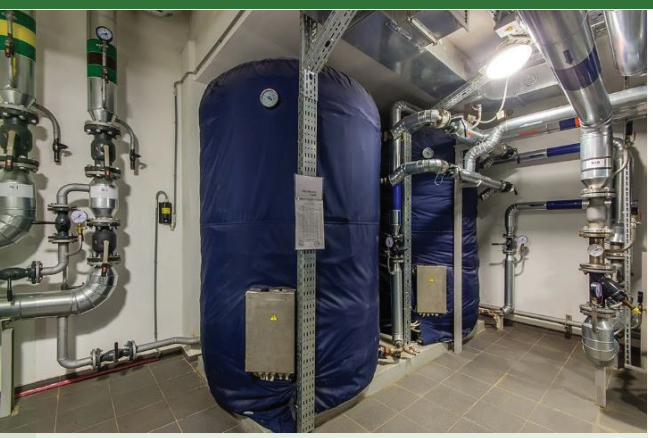
E-3-B. Require Energy Efficient Commercial Packaged Boilers



GHG Mitigation Potential

16%

Up to 16.0% of GHG emissions from boiler fuel consumption

Co-Benefits (icon key on pg. 34)

Climate Resilience

Increased energy efficiency can reduce the strain on the overall grid, particularly the risk of power outages during peak loads. Increased efficiency can also reduce energy costs.

Health and Equity Considerations

Reduction of fuel combustion in commercial spaces can help reduce indoor pollution.

Measure Description

This measure requires installation of a commercial packaged boiler with a higher energy efficiency than what is required by regulation. Improving boiler efficiency decreases fuel consumption for the same amount of energy output, thereby reducing associated GHG emissions.

Subsector

Energy Efficiency Improvements

Scale of Application

Project/Site

Implementation Requirements

This measure is only appropriate for a *commercial packaged boiler*, which, as defined in the C.F.R., means a type of packaged low pressure boiler that is industrial equipment with a capacity (rated maximum input) of 300,000 Btus per hour or more, which, to any significant extent, is distributed in commerce (1) for heating or space conditioning applications in buildings, or (2) for service water heating in buildings, but does not meet the definition of *hot water supply boiler* (as defined in 10 C.F.R. 431).

Cost Considerations

More energy-efficient boilers are typically more expensive than less efficient ones, leading to greater upfront costs. However, the replacement of less efficient boilers with more efficient models reduces energy consumption and thereby reduces long-term energy costs.

Expanded Mitigation Options

Non-applicable.

GHG Reduction Formula

A = D

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from boiler fuel consumption	1.1–16.0	%	calculated
User Inputs				
B	Boiler type	[ ]	text	user input
C	Thermal or combustion efficiency of boiler with measure	83–99	%	user input
Constants, Assumptions, and Available Defaults				
D	Boiler fuel savings with measure compared to minimum requirement	Table E-3-B.1 Table E-3-B.2	%	U.S. DOE 2016

Further explanation of key variables:

- (C) –U.S. DOE's Conservation Standards for Commercial Packaged Boilers (10 C.F.R. 431) were amended in July 2009 to set increased energy efficiency requirements for commercial packaged boilers installed after March 2012. In March 2020, U.S. DOE increased the standards, which will affect boilers installed after January 10, 2023. The minimum thermal efficiency (TE) and combustion efficiency (CE) are the metrics for determining commercial packaged boiler efficiency. TE is the ratio of the heat energy absorbed by the water to the heat energy available in the fuel burned. CE is the ratio of heat energy released by the fuel to the heat energy available in the fuel burned. The project boiler TE or CE must exceed the minimum required by the standards to result in GHG emission reductions. Boiler efficiency should be obtainable from manufacturer specifications.
- (D) – U.S. DOE calculated the average annual fuel use and savings of boilers at various TEs and CEs above the minimum requirement of the 2009 and 2020 standards based on historical consumption data. If the proposed boiler would be installed before January 10, 2023, the user should reference the annual fuel savings relative to the 2009 standards, summarized in Table E-3-B.1 in Appendix C. If the proposed boiler would be installed after January 10, 2023, the user should reference the annual fuel savings relative to the 2020 standards, summarized in Table E-3-B.2 in Appendix C.

GHG Calculation Caps or Maximums

Measure Maximum

(C_{max}) The TE or CE of the proposed boiler is capped at the "Max Tech" percentage for each boiler type, which is presented in Tables E-3-B.1 and E-3-B.2 in Appendix C.

Mutually Exclusive Measures

If the user selects Measure E-15, *Require All-Electric Development*, the user cannot also select this measure, given that it calls for use of gas- and oil-fired boilers.

Example GHG Reduction Quantification

The user reduces boiler fuel use by requiring installation of a boiler with a higher CE or TE than what is required by the 2009 or 2020 Conservation Standards for Commercial Packaged Boilers. If the proposed boiler is a 350,000 Btu/hour gas-fired hot water boiler installed in 2022 (B) with a TE of 99 percent (C), the user would reduce GHG emissions from boiler fuel consumption by 16 percent based on Table E-3-B.1 in Appendix C.

A = -16%

Quantified Co-Benefits

Improved Air Quality

The reduction in fuel consumption (i.e., natural gas or oil) from this measure would result in local improvements in air quality, because pollutants from fuel consumption would be reduced at the project site. The percent reduction in GHG emissions (A) is the same as the percent reduction in criteria pollutant emissions achieved by the measure.

Energy and Fuel Savings

The percent reduction in fuel consumption achieved by the measure is the same as the percent reduction in GHG emissions (A).

Sources

- U.S. Department of Energy (U.S. DOE). 2016. *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Commercial Packaged Boilers*. December. Available: https://www.regulations.gov/docket?D=EERE-2013-BT-STD-0030. Accessed: January 2021.