



Recent analysis on the impact of tax incentives for residential energy efficient equipment

Office of Energy Policy and Systems Analysis
U.S. Department of Energy

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Summary

Methodology:

The residential energy demand module of EPSA-NEMS was used to model the impact of **extending section 25C residential tax credit for five equipment types from 2017-2026**. Results provide insight into consumer purchasing decisions, potential tax credit value, and household energy bill impacts.

- Base case for analysis is an approximation of EIA's AEO17 reference case without the Clean Power Plan.
- Analysis includes EIA's representation of utility subsidies to consumers in AEO17, which vary by census division.

National Impacts of a 10-year extension:

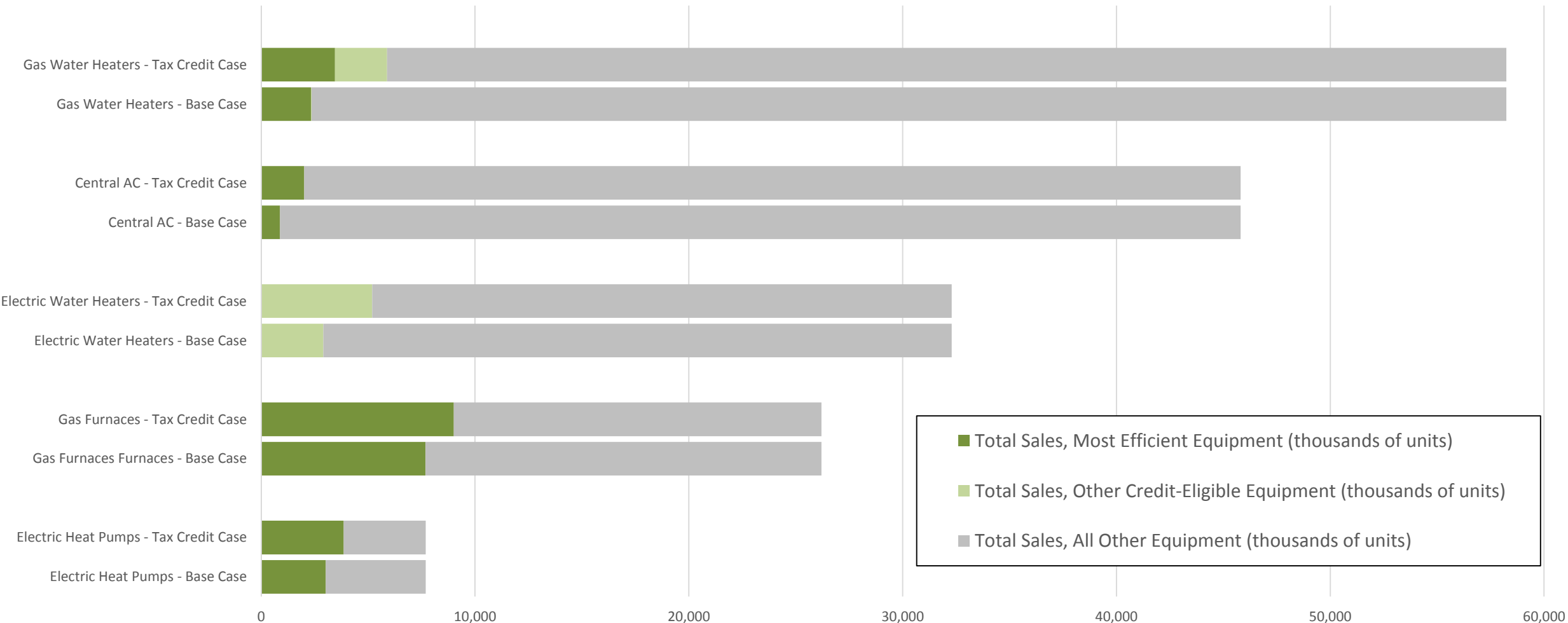
- Sales of eligible equipment increase by **54%**, ranging from 17%-150% by equipment type.
 - Credit has the largest impacts on sales of water heating and central AC equipment; impacts on space heating equipment are smaller.
- Household energy bills are reduced by **\$13.1 billion** compared to the base case (3% discount rate).

Impacts **by Census Division** (population-adjusted):

- Largest *energy bill reductions* occur in Mid Atlantic, Mountain, New England and Pacific states.
- Highest *potential credit value* (eligible sales times maximum possible credit) is in Mountain, New England and South Atlantic states.
- Increases in *non-federal investment* (consumer spending and utility subsidies) from tax credit availability are the largest in Mountain, New England and Pacific states.

How might extending the credit change the market share of efficient equipment?

Projected Residential Replacement Market Share of Efficient Equipment, with and without 25C Tax Credit, 2017-2026



What's the potential value of the credit to consumers, and what level of non-federal investment and energy bill savings might it achieve?

National Metric	Total Impact from 10-Year extension (3% discount rate)	Average Impact from a single year of tax credit
Potential Credit Value (eligible sales in tax credit case) X (maximum possible credit for equipment type)	\$5.61 billion*	\$644 million*
Incremental Non-Federal Investment (Total Customer and Utility Equipment Spending in Tax Credit Case) – (Total Customer and Utility Equipment Spending in Reference Case) – (Potential Credit Value)	\$4.77 billion	\$556 million
Energy Bill Savings, 2017-2050 (Residential energy expenditures in base case) – (Residential energy expenditures in tax credit case)	\$13.12 billion	\$1.3 billion

* - Note: "Potential Credit Value" as calculated estimates the full 25C credit to all purchases, and does not attempt to adjust for purchases made by households that cannot or otherwise would not claim the credit. For comparison, IRS Line estimates from 2011-15 for these equipment types averaged **\$258 million per year**.

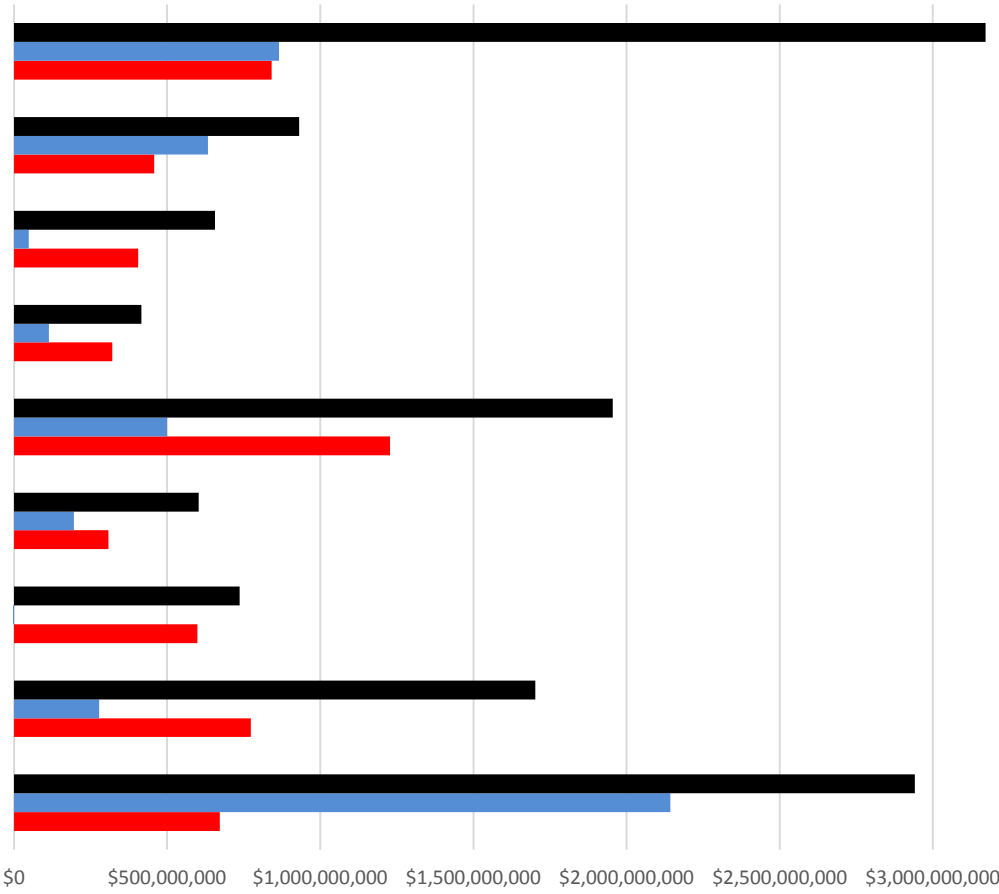
By fuel type: Potential Credit Value and Energy Savings from Ten-year Tax Credit Extension

Total Electricity savings, 2017-2050:	90.6 Twh	Total Gas savings, 2017-2050:	0.37 quads Btu
Total Potential Credit Value from Electric Equipment (HVAC, Heat Pumps, Water Heaters), 2017-2026:	\$3.32 billion (undiscounted)	Potential Credit Value from Gas Equipment (Furnaces, Water Heaters), 2017-2026:	\$3.12 billion (undiscounted)

How might impacts vary in different parts of the country?

Key: **Bill savings** = (Residential energy expenditures in base case) – (residential energy expenditures in tax credit case)
Potential Credit Value = (eligible sales in tax credit case) X (maximum possible credit for equipment type)
Incremental Non-Federal Investment = (Total Customer and Utility Equipment Spending in Tax Credit Case) – (Total Customer and Utility Equipment Spending in Reference Case) – (Potential Credit Value)

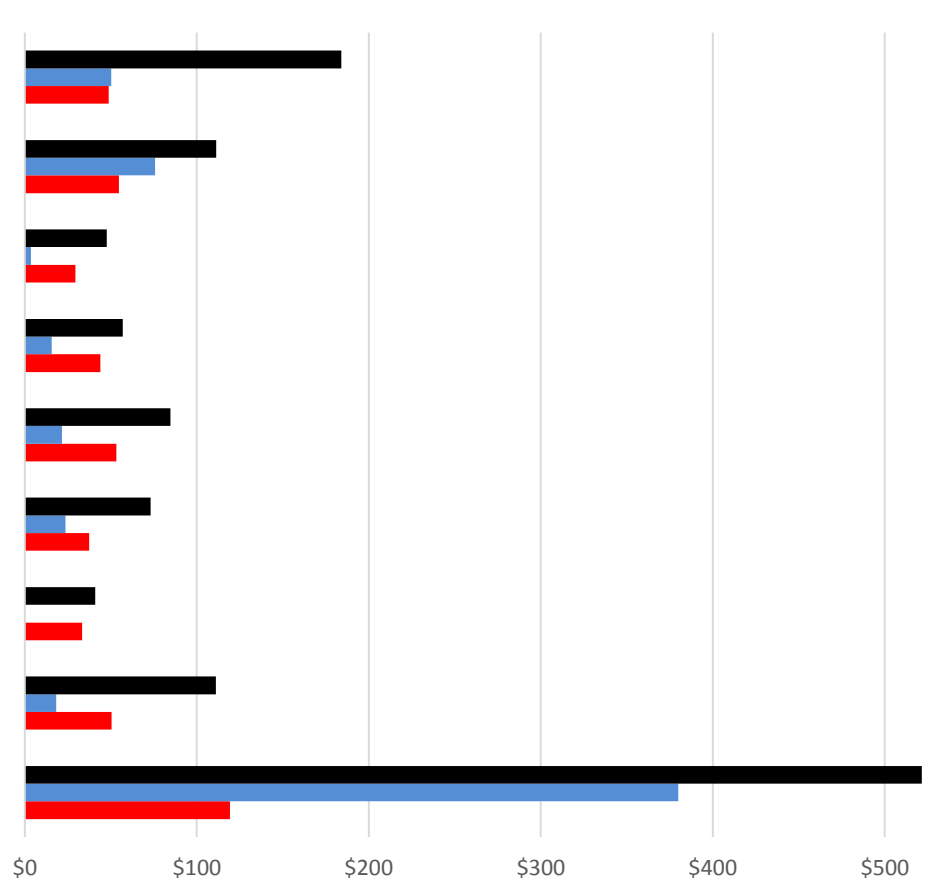
Total Impacts: Energy Bill Savings, Potential Credit Value, and Incremental Non-Federal Investment by Census Division



Census Division (states included):

- Pacific (AK,CA,HI,OR,WA)
- Mountain (AZ,CO,ID,MT,NV,NM,UT,WY)
- West South Central (AR,LA,OK,TX)
- East South Central (AL,KY,MS,TN)
- South Atlantic (DE,FL,GA,MD,NC,SC,VA,DC,WV)
- West North Central (IA,KS,MN,MO,NE,ND,SD)
- East North Central (IL,IN,MI,OH,WI)
- Mid Atlantic (NJ,NY,PA)
- New England (CT, ME, MA, NH, RI, VT)

Population-Adjusted Impacts (totals divided by # of households in census division)



Values are presented with a 3% discount rate. In some regions, "Incremental Non-federal Investment" is near or below zero. This is because if a consumer purchased efficient equipment in the base case, their own spending on the same equipment is reduced in the tax credit case by the amount of potential credit. This reduction offsets some of the additional spending that occurred from increased purchases of efficient equipment in the tax credit case.

How might total credit value, and marginal value, vary by equipment type and census division?

Total Credit Value: Tax Credit Case (\$millions)	New England (CT, ME, MA, NH, RI, VT)			Mid Atlantic (NJ, NY, PA)		E North Central (IL, IN, MI, OH, WI)		W North Central (IA, KS, MN, MO, NE, ND, SD)		S Atlantic (DE, FL, GA, MD, NC, SC, VA, DC, WV)		E South Central (AL, KY, MS, TN)	W South Central (AR, LA, OK, TX)	Mountain (AZ, CO, ID, MT, NV, NM, UT, WY)	Pacific (AK, CA, HI, OR, WA)
	Elec HP	40	77	43	25	631	142	59	75	64					
Gas Furnaces	65	348	267	95	101	39	120	103	213						
Central AC	20	60	13	35	175	42	33	188	37						
NG WH	384	229	245	107	220	58	135	106	283						
Electric WH	269	175	116	91	275	85	117	50	381						
Total for Region (\$millions)	778	889	683	353	1,402	367	464	522	977						
Total divided by households in Census Division	\$137.95	\$58.02	\$38.00	\$42.68	\$60.75	\$50.17	\$33.71	\$62.42	\$56.72						
Incremental Credit Value: TC Case Purchases MINUS Base Case Purchases (\$millions)															
	New England	Mid Atlantic	E North Central	W North Central	S Atlantic	E South Central	W South Central	Mountain	Pacific						
Elec HP	8	15	6	4	141	32	15	17	13						
Gas Furnaces	5	24	49	18	19	8	22	19	35						
Central AC	12	34	7	20	101	25	19	101	21						
NG WH	355	118	103	51	153	34	62	45	139						
Electric WH	230	97	22	36	0	0	0	0	301						

Values displayed are totals from 2017-2026 in 2016 dollars, not discounted.

How might incremental sales from the credit compare to base case sales of efficient equipment?

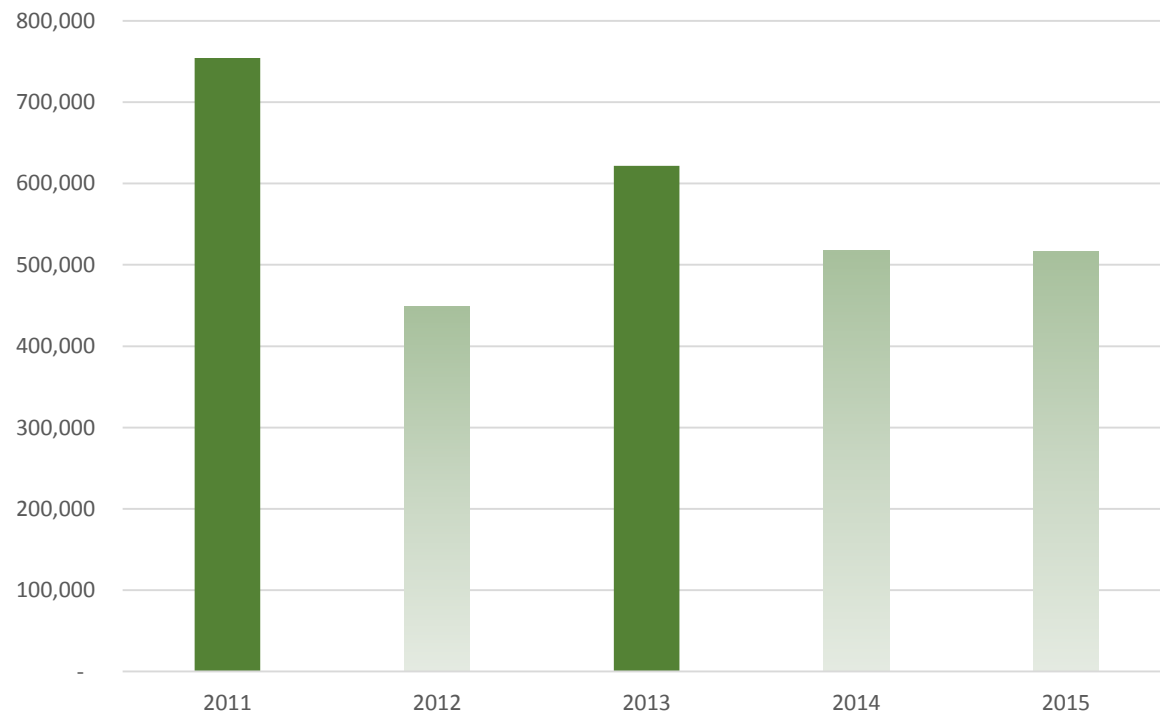
	Total Sales of Efficient Equipment (2017-2026), Base Case	Total Sales of Efficient Equipment (2017-2026), Tax Credit Case	% Increase
NG Furnaces	7,683,900	9,007,177	17%
Electric Heat Pumps	3,018,836	3,854,207	28%
NG Water Heating	2,351,125	5,887,079	150%
Electric Water Heating	2,906,473	5,193,464	79%
Central AC	879,330	2,012,263	129%
Total, all equipment types	16,839,664	25,954,190	54%

What's the Impact of Retroactively Extending Credits?

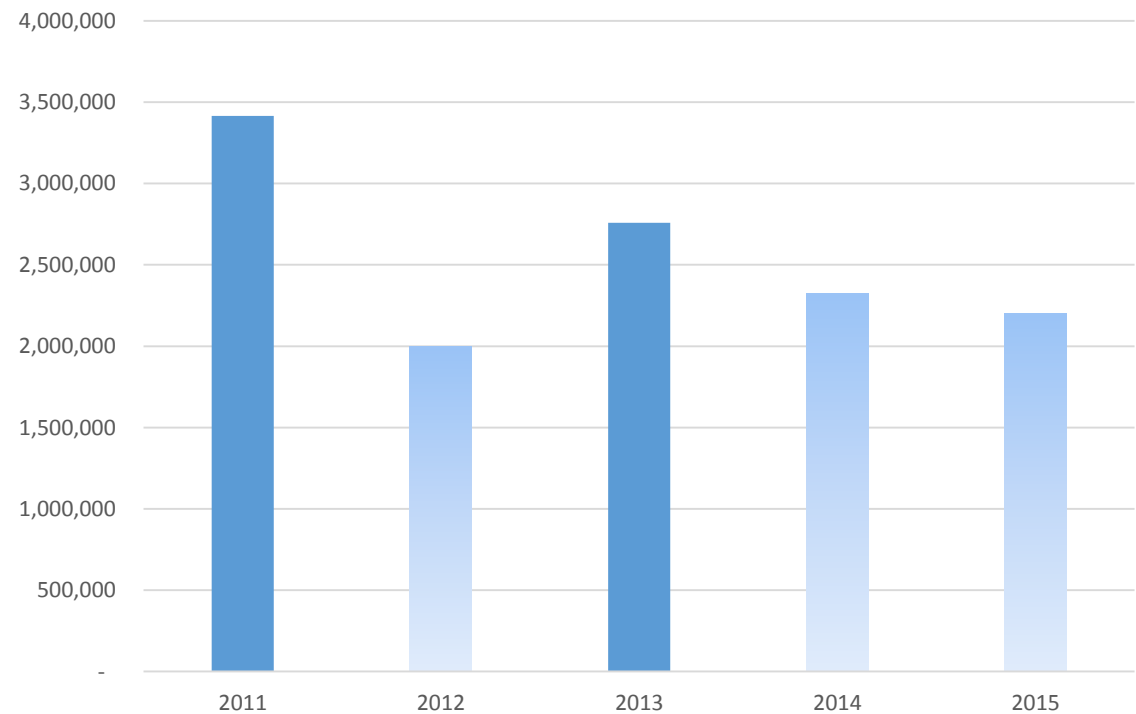
IRS uses sampling to estimate number of claims and total dollars claimed for individual tax credits each year. This data can help us understand how claims change when the status of the credit changes.

25C EE tax credits were in effect for the entire calendar years of **2011** and **2013**. In 2012, 2014 and 2015, legislation passed in December of each respective year made purchases in that year eligible for credit. Note: Data below includes all eligible 25C purchases, including windows, insulation, etc.)

IRS Line Estimates, 25C Total Claimed (\$thousands)



IRS Line Estimates, 25C # of Claimants





Appendix Slides

Office of Energy Policy and Systems Analysis
U.S. Department of Energy

Equipment Eligibility

From 26 USC 25C:

“3) Energy-efficient building property

The term "energy-efficient building property" means-

(A) an electric heat pump water heater which yields an energy factor of at least 2.0 in the standard Department of Energy test procedure,

(B) an electric heat pump which achieves the highest efficiency tier established by the Consortium for Energy Efficiency, as in effect on January 1, 2009.*

(C) a central air conditioner which achieves the highest efficiency tier established by the Consortium for Energy Efficiency, as in effect on January 1, 2009,**

(D) a natural gas, propane, or oil water heater which has either an energy factor of at least 0.82 or a thermal efficiency of at least 90 percent.

...

(4) Qualified natural gas, propane, or oil furnace or hot water boiler

The term "qualified natural gas, propane, or oil furnace or hot water boiler" means a natural gas, propane, or oil furnace or hot water boiler which achieves an annual fuel utilization efficiency rate of not less than 95.”

* - For a split air source heat pump: Seasonal Energy Efficiency Ratio (SEER) of at least 15, Heating Seasonal Performance Factor (HSPF) of at least 8.5

** - For a split central air conditioner: SEER of at least 16

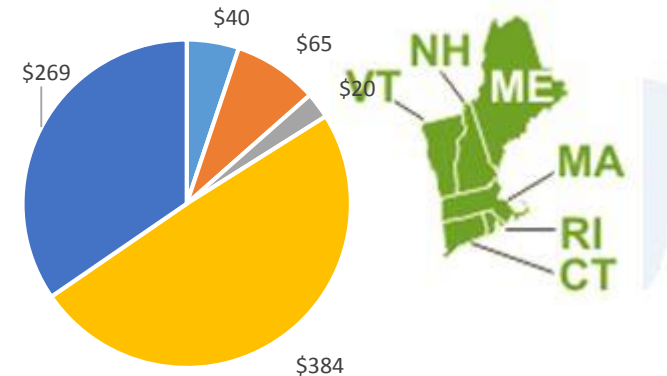
How does total potential credit value vary by equipment type and census division?

“Potential Credit Value” = equipment tax credit amount * total eligible sales in 10-year Tax Credit extension case.
 Values displayed are in 2016 dollars, not discounted.

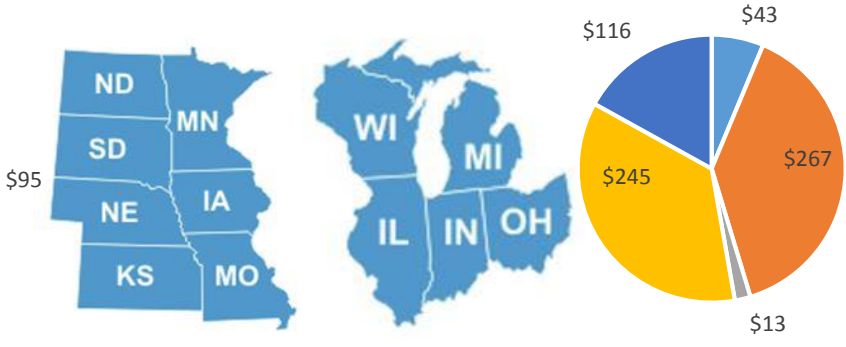
- Central AC
- Natural Gas Water Heaters
- Electric Water Heaters
- Electric Heat Pumps
- Natural Gas Furnaces

Population-Adjusted Estimates:	Pacific	Mountain	West North Central	West South Central	East North Central	East South Central	New England	Mid Atlantic	South Atlantic
Total Potential Credit Value divided by total households	\$57	\$62	\$43	\$34	\$38	\$50	\$140	\$58	\$61

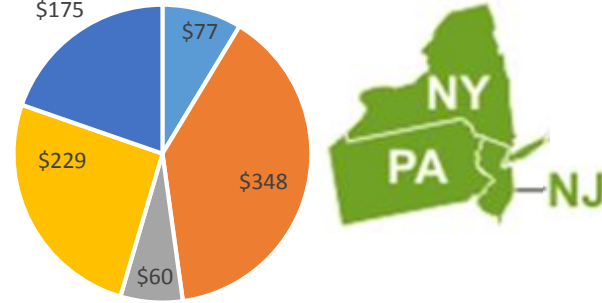
New England - \$778 million



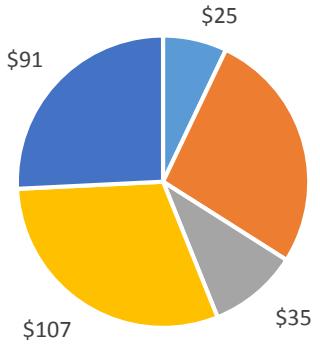
East North Central - \$683 million



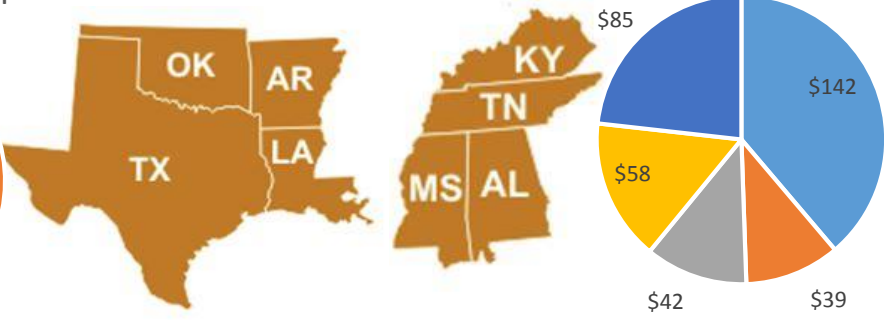
Mid Atlantic - \$889 million



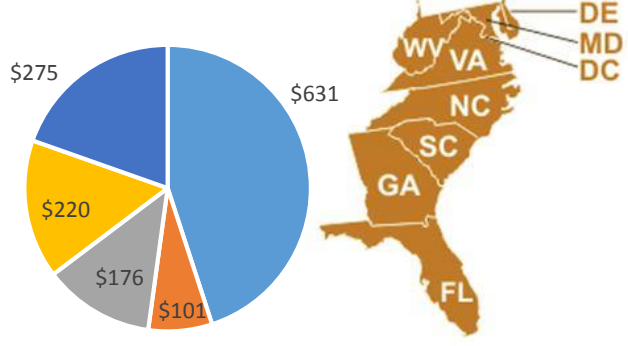
W North Central - \$353 million



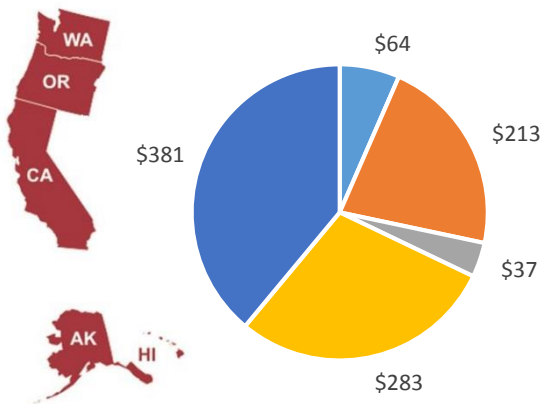
East South Central - \$367 million



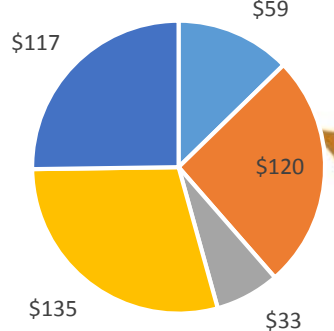
South Atlantic - \$1,402 million



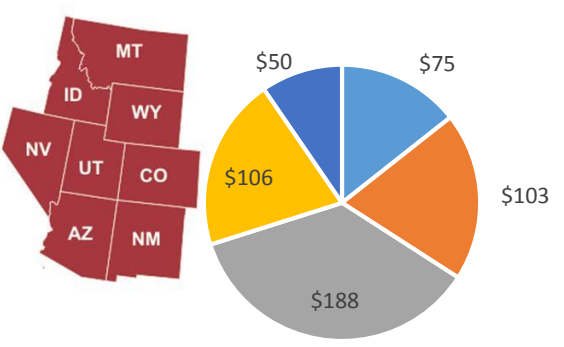
Pacific - \$977 million



West South Central - \$464 million

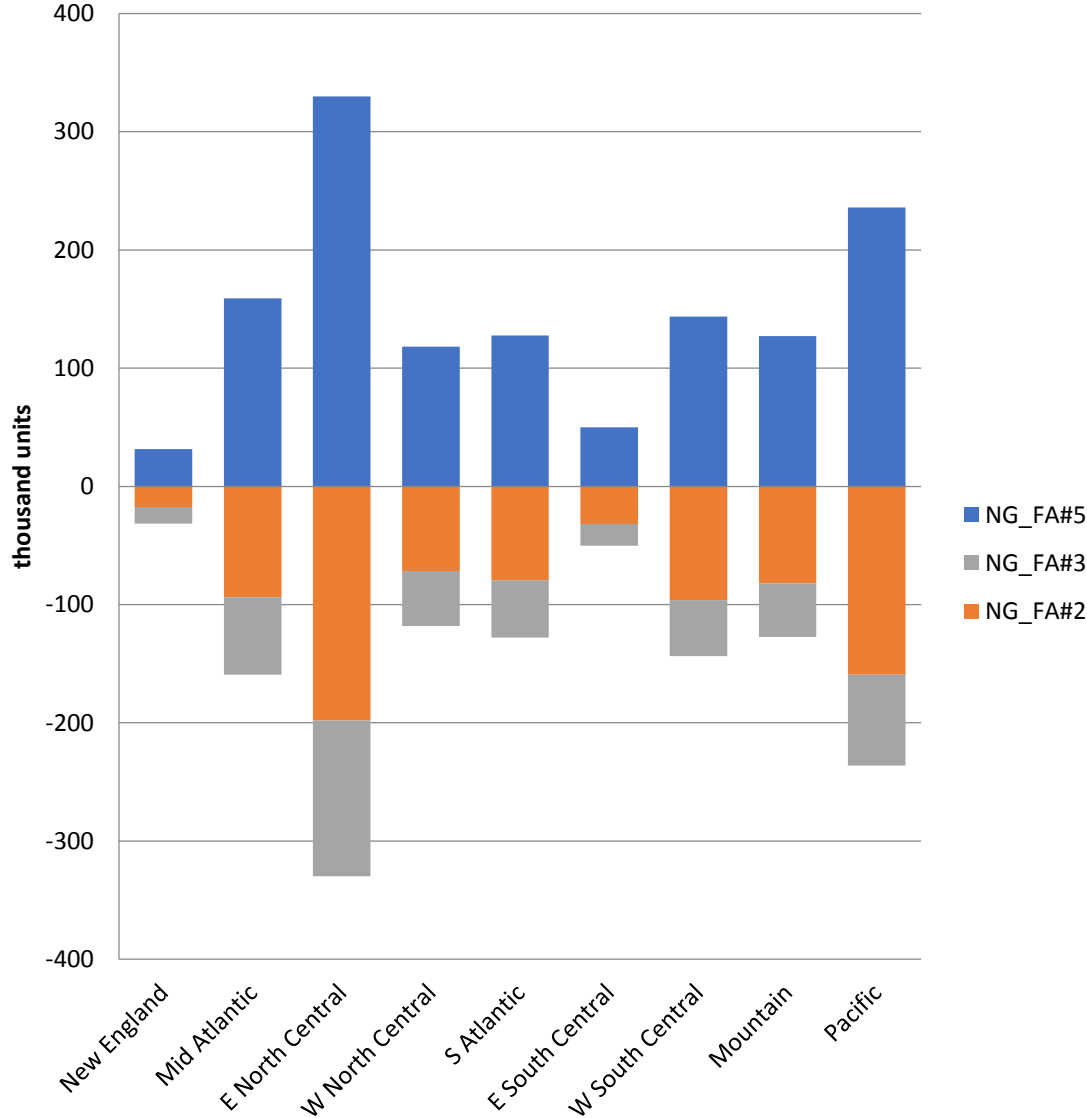


Mountain - \$522 million



Natural Gas Furnaces: \$150 credit

**Natural Gas Furnaces, 2017-2026:
Sales in Tax Credit Case minus Sales in Base Case**



Equipment ID	Efficiency (btu out/btu in)	Retail Cost
Gas Furnace #5	0.98	\$2,950
Gas Furnace #3	0.9	\$2,500
Gas Furnace #2	0.8	\$1,900

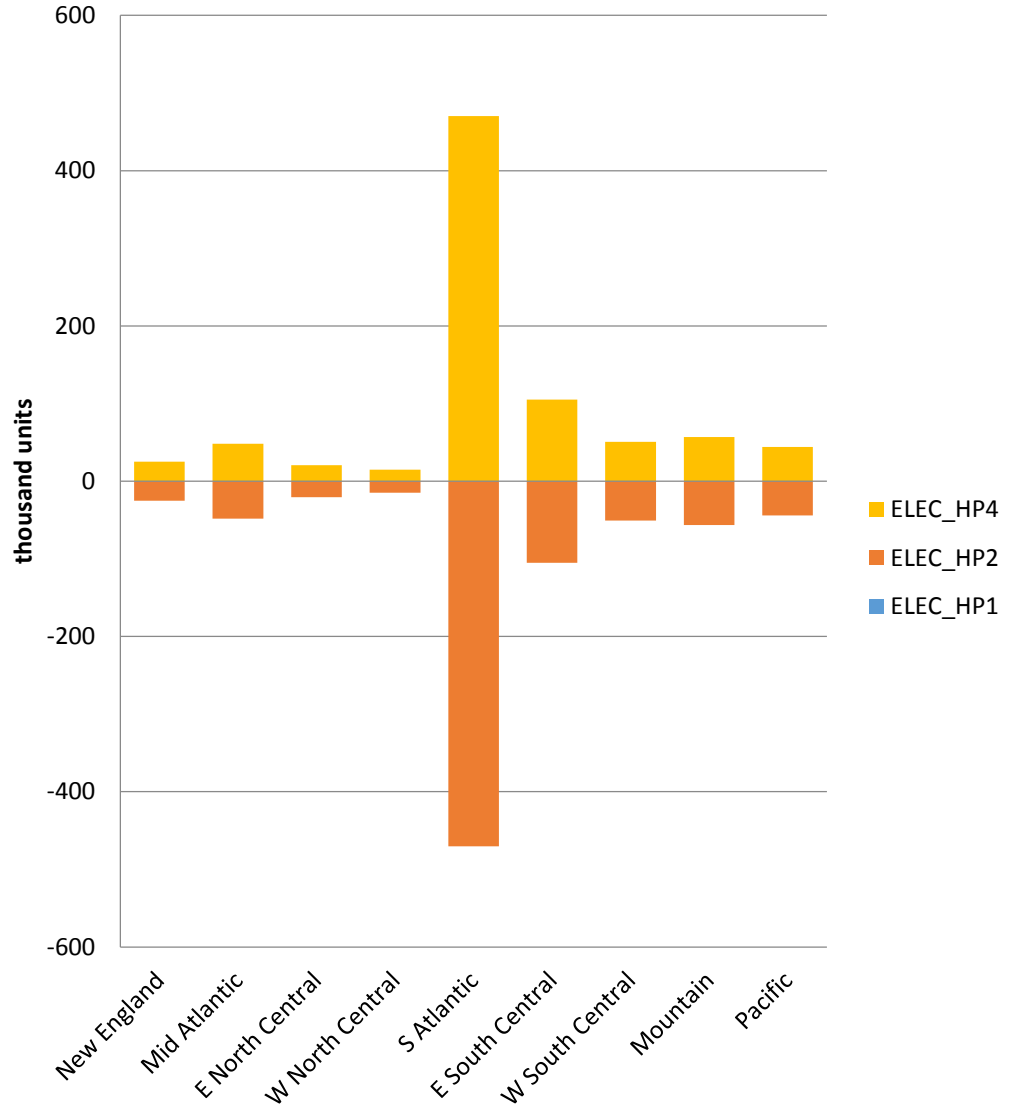
Equipment shaded green = eligible for credit

*Total 10-year sales in EPSA-NEMS, all Natural Gas Furnaces:
~26.2 million*

*Average equipment lifetime in EPSA-NEMS:
17 years*

Electric Heat Pumps: \$300 credit

Electric Heat Pumps, 2017-2026: Sales in Tax Credit Case minus Sales in Base Case



Equipment ID	Efficiency*	Retail Cost*
Heat Pump #4	Heating (HSPF) 9.8/11.7 Cooling (SEER): 22/23	\$4,500/\$4,600
Heat Pump #2	Heating (HSPF): 9.1/9.8 Cooling (SEER): 14/14.5	\$3,350/\$3,400

Equipment shaded green = eligible for credit

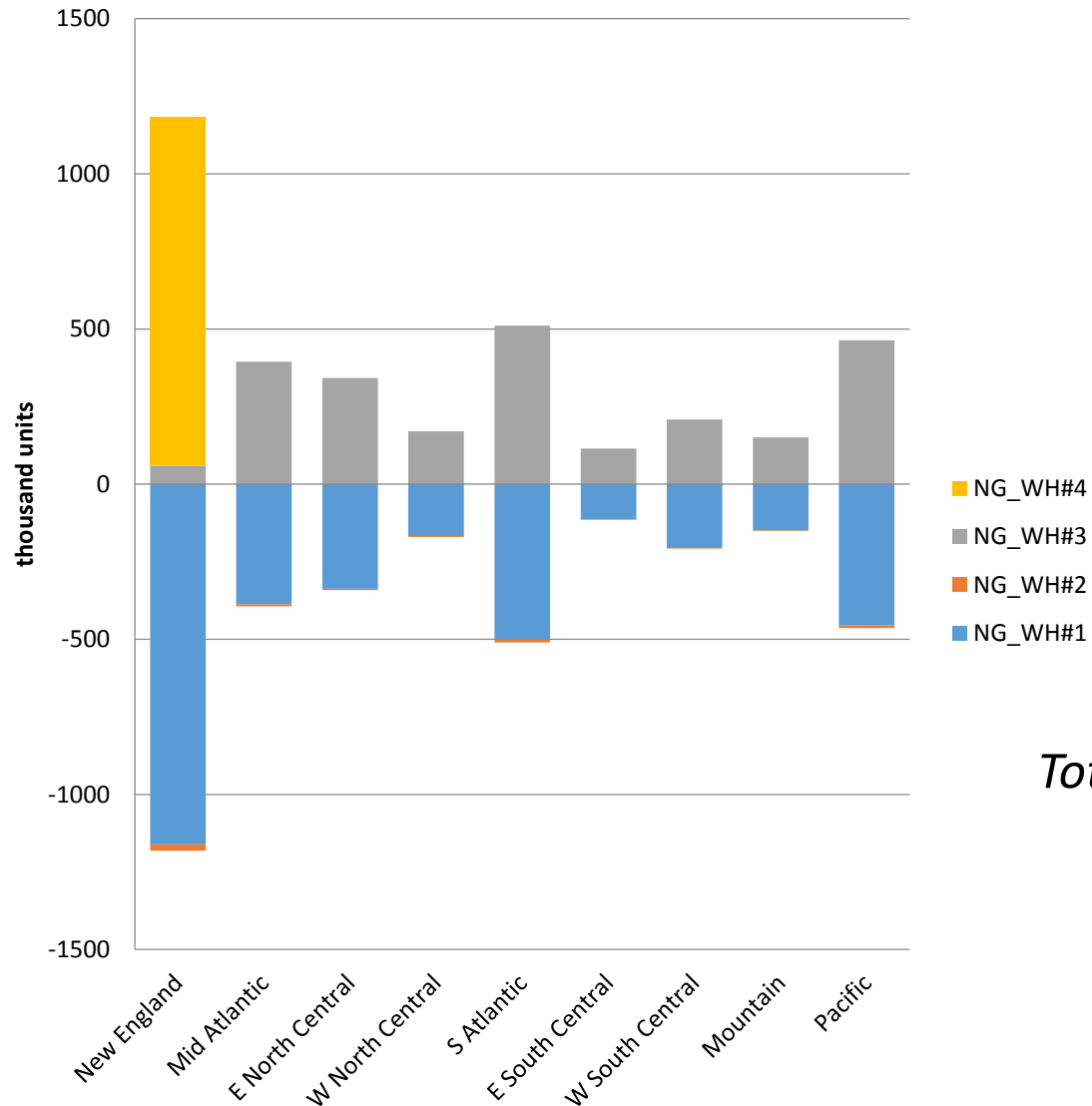
** Efficiency and Retail Costs change for each equipment class in 2020*

*Total 10-year sales in EPSA-NEMS, all Electric Heat Pumps:
~7.7 million*

*Average equipment lifetime in EPSA-NEMS:
14 years*

Natural Gas Water Heaters: \$300 credit

Natural Gas Water Heaters, 2017-2026: Sales in Tax Credit Case vs. Sales in Base Case



Equipment ID	Efficiency (btu out/btu in)	Retail Cost
Gas Water Heater #4	0.85	\$2,765
Gas Water Heater #3	0.82	\$1,680
Gas Water Heater #2	0.67	\$1,325
Gas Water Heater #1	0.62	\$1,005

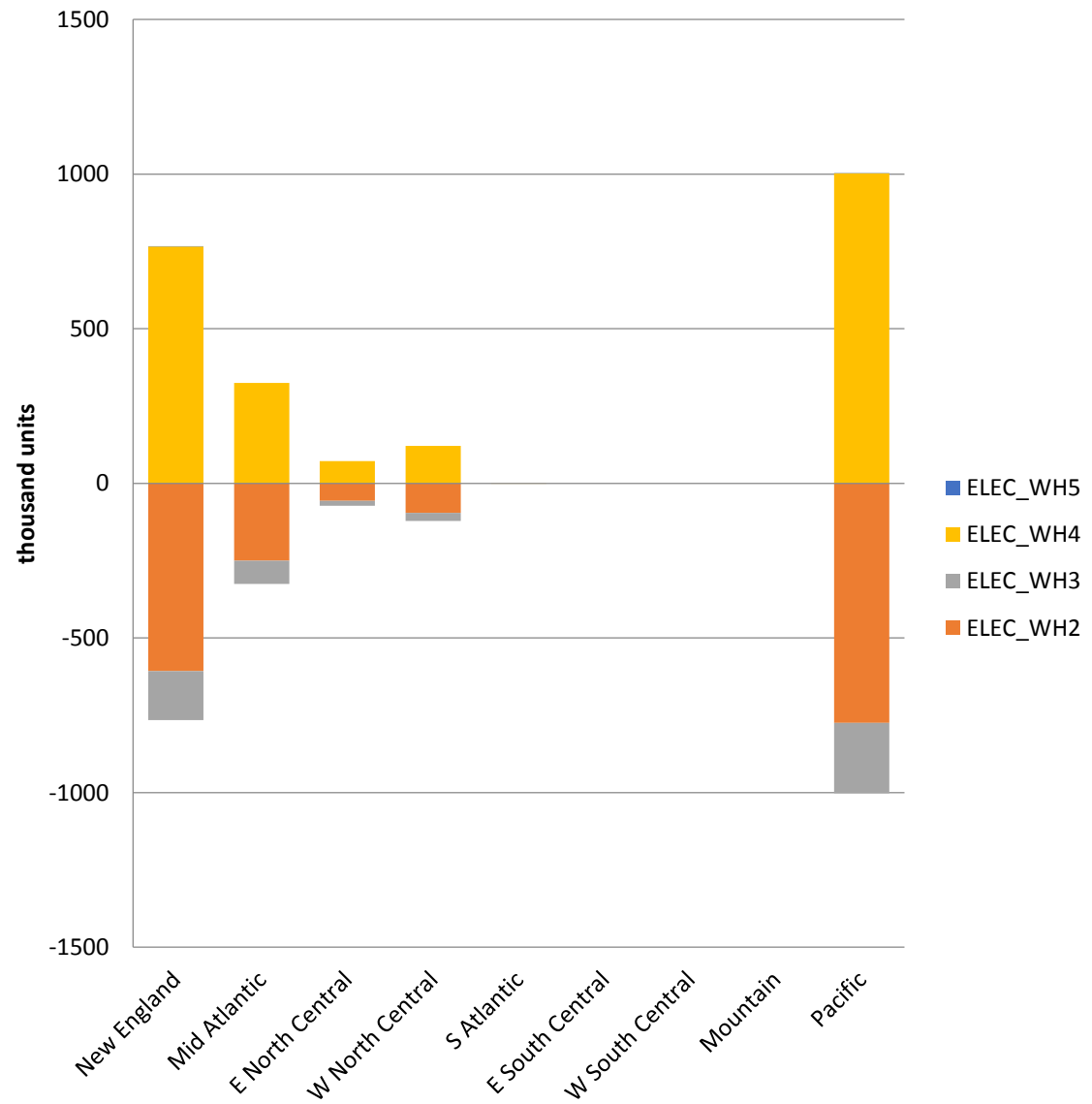
Equipment shaded green = eligible for credit

*Total 10-year sales in EPSA-NEMS, all Natural Gas Water Heaters:
~58.2 million*

*Average equipment lifetime in EPSA-NEMS:
9 years*

Electric Water Heaters: \$300 credit

Electric Water Heaters, 2017-2026: Sales in Tax Credit Case vs. Sales in Base Case



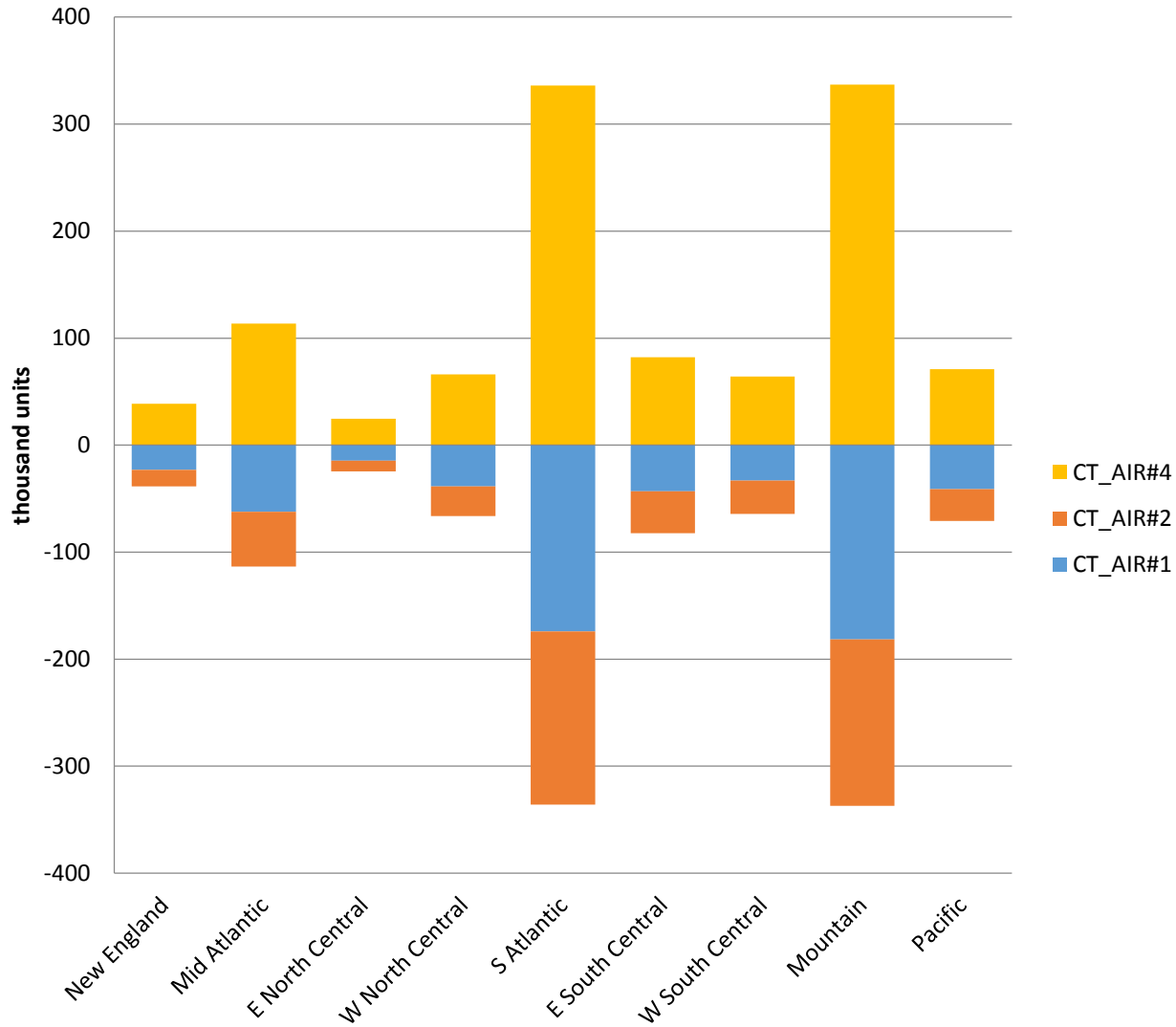
Equipment ID	Efficiency (btu out/btu in)	Retail Cost
Heat Pump Water Heater #5	2.75	\$2,170
Heat Pump Water Heater #4	2.3	\$1,870
Resistance Water Heater #3	0.95-0.96	\$730
Resistance Water Heater #2	0.92-0.95	\$640
<i>Equipment shaded green = eligible for credit</i>		

Total 10-year sales in EPSA-NEMS, all Electric Water Heaters: ~32.3 million

Average equipment lifetime in EPSA-NEMS: 16 years

Central AC units: \$300 credit

Central Air Conditioners, 2017-2026: Sales in Tax Credit Case vs. Sales in Base Case



Equipment ID	Energy Efficiency Ratio (SEER)	Retail Cost
Central AC #4	24	\$5,100
Central AC #2	14.5	\$2,300
Central AC #1	13	\$2,100

Equipment shaded green = eligible for credit

*Total 10-year sales in EPSA-NEMS, all Central AC units:
~45.8 million*

*Average equipment lifetime in EPSA-NEMS:
14 years*