U.S. Residential Stock Average Equipment Efficiency

End-Use / Indicators	2015 Reference Case	2025 by Case			2025 Relative to Reference	
		Reference	High Technology	Best Available Technology	High Technology	Best Available Technology
Main Space Heaters						
Equipment Stock (million units)						
Electric Heat Pumps	10.8	15.6	15.7	14.2	1%	-8%
Electric Other	29.3	30.0	29.8	31.8	-1%	6%
Natural Gas Heat Pumps	0.4	0.4	0.4	0.4	0%	0%
Natural Gas Other	57.8	63.6	63.8	63.2	0%	-1%
Distillate Fuel Oil	6.5	5.9	5.9	5.9	0%	0%
Propane	5.4	5.3	5.1	5.2	-4%	-3%
Kerosene	0.5	0.4	0.4	0.4	1%	1%
Wood Stoves	2.7	2.6	2.6	2.6	-2%	-1%
Geothermal Heat Pumps	1.2	2.0	2.1	2.1	5%	9%
Total	114.6	125.8	125.8	125.9	0%	0%
Stock Average Equipment Efficiency						
Electric Heat Pumps (HSPF)	7.63	8.17	8.62	10.32	6%	26%
Natural Gas Heat Pumps (GCOP)	1.30	1.34	1.38	1.38	3%	3%
Geothermal Heat Pumps (COP)	3.36	3.36	3.60	4.57	7%	36%
Natural Gas Furnace (AFUE)	0.84	0.86	0.87	0.94	2%	9%
Distillate Furnace (AFUE)	0.87	0.89	0.91	0.94	2%	6%
Space Cooling						
Equipment Stock (million units)						
Electric Heat Pumps	10.8	15.6	15.7	14.2	1%	-8%
Natural Gas Heat Pumps	0.4	0.4	0.4	0.4	0%	0%
Geothermal Heat Pumps	1.2	2.0	2.1	2.1	5%	9%
Central Air Conditioners	67.6	81.3	81.2	82.5	0%	1%
Room Air Conditioners	48.1	47.5	47.5	47.5	0%	0%
Total	128.0	146.7	146.8	146.7	0%	0%
Stock Average Equipment Efficiency						
Electric Heat Pumps (SEER)	12.89	13.99	15.14	20.44	8%	46%
Natural Gas Heat Pumps (GCOP)	0.65	0.65	0.67	0.67	3%	3%
Geothermal Heat Pumps (EER)	14.33	14.44	16.19	22.65	12%	57%
Central Air Conditioners (SEER)	13.51	14.36	16.39	22.24	14%	55%
Room Air Conditioners (EER)	10.18	11.33	11.76	12.77	4%	13%
Water Heaters						
Equipment Stock (million units)						
Electric	50.2	59.1	59.0	61.7	0%	4%
Natural Gas	58.6	62.6	62.6	60.1	0%	-4%
Distillate Fuel Oil	2.8	1.9	1.9	1.9	0%	1%
Propane	3.3	2.5	2.5	2.3	-1%	-9%
Solar Thermal	0.7	0.8	0.8	0.9	2%	12%
Total	115.6	126.8	126.9	126.9	0%	0%
Stock Average Equipment Efficiency						
Electric (EF)	0.91	0.97	1.63	1.64	67%	68%
Natural Gas (EF)	0.61	0.63	0.73	0.83	16%	32%
Distillate Fuel Oil (EF)	0.60	0.65	0.65	0.68	0%	4%
Propane (EF)	0.66	0.63	0.79	0.83	26%	33%

Source: Energy Solutions analysis of U.S. Energy Information Administration (EIA), *Annual Energy Outlook 2014.*

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Notes:

1/ Does not include microwave ovens or outdoor grills.

2/ Kilowatthours per year to run the appliance under certain test conditions as specified by the Department of Energy.

HSPF = Heating Seasonal Performance Factor: The total heating output of a heat pump in Btu during its normal annual usage period ofr heating divided by total electric input in watt-hous during the same period.

COP = Coefficient of Performance: Energy efficiency rating measure determined, under specific testing conditions, by dividing the energy output by th energy input.

GCOP = Gas Coefficient of Performance: Energy efficiency rating measure determined, under specific testing conditions, by dividing the energy output by the energy input.

AFUE = Annual Fuel Utilization Efficiency: Efficiency rating based on average usage, including on and off cycling, as set out in the standardized Department of Energy test procedures.

SEER = Seasonal Energy Efficiency Ratio: The total cooling of a central unitary air conditioner or a unitary heat pump in Btu during its normal annual usage period for cooling divided by the total electric energy input in watt-hours during the same period.

EER = Energy Efficiency Ratio: A ratio calculated by dividing the cooling capacity in Btu per hour by the power input in watts at any given set of rating conditions, expressed in Btu per hour per watt.

EF = Efficiency Factor: Efficiency (measured in Btu out / Btu in) of water heaters under certain test conditions specified by the Department of Energy.

Btu = British thermal unit.

Cases:

Reference case projection is a business-as-usual trend estimate, given known technology and technological and demographic trends. See *AEO 2014* for more details on assumptions.

High Demand Technology case assumes that residential advanced equipment is available earlier, at lower costs, and/or at higher efficiencies. Existing building shell efficiencies exhibit 50% more improvement than in the Reference case after 2013. For new construction, building code compliance is assumed to improve after 2013, and building shell efficiencies are assumed to meet ENERGY STAR requirements by 2023. Consumers evaluate investments in energy efficiency at a 7% real discount rate.

Best Available Technology case assumes that all future residential equipment purchases are made from a menu of technologies that includes only the most efficient models available in a particular year for each technology class, regardless of cost. Existing building shell efficiencies have twice the improvement of the Reference case after 2013. For new construction, 100% compliance with building codes is assumed, and building shell efficiencies are assumed to meet the criteria for the most efficient components after 2013. Consumers evaluate investments in energy efficiency at a 7% real discount rate.