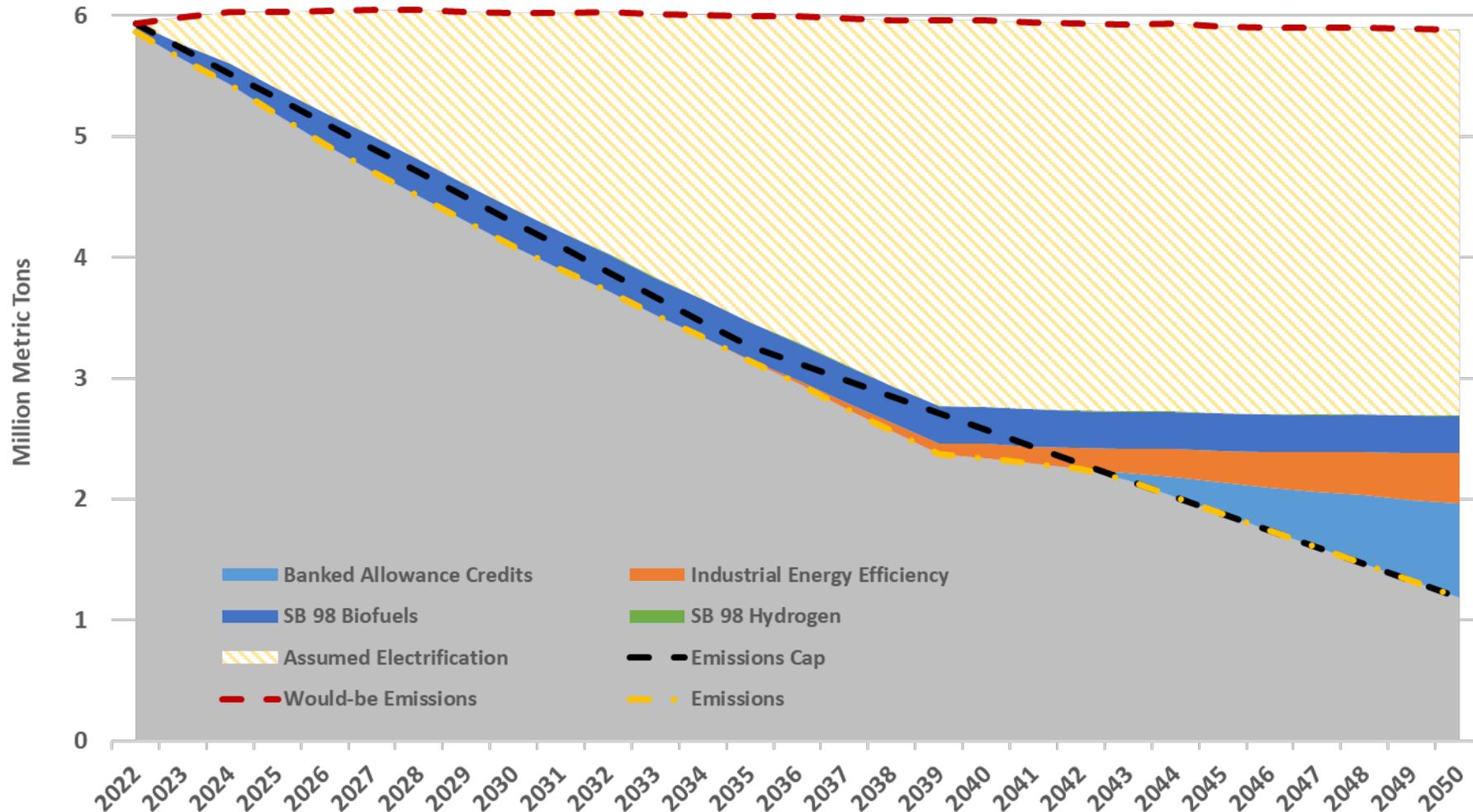
	Residential	Commercial	Industrial
2022	0%	0%	Unknown
2025	6%	7%	
2030	22%	17%	
2035	45%	34%	
2040	81%	60%	
2050	318%	235%	

*Note impacts are applicable only to the very small amount of remaining customers as the scenario assumes no new customers and that most customers leave the system by 2050

CPP Compliance Under Alternate Scenario 2- Assumed Aggressive & Rapid Electrification

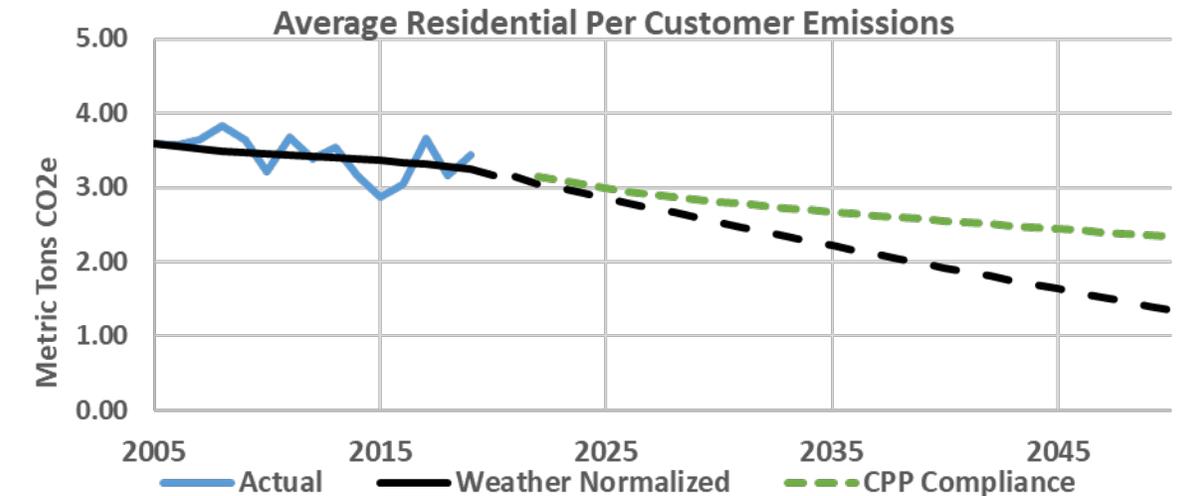
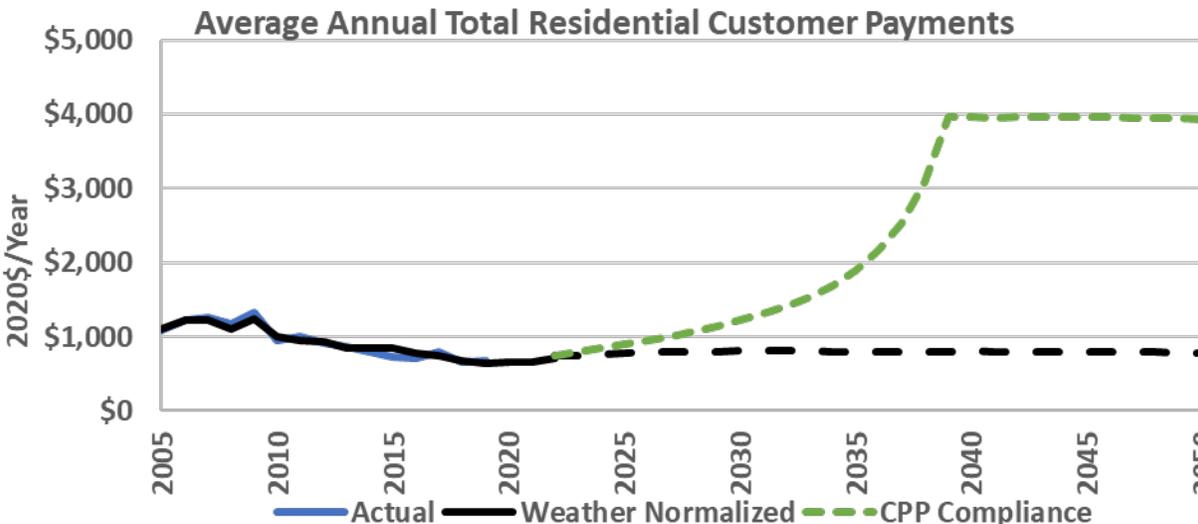
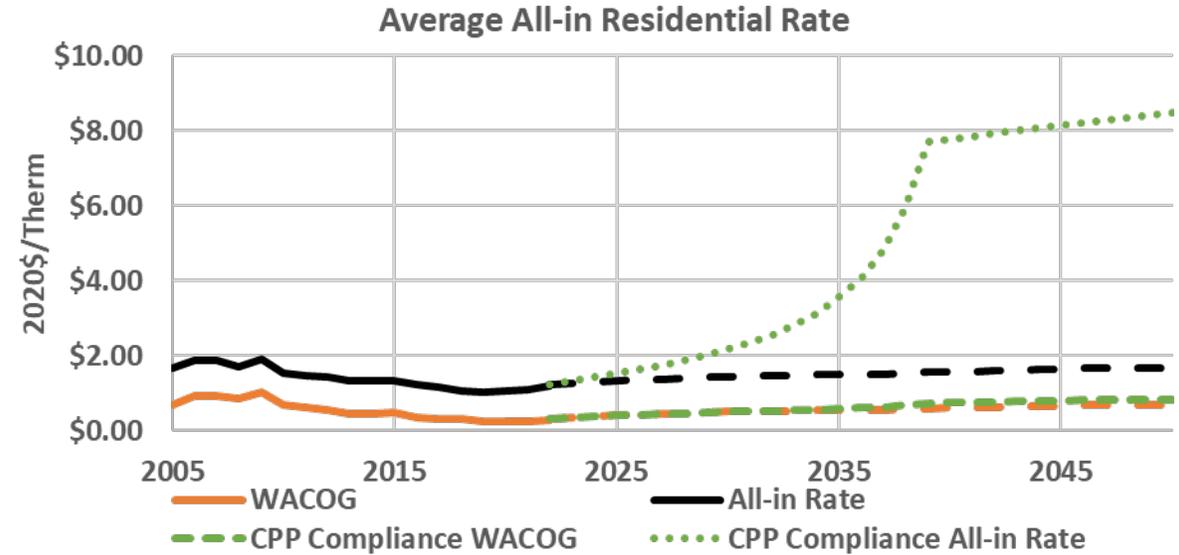
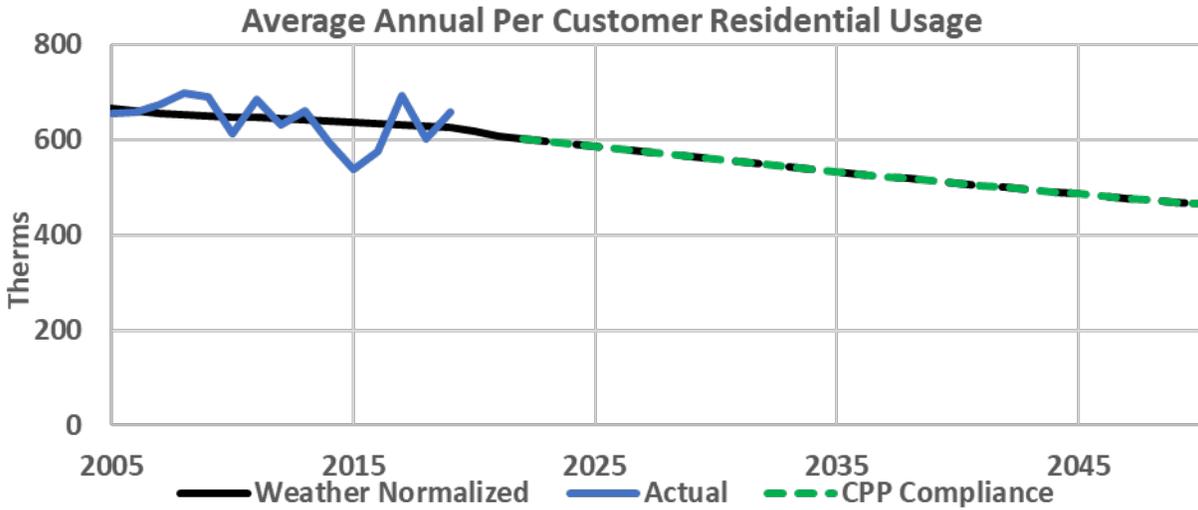


OPUC Staff Directed Alternate Scenario 2- Assumed Aggressive and Rapid Electrification



- Similar to Alternative Scenario 1, deploying the assumptions relative to electrification makes the additional assumption about gas heat pump adoption irrelevant and the constraint on RNG availability nonbinding, hence the naming of this scenario
- Without the assumption of industrial electrification a moderate amount of industrial energy efficiency would be needed starting around 2035 in addition to the banked allowance credits collected before 2042 for CPP compliance in the 2040s.

Alternate Scenario 2- Assumed Aggressive & Rapid Electrification- Residential Results*

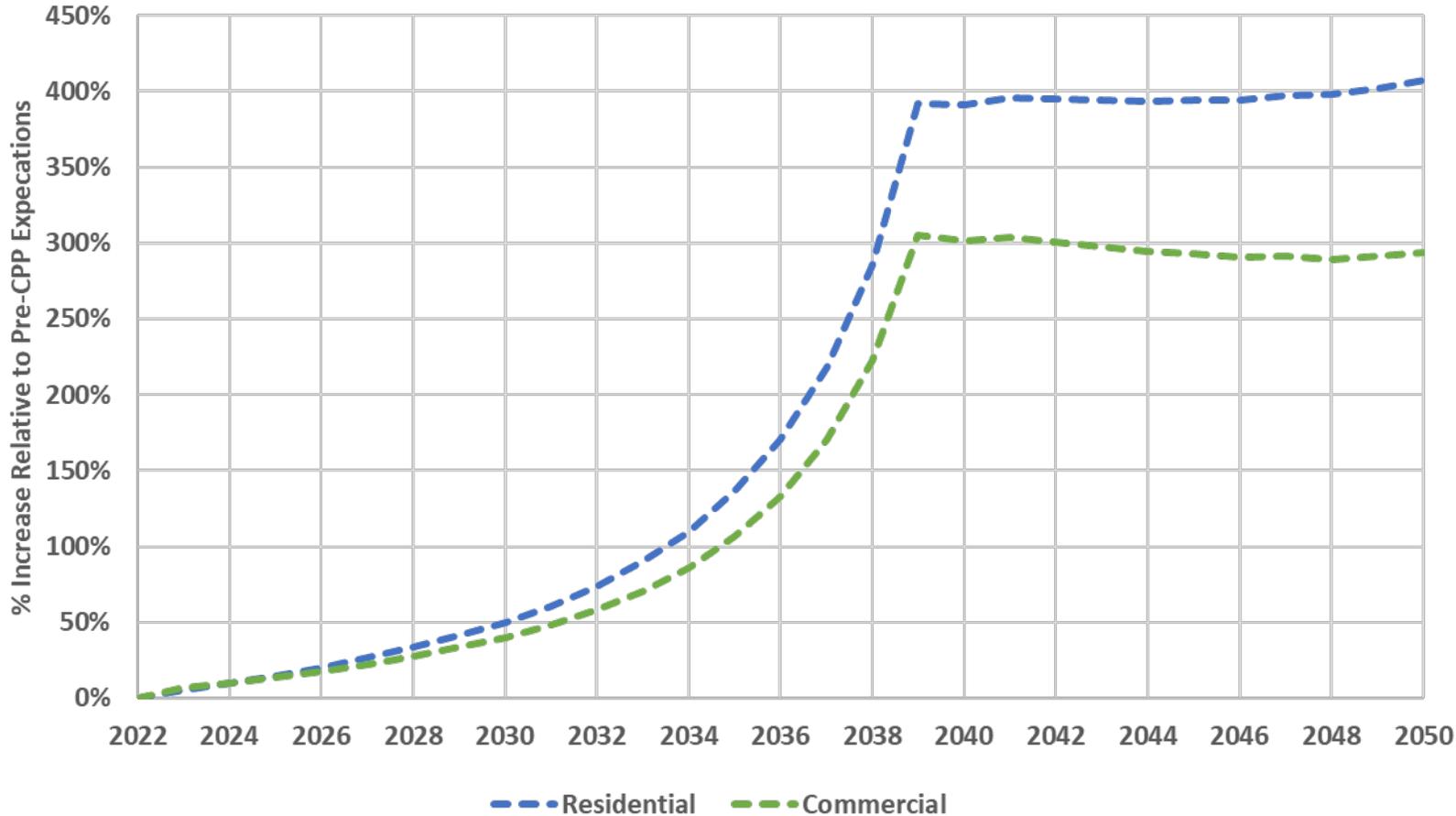


*Note that per customer impacts are applicable to a very small amount of remaining residential customers

Alternate Scenario 1- Assumed Aggressive Electrification- Bill Impacts*



Projected Increase in Total Annual Bills from Assumption of Electrification



	Residential	Commercial	Industrial
2022	0%	0%	Unknown
2025	15%	14%	
2030	50%	40%	
2035	136%	106%	
2040	391%	302%	
2050	407%	293%	

*Note impacts are applicable only to the very small amount of remaining customers as the scenario assumes no new customers and that most customers leave the system by 2050

Updated Scenario Comparison



Scenario	Renewable Supply Penetration (% of Deliveries)			Biofuel RNG Penetration (% of Current Deliveries)			Renewable Supply Portfolio Cost (2020\$/Dth)			Total Incremental Cost of CPP Program (Million 2020\$/Year)			Community Climate Investments (% of Emissions)			Annual Residential Bill Impact (% Impact of CPP)			Annual Industrial Sales Bill Impact (% Impact of CPP)		
	2025	2035	2050	2025	2035	2050	2025	2035	2050	2025	2035	2050	2025	2035	2050	2025	2035	2050	2025	2035	2050
Base Case	4%	23%	72%	4%	8%	14%	\$12.25	\$11.85	\$11.77	\$142	\$256	\$242	6%	20%	0%	9%	9%	-2%	22%	35%	39%
Restricted RNG	4%	23%	72%	4%	9%	11%	\$18.75	\$18.26	\$16.90	\$142	\$317	\$324	6%	20%	0%	13%	19%	9%	30%	59%	68%
Customer Decline	4%	17%	65%	4%	9%	15%	\$12.25	\$11.93	\$11.59	\$118	\$181	\$186	6%	20%	0%	8%	15%	18%	18%	27%	37%
Aggressive Timeline	4%	47%	65%	4%	16%	20%	\$12.25	\$13.15	\$11.74	\$168	\$493	\$360	13%	20%	20%	10%	23%	2%	27%	73%	58%
No CCIs	10%	36%	72%	10%	15%	18%	\$12.25	\$12.64	\$12.89	\$167	\$313	\$296	0%	0%	0%	11%	13%	3%	26%	45%	51%
Federal RNG Support	4%	23%	72%	4%	8%	14%	\$8.58	\$8.76	\$8.80	\$142	\$239	\$160	6%	20%	0%	7%	4%	-9%	18%	26%	17%
Voluntary Community Support	4%	16%	48%	4%	8%	9%	\$12.25	\$11.85	\$11.25	\$124	\$214	\$160	2%	20%	20%	8%	6%	-6%	19%	30%	25%
Staff Alt 1- Aggressive Electrification	4%	12%	23%	4%	6%	6%	\$12.25	\$12.13	\$12.13	\$0	\$0	\$0	0%	0%	0%	6%	43%	311%	Unknown		
Staff Alt 2- Aggressive & Rapid Electrification	4%	9%	14%	4%	5%	5%	\$12.25	\$12.25	\$12.25	\$0	\$6	\$13	0%	0%	0%	6%	45%	316%			

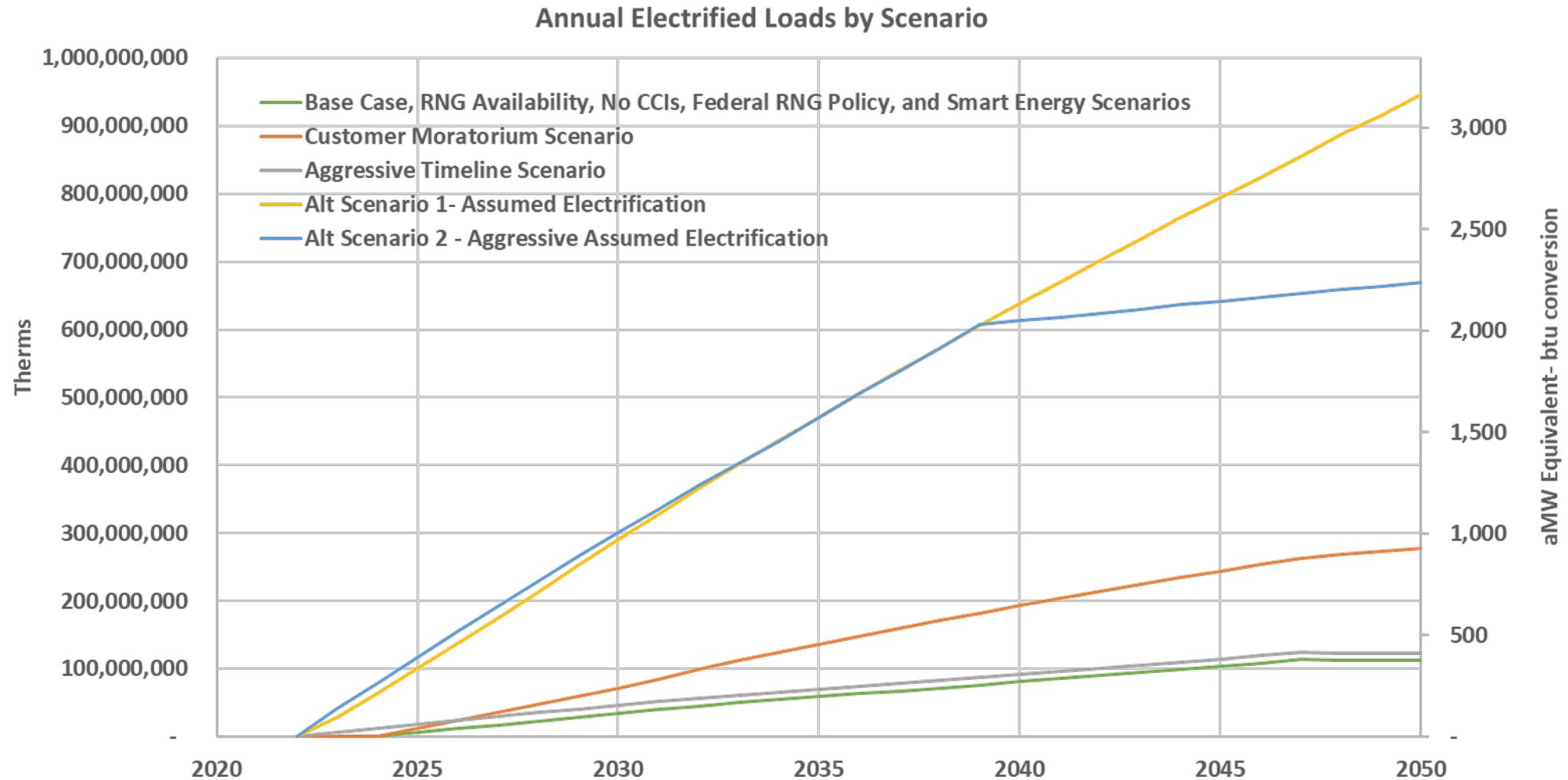
Red figures indicate that the cost of compliance to NW Natural is offset by assumed electrification, where the cost of this electrification needs to be assessed on the electric rather than gas grid

Note on Estimating Cost Impact of Electrification on Electric Customers



- To reiterate a point made throughout these proceedings, to understand the full impacts of the societal options for decarbonization the costs of building electrification on the electric system and on electric utility customers are critical to be able to compare with the cost of decarbonizing gas utility operations directly
- A comprehensive analysis of the cost of electrification on the electric system and electric utility customers requires:
 1. Using sophisticated resource planning models at an hourly level of granularity to evaluate cost and emissions differences across hours, days, seasons, and years – particularly in regards to resource needs to adequately serve peak needs
 2. An analysis that is specific to Oregon and incorporates Oregon’s emissions profiles and climate
 3. Deliberate peak planning and an understanding that natural gas utility and electric utility winter peaks are concurrent
 4. Consistent assumptions about the emissions trajectory of the natural gas and electric grids through time and consideration of the differing emissions profile across hours of the day and seasons in a year
 5. Inclusion of the costs on the electric transmission and distribution system to serve the incremental loads from building electrification
 6. Informed assumptions about the efficiency, operation, and installation practices (e.g. system sizing and the need for supplemental heating) of end use equipment, particularly during peak periods from field billing data in Oregon
 7. Inclusion of the costs to customers to retrofit buildings for electrification including all equipment and installation, service upgrades, and the total impact on utility bills across months

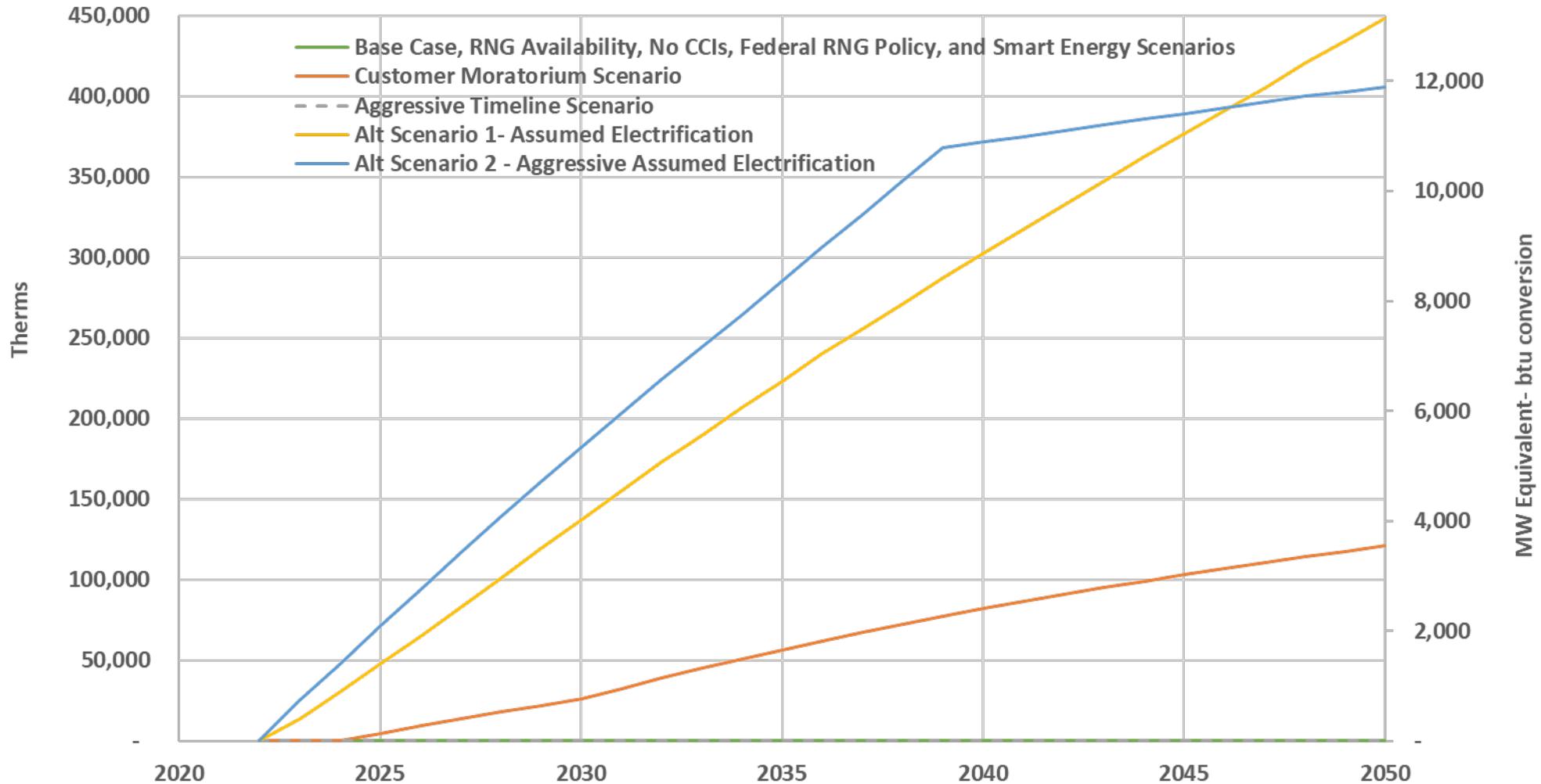
Annual Gas Loads Required to be Served by the Electric System by Scenario



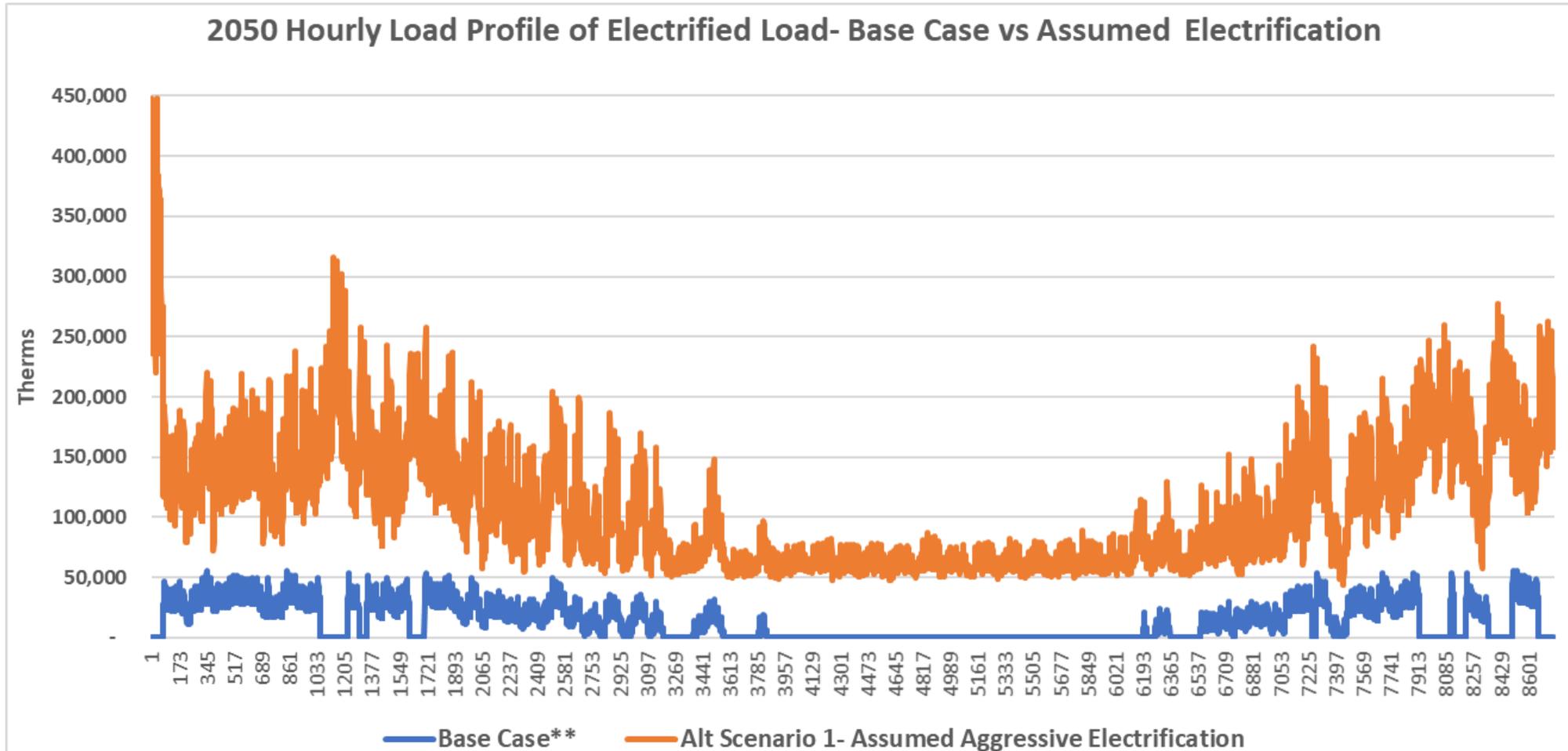
Peak Hour Loads Required to be Served by the Electric System by Scenario



Winter Peak Hour Loads by Scenario



Hourly Load Profile of Electrified Energy Needs in 2050: Gas Decarbonization vs Electrification



*1-in-30 year 3 day peak cold even imposed on first 3 days of year. 2006 weather used for remainder of year as it has similar HDDs to climate adjusted expected year weather.

**Hybrid heating systems run on natural gas heat pumps on days with an average temperature below 40°F.