



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Test Procedures and Energy Conservation Standards for Certain Equipment in ASHRAE Standard 90.1-2007

Notice of Proposed Rulemaking (NOPR) Public Meeting

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

April 7, 2009



Purpose of the Public Meeting

■ Purposes

- To present methodologies and characterize results for rulemaking analyses;
- To discuss specific issues related to each analysis;
- To seek input from interested parties on methodologies, assumptions, data sources, and results from the analyses; and
- To describe the next steps.



Statutory Authority – Energy Policy and Conservation Act, as amended

- **Addresses the requirements of 42 USC 6313(a)(6)(A)-(B).**
- **The Energy Policy and Conservation Act (EPCA) directs DOE to consider amending the existing Federal energy conservation standard for each type of equipment listed, each time ASHRAE Standard 90.1 is amended with respect to such equipment.**
- **For each type of equipment, EPCA directs that if ASHRAE Standard 90.1 is amended, DOE must review and adopt amended standards at the new efficiency level in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more stringent efficiency level would:**
 - Produce significant additional energy savings;
 - Be technologically feasible; and
 - Be economically justified. (42 U.S.C. 6313(a)(6)(A)(ii))



Opening Remarks and Comments from Interested Parties on the Proposed Test Procedures and Energy Conservation Standards

■ Opening Remarks

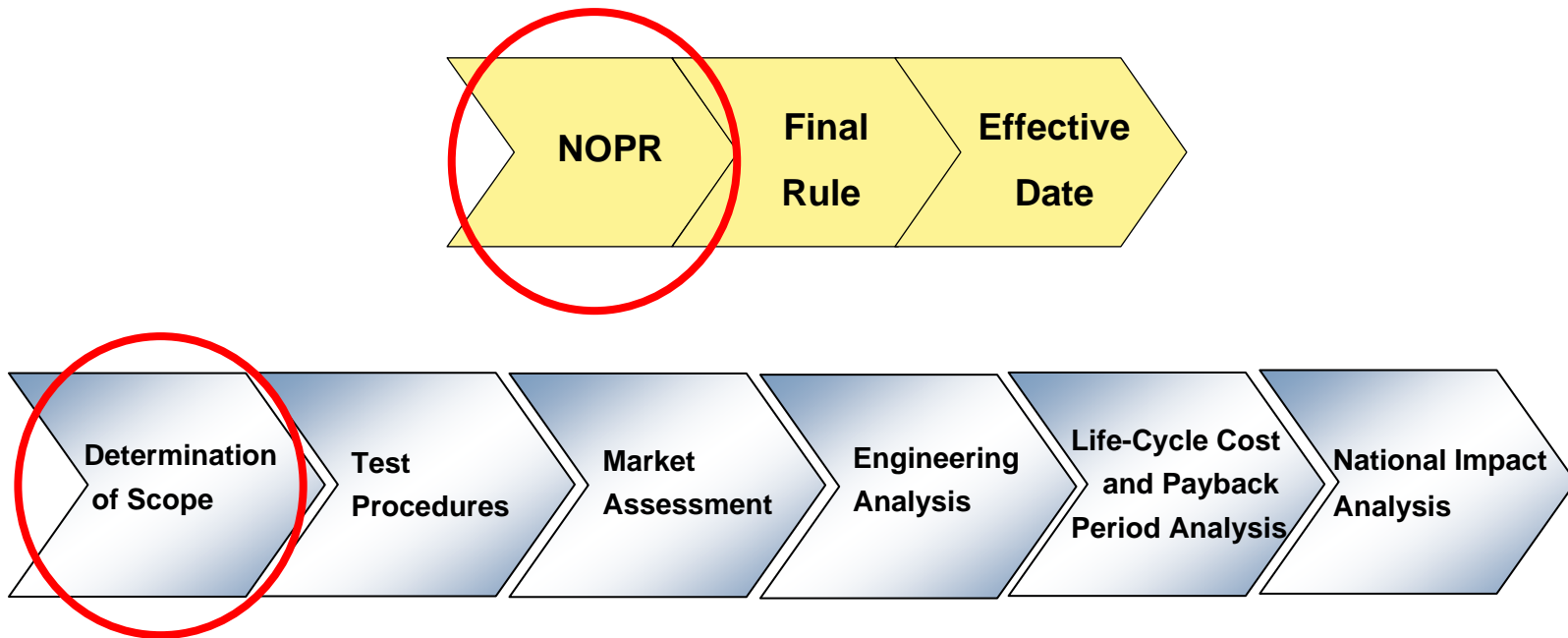
- At this time, DOE welcomes opening remarks from interested parties on the NOPR for certain ASHRAE Equipment.

■ Comments from Participants

- Participants are invited to provide summary comments or statements;
- Participants are invited to raise additional issues for discussion today; and
- Participants are invited to submit comments during the NOPR comment period, which is open through **June 3, 2009**.



NOPR Analyses Flow Diagram





Scope of Coverage Determination for the Rulemaking

- **To determine the scope of coverage for ASHRAE Standard 90.1-2007 equipment, DOE first reviewed all the changes made in ASHRAE Standard 90.1-2007.**
- **DOE identified any apparent changes to the efficiency levels of equipment covered by ASHRAE Standard 90.1-2007.**
- **DOE determined whether the apparent changes actually represent an increase in efficiency from existing Federal standards, thereby triggering DOE action.**



ASHRAE Standard 90.1-2007 Scope of Coverage Determination Summary

Equipment Class	Preliminary Determination
Gas-fired Commercial Warm Air Furnaces	No action required.
Oil-fired Commercial Warm Air Furnaces	No action required.
Three-Phase Through-the-Wall Air-Cooled Air Conditioners and Heat Pumps	EISA 2007 specifies amended standards.
Three-Phase, Small-Duct, High-Velocity Air-Cooled Air Conditioners and Heat Pumps	EISA 2007 specifies amended standards.
Commercial Package Air-Cooled Air Conditioners with a Cooling Capacity at or above 760,000 Btu/h	DOE does not have the authority to consider amended standards.
Water-Cooled and Evaporatively-Cooled Commercial Package Air Conditioners and Heat Pumps with a Cooling Capacity at or above 135,000 Btu/h and less than 240,000 Btu/h	No action required.
Water-Cooled and Evaporatively-Cooled Commercial Package Air Conditioners and Heat Pumps with a Cooling Capacity at or above 240,000 Btu/h and less than 760,000 Btu/h	Further consider ASHRAE Standard 90.1-2007 efficiency levels.
Commercial Packaged Boilers	Further consider ASHRAE Standard 90.1-2007 efficiency levels.



Commercial Packaged Boiler Backsliding Analysis

- **EPCA’s “anti-backsliding” clause mandates that the Secretary shall not prescribe any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of covered equipment. (42 U.S.C. 6295(o)(1); 42 U.S.C. 6316(a))**

- **ASHRAE Standard 90.1-2007 changes the efficiency metric for eight equipment classes of commercial packaged boilers from combustion efficiency to thermal efficiency.**
 - Since there is no direct relationship or method of comparison for thermal and combustion efficiency, DOE developed an analytical approach to assist in determining the relative stringencies of the thermal efficiency levels specified in ASHRAE Standard 90.1-2007 compared to the Federal energy conservation standards specified in terms of combustion efficiency .
 - In order to make the comparison between efficiency metrics, DOE analyzed the average relationship between thermal and combustion efficiency for the minimally complying equipment in DOE’s database. For each equipment class, DOE established an average difference between the two efficiency metrics.

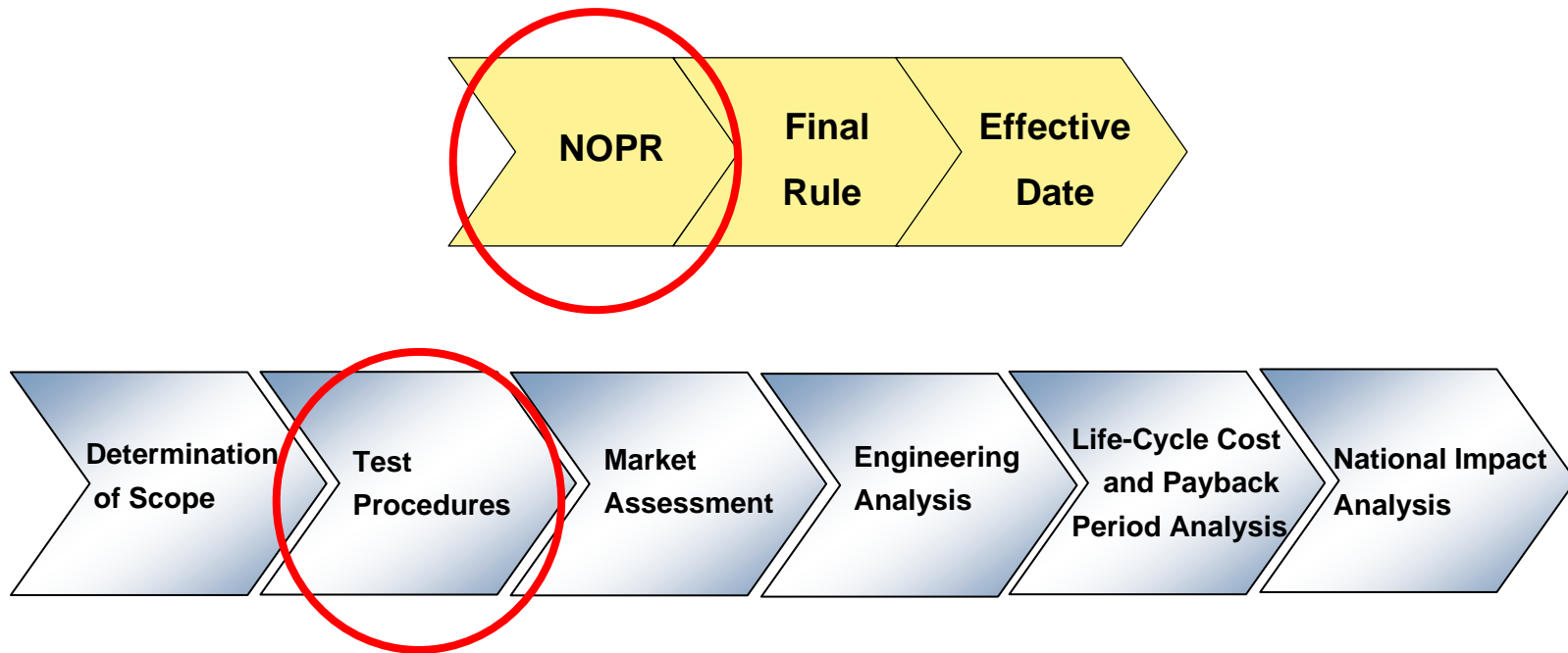


Commercial Packaged Boiler Backsliding Analysis

- **DOE considered several additional factors in its backsliding analysis.**
 - The accuracy and validity of the thermal efficiency ratings reported by manufacturers in equipment literature or in AHRI's database.
 - The benefits of switching to a thermal efficiency metric and requiring manufacturers to report thermal efficiency for these eight equipment classes.
 - The overall energy savings that would result from adopting the efficiency levels in ASHRAE Standard 90.1-2007 compared to current Federal energy conservation standards.
- **Based on both its analytical approach and the additional factors considered, DOE has tentatively concluded that the efficiency levels in ASHRAE Standard 90.1-2007 represent an increase in efficiency as compared to the existing Federal energy conservation standards.**
- **DOE performed a market analysis, economic analysis, and energy savings analysis for all of the identified commercial packaged boiler equipment classes to consider energy conservation standards at the ASHRAE Standard 90.1-2007 efficiency levels, as well as at levels more stringent than those found in ASHRAE Standard 90.1-2007.**



NOPR Analyses Flow Diagram





Definition of Combustion and Thermal Efficiency for Commercial Packaged Boilers (Issue #1)

- **DOE is proposing changes to the definitions in the 10 CFR Part 431.82 concerning commercial packaged boilers, including:**
 - Add thermal efficiency definition to read: “Thermal efficiency for a commercial packaged boiler is determined using test procedures prescribed under §431.86 and is the ratio of the heat absorbed by the water or the water and steam to the higher heating value in the fuel burned.”
 - Amend combustion efficiency definition to read: “Combustion efficiency for a commercial packaged boiler is determined using the test procedures prescribed under §431.86 and equals to 100 percent minus percent flue loss (percent flue loss is based on input fuel energy).”

DOE seeks comment on its proposed definitions for “thermal efficiency” and “combustion efficiency” for commercial packaged boilers.



Test Procedures for Commercial Packaged Boilers

- **Summary of the proposed changes effective 180 days on or after the final rule publication date:**
 - Updates to the test procedures for commercial packaged boilers in 10 CFR Part 431 to reference the most recent version of the Hydronics Institute (HI) Boiler Testing Standard (i.e. HI BTS-2000 (Rev06.07)).
 - DOE's changes do not include any substantive changes to the actual test methods currently required for commercial packaged boilers.
 - Elimination of the reference to an obsolete alternative test procedure for steel boilers – ASME PTC 4.1.
 - The provision in 10 CFR Part 431 allowing for the use of ASME PTC 4.1 as an alternate test procedure for steel commercial packaged boilers expired on October 23, 2006.
- **Summary of the proposed changes effective on or after March 3, 2012:**
 - Requirements for commercial packaged boilers to be tested and rated for the efficiency metric (i.e. combustion or thermal efficiency) that is applicable based on the proposed standard levels for each equipment class using the HI BTS-2000 (Rev06.07) testing procedure.

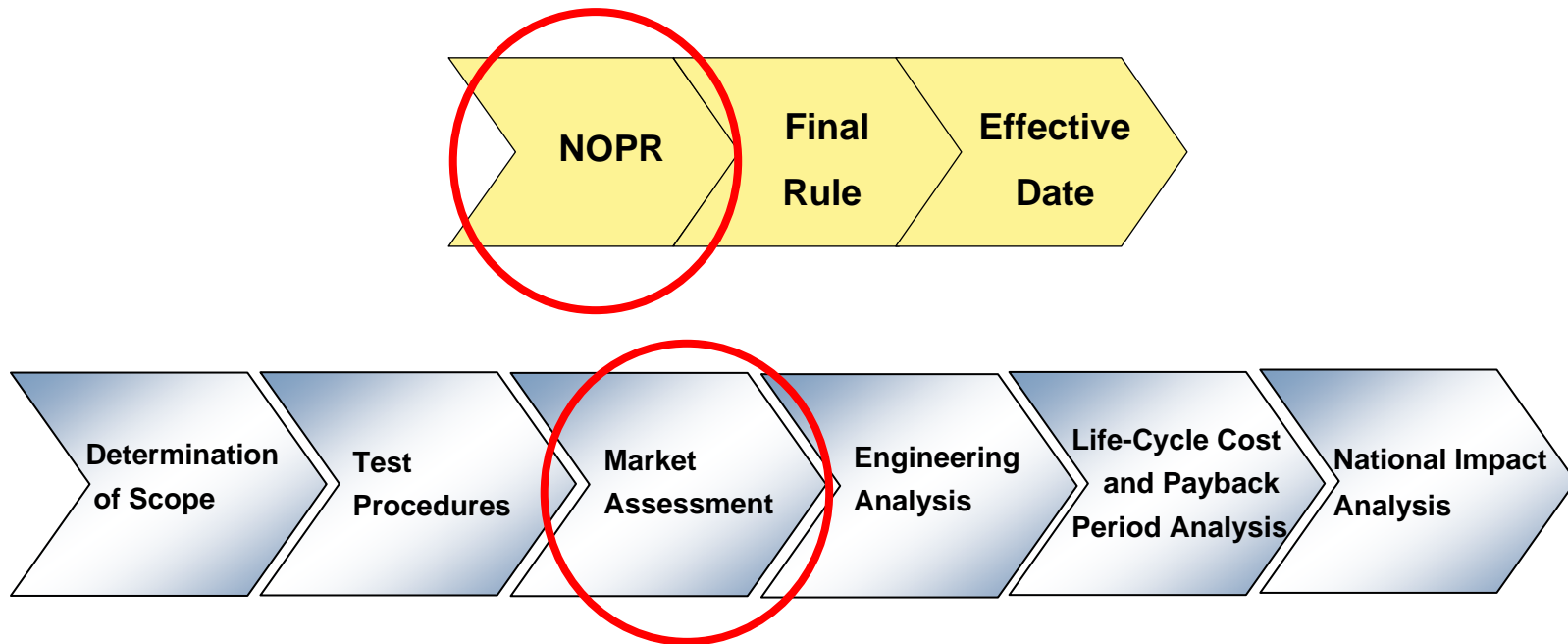


Test Procedures for Commercial Packaged Boilers

- **Dual output boilers (capable of producing either steam or hot water)**
 - DOE currently allows dual output boilers to be tested as steam boilers and rated in both steam and hot water modes.
 - If the ASHRAE Standard 90.1-2007 efficiency levels are adopted as Federal standards, large steam boilers will be required to meet a thermal efficiency standard, while large hot water boilers would be required to meet a combustion efficiency standard. Small boilers, regardless of output type, will be required to meet a thermal efficiency standard.
- **DOE is proposing to allow small dual output boilers to be tested for thermal efficiency in steam mode only and rated for thermal efficiency in both the steam and hot water modes using the result of the thermal efficiency test in steam mode, or to be tested and rated for thermal efficiency separately in each mode.**
- **DOE is proposing to allow manufacturers to rate large dual output boilers as large steam boilers based on the result of the thermal efficiency test performed in steam mode, and as large hot water boilers based on the result of the combustion efficiency test performed in steam mode. In addition, DOE is proposing to allow dual output boilers to be tested and rated separately in each output mode.**



NOPR Analyses Flow Diagram





Purpose

■ Market Assessment

- To characterize the commercial boiler markets to determine available equipment efficiencies, manufacturers, and shipments.



Equipment Classes

- **DOE is proposing 10 equipment classes of commercial packaged boilers differentiated by input capacity (i.e., small or large), fuel type (i.e., gas or oil), output (i.e., hot water or steam) and draft type (i.e., natural draft or other draft).**
- **DOE is proposing the following ten equipment classes, which are consistent with those specified in ASHRAE Standard 90.1-2007:**
 - Small Gas Hot Water;
 - Small Gas Steam All Except Natural Draft;
 - Small Gas Steam Natural Draft;
 - Small Oil Hot Water;
 - Small Oil Steam;
 - Large Gas Hot Water;
 - Large Gas Steam All Except Natural Draft;
 - Large Gas Steam Natural Draft;
 - Large Oil Hot Water; and
 - Large Oil Steam.



Market Analysis

■ Commercial Packaged Boilers Overall Market Characteristics

- Approximately 36,000 units covered by this rulemaking were shipped in 2007 (2007 AHRI data).
- DOE identified 46 brand names under which commercial packaged boilers are manufactured or marketed.

■ Performance Data Sources

- DOE used the Institute of Boiler and Radiation Manufacturers' (I=B=R) Ratings for Boilers, Baseboard Radiation, Finned Tube (Commercial) Radiation, and Indirect-Fired Water Heaters (January 2008 Edition) as the basis for its market analysis.
- DOE used information found in manufacturer catalogs to confirm information in the I=B=R Ratings Directory whenever possible. DOE also used information from manufacturer datasheets to identify efficiency ratings of commercial boilers that are not I=B=R certified.



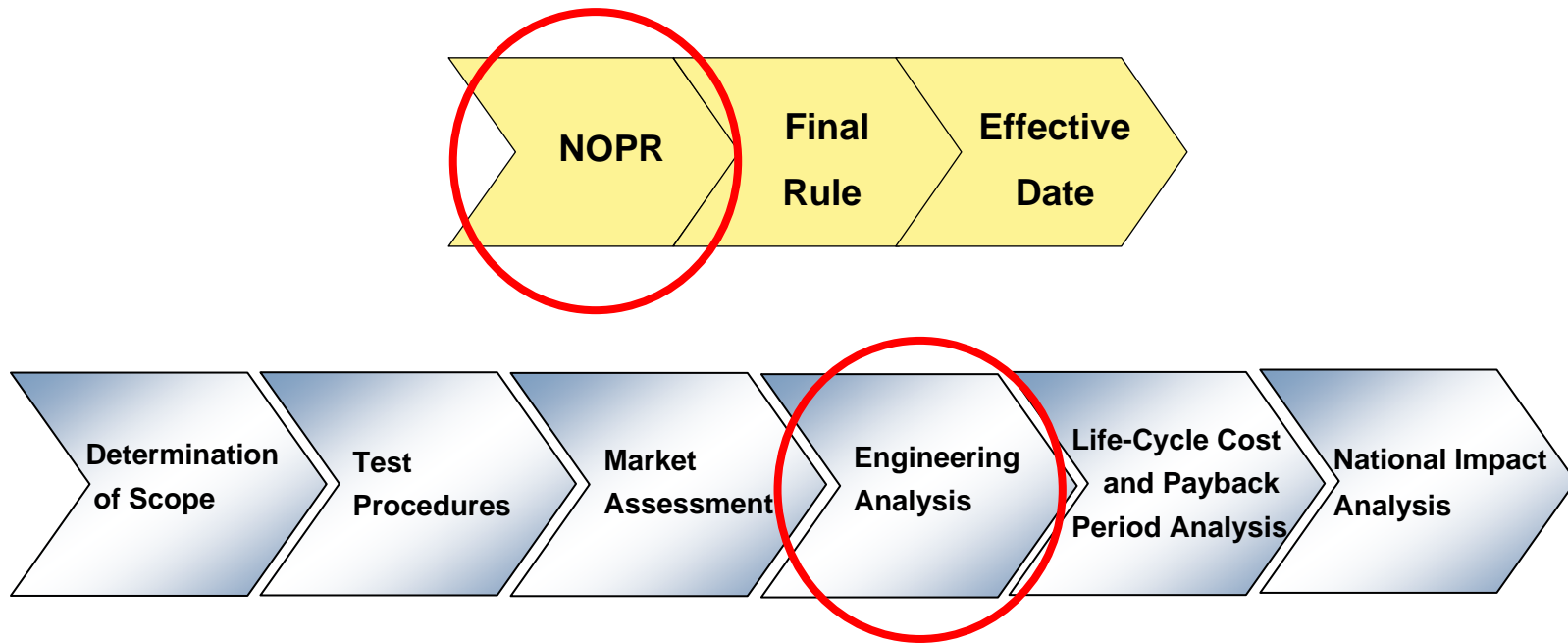
Dual Output Commercial Packaged Boilers (Issue #2)

- Dual output boilers are capable of operating in both hot water and steam mode. The data provided in the I=B=R Directory lists efficiency ratings for several dual output boilers.
- The test procedure for dual output commercial packaged boilers requires only that manufacturers test the steam mode, and allows them to rate the boiler's performance in both steam and hot water modes using the results of the steam mode test.
- For the NOPR analysis, DOE assumed the efficiencies listed for dual output boilers were representative of the boilers being operated in the steam mode because of the test procedure requirements for dual output boilers.

DOE seeks information which would allow DOE to convert the steam ratings in the I=B=R Directory and manufacturers' catalogs for dual output boilers to hot water ratings.



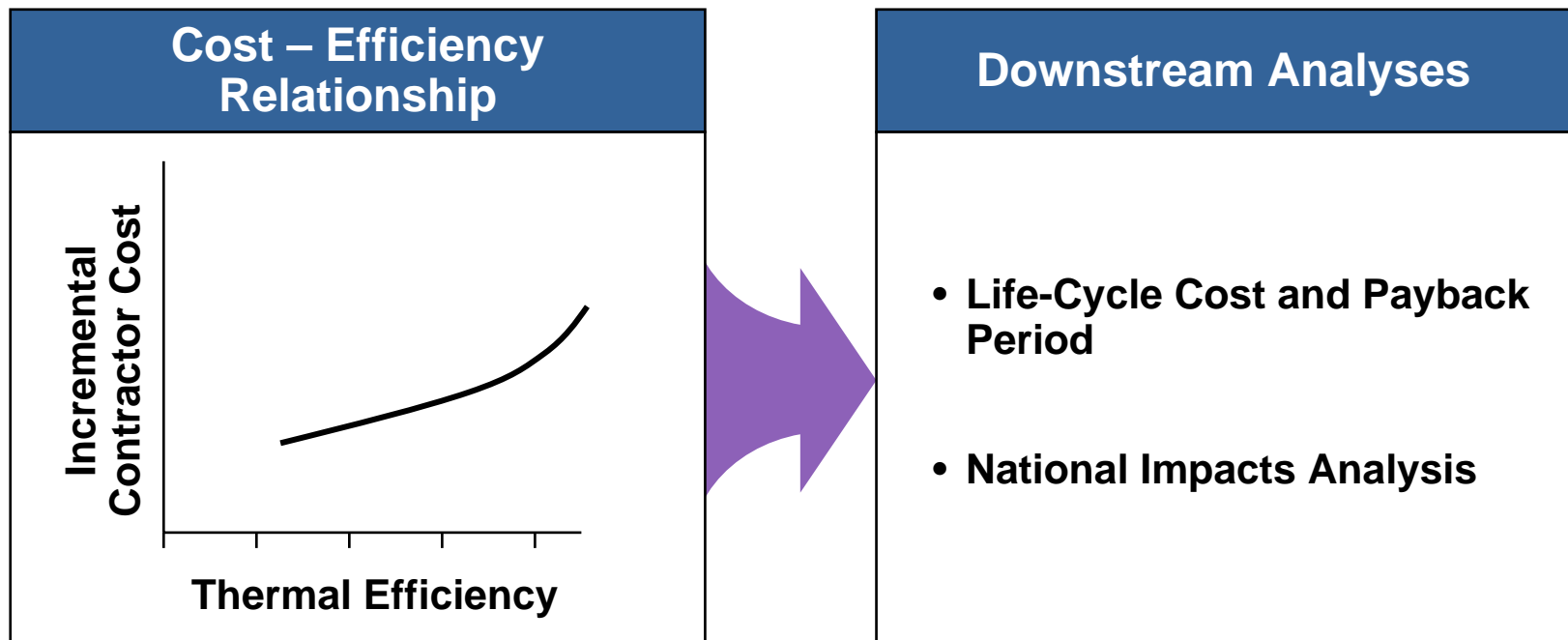
NOPR Analyses Flow Diagram





Purpose of the Engineering Analysis

- Characterize the relationship between contractor cost and efficiency (thermal efficiency or combustion efficiency).





Engineering Analysis Method

■ Efficiency-Level Approach

- The efficiency level approach allows DOE to examine the relative costs of achieving increases in energy efficiency levels without regard to the particular design manufacturers would use to achieve such efficiency increases.
- The efficiency levels that DOE considered in the engineering analysis for each equipment class are representative of commercial packaged boiler equipment available on the market.
- DOE developed baseline cost and incremental costs based on discussions with mechanical contractors.

■ Representative Gross Output Capacities

- DOE focused the engineering analysis on the gross output capacities identified in the April 2000 Screening Analysis for EPACK-Covered Commercial Heating, Ventilating and Air-Conditioning and Water-Heating Equipment
 - For small equipment (i.e. gross output capacity is between 300 and 2,500 kBtu/h), DOE collected data for commercial packaged boilers with a gross output capacity near 400 kBtu/h, 800 kBtu/h, and 1,500 kBtu/h.
 - For large equipment, DOE collected data for commercial packaged boilers with a gross output capacity near 3,000 kBtu/h.



Engineering Analysis Method

■ Data Collection

- DOE contacted mechanical contractors to obtain data for commercial packaged boilers identified by their efficiency, gross output, type of output, type of fuel, and type of draft system.
- DOE collected data across a range of efficiencies for various manufacturers near the representative gross output capacities.

■ Aggregating Data to Develop Cost-Efficiency Relationship

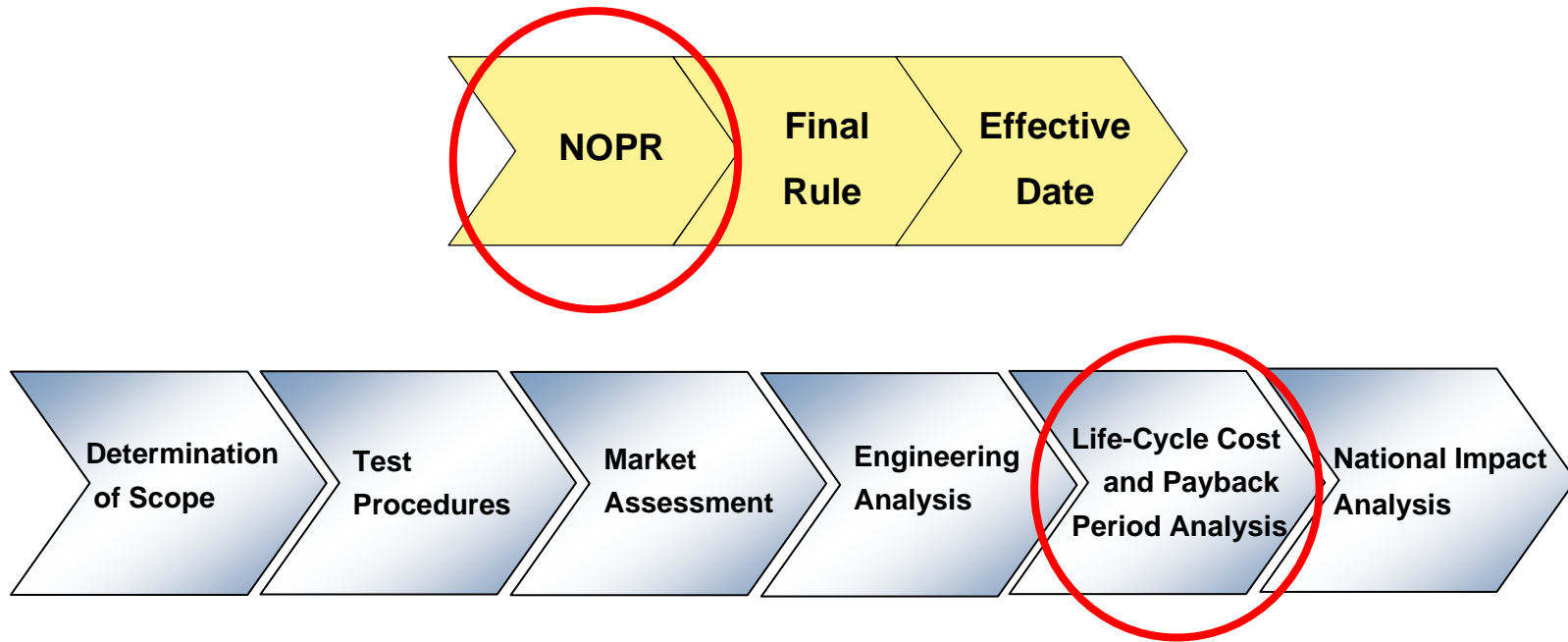
- DOE normalized the data for “small” commercial packaged boiler equipment classes by output capacity.
- DOE aggregated the data for each of the ten equipment classes and fit a curve that best characterized the cost-efficiency relationship.
- DOE subtracted the baseline cost (i.e. the cost of equipment at ASHRAE Standard 90.1-2007 levels) to normalize the cost data in order to identify the incremental cost of achieving higher efficiency levels.

■ Results

- A set of cost-efficiency results that represent the cost to increase the efficiency of an average boiler in each equipment class. The results do not represent any single boiler design, material, or manufacturer, but rather an average cost-efficiency relationship across all manufacturers and designs for the given equipment class.



NOPR Analyses Flow Diagram





Purpose of the Life-Cycle Cost and Payback Period Analysis

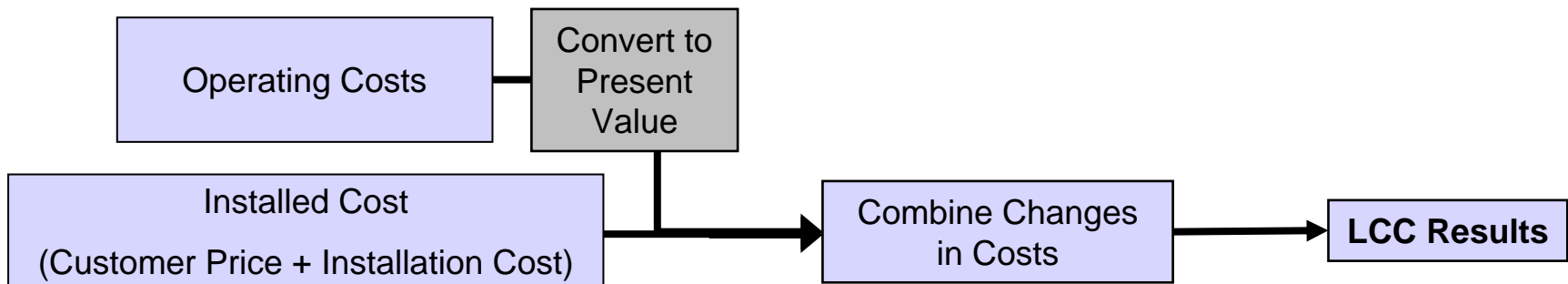
- **To characterize the reduction in operational expenses, increases in installed cost, and resultant customer life-cycle cost savings and payback period for higher efficiency commercial packaged boiler equipment.**

- **Analysis Components**
 - Energy Analysis of Commercial Packaged Boiler Energy Consumption;
 - Markup Analysis Applied to Engineering Analysis Contractor Prices; and
 - Life-Cycle Cost and Payback Period Calculations.



Life-Cycle Cost Analysis

- **Life-Cycle Cost (LCC) equals customer installed price plus the sum of annual operating costs discounted to a particular base year (2012, in this case) in 2008\$.**
- **Economic evaluation from the customer perspective.**
- **Results are expressed as LCC savings (baseline minus standard level).**
- **Simple payback period (in years) is also calculated and reported in this analysis.**





Energy Analysis Method

■ Energy Analysis

- Conducted using Full Load Equivalent Operating Hour (FLEOH) estimates for Commercial Packaged Boiler used in Seven Building Types and 11 Climate Regions from DOE's 2000 Screening Analysis (77 Market Sectors).*
- FLEOH is ratio of annual boiler heating load to boiler capacity.

■ Market Segmentation

- States and Buildings within climate regions were assigned FLEOHs from appropriate climate region.

■ Annual Energy Consumption (in Million Btu/yr) is calculated as:

$$AEC = 0.001 \times \text{Boiler Capacity (kBtu/h)} \times \text{FLEOH} / \text{Efficiency}_{\text{seasonal}}$$

Efficiency_{seasonal} = Thermal efficiency for non-condensing boilers

= Adjusted thermal efficiency for condensing boilers (to reflect return water temperature assumptions during the course of the year)

*U.S. Department of Energy Office of Energy Efficiency and Renewable Energy. Energy Conservation Program for Consumer Products: Screening Analysis for EPACT Covered Commercial HVAC and Water Heating Equipment Screening Analysis. April 2000.
Note. These FLEOHs include impact of standby losses on energy use.



Markups to Determine Equipment Price

- **Distribution Channel Markup Chain Assumptions (from contractor purchase)**
 - New Construction: Mechanical Contractor -> General Contractor -> Customer (100%).
 - Replacements: Mechanical Contractor -> Customer (100%).
- **Inputs**
 - Firm balance sheets data:
 - Mechanical Contractors: *U.S. Census Bureau Financial Data for Plumbing, Heating, and Air-Conditioning Contractors, 2002 and Air Conditioning Contractors of America (ACCA) financial analysis data.*
 - General Contractors: *U.S. Census Bureau Financial Data for Commercial and Institutional Building Construction Contractors.*
 - State Sales Tax Data
 - 33% to 67% split of equipment between new construction and replacement market, respectively.
- **Outputs**
 - Weighted average baseline markups of 1.48 for replacement market and 1.77 for new construction market (including sales tax). Average baseline markup of 1.56 applies to baseline contractor costs.
 - Weighted average incremental markups of 1.20 replacement market and 1.29 for new construction market (including sales tax). Average Incremental markup of 1.22 applied to incremental cost of higher efficiency equipment.



Fuel Prices

- LCC analysis was based on state average commercial oil and natural gas fuel prices from EIA.
- Fuel price adjustments by building type were developed using the ratio of average price in 2003 CBECS by building type to the reported commercial average price in CBECS.
- These adjustments were applied to the state-by-state average commercial sector electricity prices calculated from EIA data for 2006 to obtain state-by-state electricity prices by business type.
- These state-by-state prices by building type were projected for 2012 and beyond using EIA AEO 2008 national commercial fuel price trends for commercial oil and natural gas fuels. For years beyond the EIA projection (2030-2042), fuel price trends were projected based on the average escalation in the period from 2020-2030.



Other LCC Inputs

■ Installation Costs

- Baseline Installation costs developed from Means Costworks Data for natural gas hot water and steam boilers as a function of equipment capacity. Oil-fired hot water and steam boilers assumed to be equivalent.
- Additional installation costs adders introduced for boilers with higher combustion efficiency levels to account for non-corrosive venting and for condensate removal where necessary. For the replacement market adders also include labor costs to retrofit venting.
- Installation costs adjusted for each state using Means Costworks Data.

■ Discount Rates

- Based on weighted average cost of capital for businesses from *Damodaran Online* website).
- Aligned specific business type data with commercial buildings to get weighted average cost of capital by building type.

■ Equipment lifetime assumed to be 30 years.

■ Baseline repair costs developed using MARS Facility Cost Database.

- Repair cost assumed to increase proportionally to first cost at higher efficiency levels due to use of more costly manufacturing components.

■ Maintenance Costs

- Based on RS Means Costworks Database, held constant with efficiency level.



Installation Cost (Issue #3)

- For more-stringent efficiency levels, DOE estimated the cost for stainless steel venting based on an assumed 35-foot flue length and applied the entire materials cost to commercial packaged boilers going into the replacement market.
- In addition, DOE assumed additional costs for control modifications for higher-efficiency boilers and for condensate removal for near condensing and condensing boilers.
- DOE recognized, however, that installation costs could potentially be higher with higher efficiency commercial packaged boilers due primarily to venting concerns with existing flues and chimney cases in the replacement market.
- DOE did not have data to calibrate the extent to which additional cost should apply.

DOE seeks comment and information on how installation costs could potentially increase with higher-efficiency commercial packaged boilers due primarily to venting concerns.

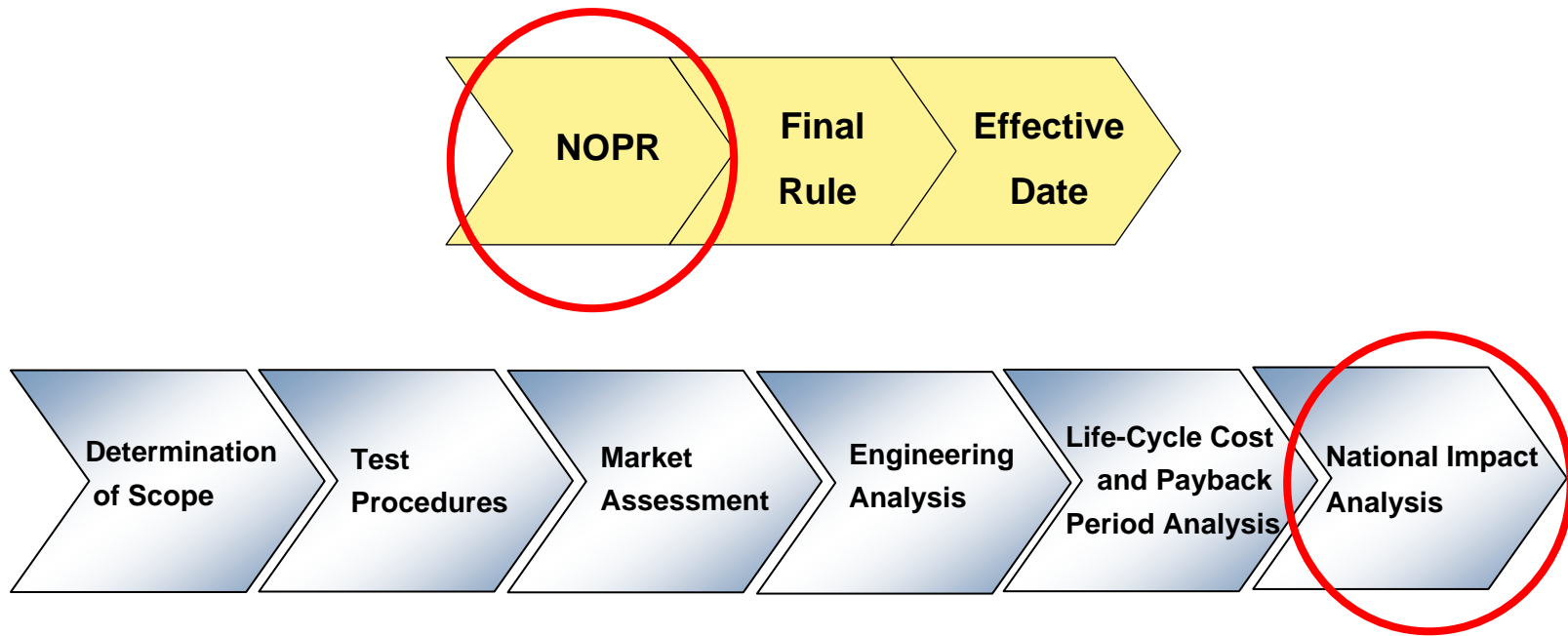


LCC and Payback Period Results

- **LCC results are expressed as national average LCC savings as well as in terms of the distribution of LCC savings for higher standards compared to adoption of the baseline level (ASHRAE Standard 90.1-2007 efficiency levels).**
- **Using data from the market assessment with regards to current shipments, DOE also developed estimates of the fraction of the market with net LCC increase, net LCC decrease, and no change in LCC.**
- **PBP results are expressed in terms of national average PBP as well as in terms of a distribution of PBP for the boiler market.**



NOPR Analyses Flow Diagram





Purpose of the National Impact Analysis

■ National Impact Analysis

- To estimate the National Energy Savings (NES) from adoption of commercial packaged boiler standards higher than the ASHRAE Standard 90.1-2007 efficiency levels.
- To estimate the national economic impact on the nation (in terms of national Net Present Value (NPV) from adoption of commercial packaged boiler standards higher than the ASHRAE Standard 90.1-2007 efficiency levels.

■ Analysis Components

- Shipment Analysis;
- National Energy Savings Calculations; and
- National Net Present Value Calculations.



Shipment Analysis

■ Shipments Analysis – Purpose

- To estimate shipments of commercial packaged boilers over time.

■ Methodology

- Disaggregated 2007 shipment data by equipment class.
- Assumed saturation rate of boilers in new commercial construction is the same as in stock.
- Assumed average boiler life of 30 years results in a replacement rate for stock of $\sim 1/30$ years.
- Used 2007 estimate of commercial building growth to commercial building stock from AEO 2008 to estimate shipments going to new construction and replacement markets in 2007.
- Future shipments going to new construction based on the ratio of AEO2008 commercial construction growth (sf) in years 2012-2042 to 2007 growth (sf).
- Future replacements based on replacements required for future stock based on a Weibull-based survival function for commercial packaged boilers (30 yr average life).
 - Distribution of vintages in existing stock based on long term steady-state solution to survival function.



National Impact Analysis - Methodology

- **National Energy Savings (NES) calculated for period from 2012 through 2042 (i.e., 30 year energy savings period from earliest possible standard effective date).**
- **National NPV calculated from 2012-2085, which covers *life-cycle* installation and operational expenses for all equipment shipments between 2012 and 2042.**
- **Both NES and NPV analysis take into account a two-year delay for DOE to set standards more stringent than the efficiency levels in ASHRAE Standard 90.1-2007.**
 - Amended energy conservation standards at the ASHRAE efficiency levels implemented in 2012.
 - Amended energy conservation standards at more stringent efficiency levels than those in ASHRAE Standard 90.1-2007 implemented in 2014.
 - Energy savings benefits for adopting the efficiency levels in ASHRAE Standard 90.1-2007 based on market assessment of average thermal efficiency of the fraction of boiler shipments stock below ASHRAE efficiency level.
- **Used national average customer prices, annual energy use, energy prices, annual repair and maintenance expenditures from LCC analysis.**
- **Streams of energy use and total costs calculated over analysis time periods with all costs (expenditures) discounted to the present.**



National Impact Analysis – Methodology Continued

- Analysis used a distribution of boilers shipments mapped to each of the efficiency levels considered (i.e., those efficiency levels include a level below-ASHRAE, the ASHRAE level, and up to 4 higher efficiency levels) based on mapping the market assessment data for available boiler models to the analyzed efficiency levels.
- Amended energy conservation standards assumed to “roll up” less-efficient equipment to standard level, but not to affect projected shipments for boilers at higher efficiency levels.
- Once an amended standard is in place, old equipment goes out of the inventory according to base case efficiency mix. New equipment is sold and replaced according to the new efficiency mix.
- Fuel prices based on extrapolation of EIA data from AEO 2008 (2020-2030).

Example Distribution of Efficiencies for Small Gas-Fired Hot Water Boilers

Equipment Class	Energy Efficiency Level					
	Below 0 (Market Baseline) ~77.5% Et	Level 0 (ASHRAE) 80% Et	Level 1 82% Et	Level 2 84% Et	Level 3 86% Et	Level 4 88% Et
Small, Gas-Fired, Hot Water	8.9%	14.3%	29.3%	22.3%	7.7%	17.5%



National Impact Analysis (Issues #4 through #6)

DOE seeks comment on the potential for a rebound effect to occur in the commercial packaged boiler industry. (Issue #4)

DOE seeks comment on DOE's assumption and the potential significance of any overestimation of savings. In particular, DOE requests data that would allow it to better characterize the likely increases in packaged boiler efficiencies that would occur over the 30-year analysis period absent amended energy conservation standards. (Issue #5)

DOE seeks comment on the NES-forecasted base-case distribution of efficiencies and DOE's prediction of how amended energy conservation standards affect the distribution of efficiencies in the standards case. (Issue #6)



National Impact Analysis – Results

- **Cumulative NES savings (2012-2042) provided for establishing amended energy conservation standards at efficiency levels more stringent than those in ASHRAE Standard 90.1-2007.**
 - NES based on the difference between the NES savings for adoption of the ASHRAE level in 2012 and adoption of higher standard levels in 2014.

- **Cumulative NPV savings (2012-2085) provided for establishing amended energy conservation standards at efficiency levels more stringent than those in ASHRAE Standard 90.1-2007 using both 3-percent and 7-percent discount rates.**
 - NPV based on the difference between the NPV savings for adoption of the ASHRAE level in 2012 and adoption of higher standard levels in 2014.



Closing Remarks and Comments from Interested Parties on the Proposed Test Procedures and Energy Conservation Standards

■ Closing Remarks

- At this time, DOE welcomes any additional remarks or questions from interested parties on the NOPR for certain ASHRAE Equipment.

■ DOE specifically invites comment on:

- The proposed test procedure amendments for commercial packaged boilers;
- The proposed energy conservation standard levels (i.e., the efficiency levels specified by ASHRAE Standard 90.1-2007) for commercial packaged boilers; and
- The proposed energy conservation standard levels (i.e., the efficiency levels specified by ASHRAE Standard 90.1-2007) for water-cooled and evaporatively-cooled commercial package air conditioners and heat pumps with a cooling capacity at or above 240,000 Btu/h and less than 760,000 Btu/h.



Proposed Amended Energy Conservation Standards for Commercial Packaged Boilers

Equipment Type	Subcategory	Size Category (Input)	Efficiency Level*	
			Effective Date: March 2, 2012	Effective Date: March 2, 2022
Hot Water Commercial Packaged Boilers	Gas-fired	$\geq 300,000$ Btu/h and $\leq 2,500,000$ Btu/h	80% E _T	80% E _T
Hot Water Commercial Packaged Boilers	Gas-fired	$> 2,500,000$ Btu/h	82% E _C	82% E _C
Hot Water Commercial Packaged Boilers	Oil-fired	$\geq 300,000$ Btu/h and $\leq 2,500,000$ Btu/h	82% E _T	82% E _T
Hot Water Commercial Packaged Boilers	Oil-fired	$> 2,500,000$ Btu/h	84% E _C	84% E _C
Steam Commercial Packaged Boilers	Gas-fired – all, except natural draft	$\geq 300,000$ Btu/h and $\leq 2,500,000$ Btu/h	79% E _T	79% E _T
Steam Commercial Packaged Boilers	Gas-fired – all, except natural draft	$> 2,500,000$ Btu/h	79% E _T	79% E _T
Steam Commercial Packaged Boilers	Gas-fired – natural draft	$\geq 300,000$ Btu/h and $\leq 2,500,000$ Btu/h	77% E _T	79% E _T
Steam Commercial Packaged Boilers	Gas-fired – natural draft	$> 2,500,000$ Btu/h	77% E _T	79% E _T
Steam Commercial Packaged Boilers	Oil-fired	$\geq 300,000$ Btu/h and $\leq 2,500,000$ Btu/h	81% E _T	81% E _T
Steam Commercial Packaged Boilers	Oil-fired	$> 2,500,000$ Btu/h	81% E _T	81% E _T

*E_T is thermal efficiency and E_C is combustion efficiency.



Proposed Amended Energy Conservation Standards for Water-Cooled and Evaporatively-Cooled Commercial Package Air-Conditioning and Heating Equipment with a cooling capacity at or above 240,000 Btu/h and less than 760,000 Btu/h

Equipment Type	Size Category	Heating Section Type	Efficiency Level
Water-cooled and evaporatively-cooled commercial package air conditioners and heat pumps	$\geq 240,000$ Btu/h and $\leq 760,000$ Btu/h	Electric Resistance (or none)	11.0 EER*
Water-cooled and evaporatively-cooled commercial packaged air conditioners and heat pumps	$\geq 240,000$ Btu/h and $\leq 760,000$ Btu/h	All other	10.8 EER*

*EER is energy efficiency ratio.



How to Submit Comments...

- **Public Meeting** – Oral comments will be captured in the transcript and become part of the public record.
- **Written comments** – NOPR comment period open until June 3, 2009.
Reference docket #: **EERE-2008-BT-STD-0013** and/or RIN #: **1904-AB83**.

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