

Summary of EPA Final Rules for Air Toxic Standards for Industrial, Commercial, and Institutional (ICI) Boilers and Process Heaters

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On December 20, 2012, the Environmental Protection Agency (EPA) finalized rules setting air toxic standards for boilers, process heaters and certain solid waste incinerators (CISWI). This document provides a summary of the requirements of the major source and area source rules.

EPA initially issued final rules for these units in March 2011, setting standards intended to cut emissions of hazardous air pollutants (HAPs) such as mercury, dioxin and lead. These pollutants can cause a range of dangerous health effects -- from developmental disabilities in children, to cancer, heart attacks and premature death. At the same time it issued the final rules in March, EPA also announced that it intended to reconsider those standards under a Clean Air Act process that allows the agency to seek additional public review and comment to ensure full transparency in its rulemaking. The reconsideration process allowed EPA to address additional technical issues that arose from earlier public comment and provided the public additional opportunity to comment on measures in the final rules that were not in the original proposed rules. EPA released a reconsideration proposal in December 2011 that included a number of proposed amendments and technical corrections to these final rules. The final standards released in December 2012 include additional amendments and adjustments that reflect new data provided to EPA and additional information about real-world performance and conditions under which affected boilers operate.

EPA estimates that less than one percent of the 1.5 million boilers in the United States would need to meet emissions limits under the final rules. About 183,000 of the boilers located at small sources of air emissions such as hotels, hospitals and commercial buildings would be covered by the **Area Source Boiler Rule (40 CFR subpart JJJJJ)**. Of these, over 99 percent would need to follow work practice rules such as periodic tune-ups. The remaining one percent (about 600 units) would have to meet specific emissions limits. EPA estimates that there are about 14,000 boilers at large sources of air emissions including refineries, chemical plants and some institutional facilities such as universities that would be covered by the **Major Source Boiler MACT (maximum achievable control technology) Rule (40 CFR subpart DDDDD)**. Eighty eight percent of these would need to follow work practice standards such as annual tune-ups. Twelve percent, about 1,750 boilers primarily fired by coal, oil and biomass, would need to meet specific emissions limits. Under the **Commercial and Industrial Solid Waste Incineration Unit MACT (40 CFR subpart CCCC and DDDD)**, the final rules affect 106 existing sources located and 6 facilities. Table 1 provides the key requirements of the final Area Source and Major Source rules.

Table 1. Key Requirements for the Final Area and Major Source Boilers MACT Rules

	Key Requirements	
Boiler	Area Source (about 183,000 covered sources; less than 1% need to meet numerical emissions limits)	Major Source (about 14,000 covered sources; 12% need to meet numerical emission limits)
Natural gas / refinery gas units and metal process furnaces (Gas 1)	N/A	Tune-up every 5 years for units ≤ 5 MMBtu/hr; Tune-up every 2 years for units >5 MMBtu/hr and < 10 MMBtu/hr; Annual tune-ups for units ≥ 10 MMBtu/hr; Units using other gaseous fuels can qualify if they demonstrate contaminant levels similar to natural gas
Limited use units (units that have a federally enforceable average annual operating capacity factor ≤ 10)	Tune-up every 5 years. Existing units must complete an initial tune-up prior to compliance date	Tune-up every 5 years. Existing units must complete an initial tune-up prior to compliance date
Seasonal boilers – biomass or oil-fired boilers that undergo a shutdown for at least 7 consecutive months each 12 month period	Tune-up every 5 years. Existing units must complete an initial tune-up prior to compliance date	N/A
Units with an oxygen trim system that maintains an optimum air-fuel ratio (all fuels, all sizes, new and existing)	Tune-up every 5 years (supersedes other tune-up requirements)	Tune-up every 5 years (supersedes other tune-up requirements)
Existing Sources		
≤ 5 MMBtu/hr	<u>Oil-fired</u> : Tune-up every 5 years; <u>Coal-fired</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years; Initial tune-up prior to compliance date	<u>Gas 2 and light liquid</u> : Tune-up every 5 years; <u>Heavy liquid and solid fuel-fired units (coal & biomass)</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years; Initial tune-up prior to compliance date
>5 MMBtu/hr and < 10 MMBtu/hr	<u>Oil-fired (not limited use, seasonal, or use an oxygen trim system)</u> : Tune-up every 2 years; <u>Coal-fired</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years; Initial tune-up prior to compliance date	<u>Gas 2, light liquid, heavy liquid and solid fuel-fired units (coal & biomass)</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years; Initial tune-up prior to compliance date

	Key Requirements	
Boiler	Area Source (about 183,000 covered sources; less than 1% need to meet numerical emissions limits)	Major Source (about 14,000 covered sources; 12% need to meet numerical emission limits)
≥ 10 MMBtu/hr	Coal, biomass, or oil-fired: <ul style="list-style-type: none"> • <u>Emission limits</u>: coal-fired – Hg, and CO; biomass, oil-fired - no emission limits • Tune-up required every 2 years (units with continuous oxygen trim system – tune-up every 5 years) – serves as work practice standard for dioxin/furan emissions • One time energy assessment (boiler system(s) and related on-site energy use system(s)) 	All units (except for Gas 1 or metal process furnaces): <ul style="list-style-type: none"> • <u>Emission limits</u>: Hg, CO, PM (or total selected metals), HCl, alternate CO CEMS limit • Annual tune-up (units with continuous oxygen trim system – tune-up every 5 years) – serves as work practice standard for dioxin/furan emissions • One time energy assessment (boiler system(s) and related on-site energy use system(s))
New Sources		
≤ 5 MMBtu/hr	<u>Oil-fired</u> : Tune-up every 5 years; <u>Coal-fired</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years	<u>Gas 2 and light liquid</u> : Tune-up every 5 years; <u>Heavy liquid and solid fuel-fired units (coal & biomass)</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years
>5 MMBtu/hr and < 10 MMBtu/hr	<u>Oil-fired (not limited use, seasonal, or use an oxygen trim system)</u> : Tune-up every 2 years; <u>Coal-fired</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years	<u>Gas 1, Gas 2, light liquid, heavy liquid and solid fuel-fired units (coal & biomass)</u> : Tune-up every 2 years; Units with continuous oxygen trim system – tune-up every 5 years
≥ 10 MMBtu/hr	Emission limits: <ul style="list-style-type: none"> • Coal-fired - Hg, PM and CO; • Biomass & oil-fired – PM (new oil-fired boilers that combust only low-sulfur oil are not subject to the PM emission limit; • CO CEMS can be used in place of meeting the CO emissions limit) Tune-up required every 2 years (units with continuous oxygen trim system – tune-up every 5 years)	All units (except for Gas 1 or metal process furnaces): <ul style="list-style-type: none"> • Emission limits: Hg, CO, PM (or total selected metals), HCl, alternate CO CEMS limit • Annual tune-up (units with continuous oxygen trim system – tune-up every 5 years) – serves as work practice standard for dioxin/furan emissions

	Key Requirements	
Boiler	Area Source (about 183,000 covered sources; less than 1% need to meet numerical emissions limits)	Major Source (about 14,000 covered sources; 12% need to meet numerical emission limits)
Compliance Deadlines		
Existing Sources	March 21, 2014	January 31, 2016 (sources may request an additional year to comply if such time is required for the installation of controls or for repowering; this includes the installation of combined heat and power, waste heat recovery, or gas pipeline or fuel feeding infrastructure)
New Sources	May 20, 2011, or date of start-up (New sources are defined as those that construction or reconstruction began after June 4, 2010)	New sources must comply with the rule upon start-up, however, since the rule was changed several times, new sources that began construction or reconstruction between June 4, 2010 and January 31, 2013 can comply with alternate limits until January 31, 2016 when they must comply with the finalized new source limits

Key Provisions of the December 2012 Final Emission Standards for [Area Source](#) Industrial, Commercial, and Institutional Boilers

As shown in Table 1, EPA is continuing to require work practice standards for 99 percent of the affected units (around 182,400) which include routine maintenance and tune-ups. The work practice standards require tune-ups on a biennial or 5-year basis depending on fuel, equipment and size. Existing units must comply by March 21, 2014 -- three years after the original publication of the area source rule in the Federal Register. Specific adjustments from the reconsidered proposed area source rule include:

- The mercury and carbon monoxide limits were revised for new and existing coal-fired boilers.
- The deadline for initial notification for existing area source boilers was revised to no later than January 20, 2014.
- Extended the compliance date for existing boilers subject to the tune-up requirement to March 21, 2014 (also the compliance date for boilers subject to emission limits and subject to the energy assessment requirement).
- Clarified that temporary boilers, residential boilers and electric boilers are not part of the source categories being regulated.
- Added subcategories for seasonally-operated boilers and limited-use boilers.
- Reduced tune-up frequency for certain boilers, and specified that initial tune-ups are not required for new boilers.

- Clarified that the energy assessment is limited to only those energy use systems located on-site associated with affected boilers. Specified that sources that operate under certain energy management programs that include the affected boilers satisfy the energy assessment requirement.
- Reduced fuel sampling and performance testing requirements under certain circumstances.

Key Provisions of the December 2012 Final Emissions Standards for [Major Source](#) Industrial, Commercial, and Institutional Boilers and Process Heaters

Major source facilities are those that have the potential to emit 10 or more tons per year (tpy) of any single air toxic or 25 tpy or more of any combination of air toxics. Like the previous versions of the rule, the December 2012 final rule covers boilers and process heaters that use natural gas, fuel oil, coal and other fossil-based solids, biomass and other bio-based solids, refinery gas, or other gaseous fuels. Boilers and process heaters that burn solid waste are not included in these standards unless they are exempt under the Clean Air Act from standards for incinerators. The December 2012 final rule includes specific emissions limits for 16 different subcategories of boilers and process heaters based on the design and fuel use of the units. Specific adjustments from the reconsidered proposed major source rule include:

- Extended the deadline for demonstrating compliance to three years from the date the final rule is published in the Federal Register (the compliance date is January 31, 2016) to provide facilities sufficient time to install controls or to make other compliance-related decisions. Existing sources may request an additional year beyond that if they are in the process of installing controls or repowering.
- For all new and existing natural gas- and refinery gas-fired units (Gas 1 units) and for limited-use units, the December 2012 final rule maintains a work practice standard (periodic tune-ups for each unit) in place of numeric emission limits.
- For all new and existing units with a heat input capacity less than 10 million Btu per hour (MMBtu/hr), the final rule does not change previous proposed requirements of a work practice standard (periodic tune-up for each unit) instead of numeric emission limits.
- Units combusting other gaseous fuels can qualify for work practice standards by demonstrating that they have contaminant levels similar to natural gas (gas 1). The final rule also relaxed the mercury sampling frequency for other gaseous fuels to qualify as a clean gas, if initial mercury constituents fall below certain thresholds.
- The final rule has provisions reducing the frequency of required tune-ups for some units, allowing for many systems to conduct biennial tune-ups and allowing for tune-ups every five years for units with continuous oxygen and CO trim systems.
- The December 2012 final rule does change the frequency of when tune-ups are required for new and existing “limited use” boilers – tune-ups are required every 5-years (the reconsideration from December 2011 required biennial tune-ups).
- The definition of the limited use subcategory was adjusted, allowing more flexibility on operations without increasing emissions or harm to human health and the environment. Limited use was

originally defined as those systems that annually operate for 10% of the time or less – 876 hours or less. The EPA is now using a capacity-factor approach so that limited use is based on units with a federally enforceable operating limit of less than or equal to 10 percent of an average annual capacity factor.

- The December 2012 final rule regulates dioxin/furan emissions with a work practice standard in lieu of numeric emission limits.
- The EPA revised the burner inspection requirements. The final rule states that units that sell electricity must schedule the burner and air-to-fuel system inspections at the time of the first outage but not to exceed 36-months from the previous inspection. This change was made in response to comments that large boilers that serve electricity for sale may not require annual outages and would, therefore, need to be taken off-line for the sole purpose of an annual tune-up.
- The EPA clarified in the final rule that boilers and process heaters used for research and development such as for testing propulsion systems on military vessels are exempt from compliance.
- The final rule establishes numeric emission limits for all other existing and new boilers and process heaters located at major sources for the following pollutants in order to limit the release of hazardous air toxics (HAPs):
 - Mercury (Hg),
 - Filterable particulate matter (PM) or total selected metals (TSM¹) - as surrogates for non-mercury HAP metals.
 - Hydrogen chloride (HCl) - as a surrogate for acid gas HAP, and
 - Carbon monoxide (CO) - as a surrogate for non-dioxin/furan organic air toxics
- Added a separate subcategory for fluidized bed units with fluidized bed heat exchangers designed to burn coal (i.e., coal refuse units).
- Establishes total selected metals (TSM) limits for all subcategories of units. Sources will have the option of meeting either PM limits or the alternative TSM limits. In the December 2011 Reconsideration Proposal, the EPA did not propose any alternative TSM limits for the light liquid, heavy liquid, and non-continental liquid categories, requiring sources in these subcategories to meet the filterable PM limits in all cases.
- The final rule has one single PM limit for all existing solid fuel (coal and biomass) subcategories and one single PM limit for all new coal/solid fossil fuel subcategories.
- The EPA added stack test procedures in the final rule for conducting performance stack test for demonstrating compliance with the alternate TSM emission limits – initial and annual stack tests must be performed.
- The final rule has revised definitions, including those for “30-day rolling average” and “daily block average,” “energy assessment” and “qualified energy assessor,” and “startup” and “shutdown.”

¹ TSM includes the following eight metals: arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, and selenium.

- Removed the requirement for large biomass units to install PM CEMS, and replaced the requirement for large coal units to install PM CEMS with a requirement to install a PM CPMS but have the option to use PM CEMS
- Maintained previously proposed requirements that existing major source facilities are required to conduct a one-time energy assessment to identify cost-effective energy conservation measures for their affected boilers and related energy using systems. Clarified that the energy assessment is limited to only those energy use systems located on-site associated with affected boilers, and specified that sources that operate under certain energy management programs that include the affected boilers satisfy the energy assessment requirement. Also added a cap (not to exceed 160 hours) on on-site technical hours for large fuel use facilities

Estimated Compliance Cost Impacts of the December 2012 Final Major Source Boiler MACT Rule

While the final rule provides additional flexibility and expands the compliance options for many facilities with affected units, EPA is still estimating significant investment costs for affected coal and oil boilers. EPA estimates that for the December 2012 final major source rule, the capital costs for compliance for the existing 621 coal boilers will be \$2.6 billion, at an average cost of \$4.1 million per boiler. Annualized costs, including testing and monitoring, for the affected existing coal boilers are estimated at \$904 million. Estimated capital costs for the 934 affected liquid fueled boilers are \$1.5 billion, and average cost of \$1.6 million. Annualized costs for the affected liquid units are \$387 million. The total capital and annual costs include costs for control devices, work practices, testing and monitoring.





DOE Technical Assistance for Major Source Industrial Boilers

DOE has joined EPA in an effort to help ensure that major sources burning coal and oil have information on cost-effective clean energy strategies for compliance. DOE currently provides technical information on clean energy options to industry through its regional Clean Energy Application Centers. DOE is supplementing this effort to provide site-specific technical and cost information to the major source facilities that are currently burning coal or oil in their boilers. These facilities may have opportunities to develop compliance strategies, such as natural gas combined heat and power, which are cleaner, more energy efficient, and that can have a positive economic return for the plant over time. These opportunities can be considered alongside investment in pollution controls to comply with the standards in the rule. DOE is contacting these coal- and oil-fired facilities to provide information on clean energy options for compliance, as well as potential funding and financing opportunities. Facilities that make use of this outreach can potentially develop strategies to reduce their emissions to comply with the regulations while adding to their bottom line.

In addition, the boiler tune-up portion of the regulation can save facilities energy-related costs, and the energy assessment portion of the regulation will identify additional energy and cost savings. DOE will provide to all affected sources information on financial incentives available at the local, state, utility and federal level to assist them in undertaking a boiler tune-up and/or energy audit.

Resources

For more information on the CEAC Boiler MACT technical assistance:

- Overview of [Boiler MACT and how Combined Heat and Power is a Technical & Economic Compliance Strategy](#)
- Fact Sheet ["DOE Offers Boiler MACT Technical Assistance"](#)
- Information on [Financial Incentives Available for Facilities that are Affected by the US EPA "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Final Rule"](#)
- [Individuals with specialized DOE training](#) that may be of assistance in complying with Boiler MACT
- Contact Katrina Pielli, U.S. DOE, katrina.pielli@ee.doe.gov

For more information on the rule:

- [EPA Emissions Standards for Boilers and Process Heaters and Commercial/Industrial Solid Waste Incinerators](#)
- [National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers – Guidance for Calculating Emission Credits Resulting from Implementation of Energy Conservation Measures](#)