

Benefits and Costs of Five Important Clean Air Rules in 2030

Cars, trucks and nonroad engines are important sources of air pollution in the United States. As shown by the table below, EPA rules to control these emissions will achieve large emissions reductions and large public health benefits as dirtier, old engines are replaced by cleaner, new ones.

See pp. 2 for a brief description of each measure.

	<u>Light Duty Tier 2</u>	<u>Heavy Duty 2007</u>	<u>Nonroad Diesel Tier 4</u>	<u>Locomotive & Marine Diesel</u>	<u>Ocean Vessel Strategy</u>
NOx (short tons)	2,800,000	2,600,000	738,000	795,000	1,200,000
PM2.5 (short tons)	36,000	109,000	129,000	27,000	143,000
VOC (short tons)	401,000	115,000	34,000	43,000	0
SOx (short tons)	281,000	142,000	376,000	0	1,300,000
Total Cost (billion)	\$5.3	\$4.2	\$1.7	\$0.7	\$3.1
Total Monetized Benefits (billion)	\$25	\$70	\$80	\$11	\$110
Avoided Premature Mortality	4,300	8,300	12,000	1,400	13,000
Avoided Hospital Admissions	3,000	7,100	8,900	870	12,400
Avoided Lost Work Days	700,000	1,500,000	1,000,000	120,000	1,400,000

Table Notes

- Data and methods change over time to reflect new information. The impacts presented in this table reflect the best methods and data that were available at the time of the analysis. It is not possible to say with certainty what impact the variation in methods has on the estimates.
- Estimates of PM-related premature mortality avoided for all five rules are derived from the American Cancer Society (ACS) prospective cohort study. Analysis of the ACS cohort data has been updated over time, with the appropriate study used to estimate PM-related mortality in each of the five rules as follows: Light Duty Tier 2 – Pope et al., 1995; Heavy Duty 2007 – Krewski et al., 2000; Nonroad Diesel Tier 4, Locomotive & Marine Diesel and Ocean Vessel Strategy – Pope et al., 2002. Estimates of ozone-related premature mortality avoided are included in the mortality totals for the Locomotive & Marine Diesel Rule and the Ocean Vessels Strategy (Bell et al., 2005).
- The dollar year in which costs and benefits are calculated varies between rules, and are as follows: Light Duty Tier 2 – 1997\$; Heavy Duty 2007 – 1999\$; Nonroad Diesel Tier 4 – 2000\$; Locomotive & Marine Diesel and Ocean Vessel Strategy – 2006\$

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Program Descriptions

Light-duty vehicles – Tier 2 standards -- These emissions standards apply to new passenger cars and light trucks, including pickup trucks, vans, minivans and sport-utility vehicles (SUVs). Primarily aimed at reducing emissions that contribute to ozone, particulate matter pollution and air toxics, the rule treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline. These standards, which apply regardless of fuel type, were phased in between 2004 and 2007 (or 2009 for certain vehicle types). The low sulfur fuel standards were phased in between 2000 and 2007.

Heavy-duty highway vehicle standards – These emissions standards apply to new trucks and buses (heavy-duty vehicles with diesel or gasoline engines). The rule limits emissions that contribute to particulate matter pollution, ozone and air toxics. The rule treats heavy-duty vehicles and fuels as a system, combining requirements for cleaner vehicles with requirements for much lower levels of sulfur in fuel, including ultra-low sulfur diesel fuel. The heavy-duty vehicle standards were phased in between 2007 and 2010 while the fuel standards became effective beginning July 2006.

Nonroad diesel engines – Tier 4 standards - - - These standards, covering a wide range of engines including those used in construction and agriculture equipment, established more stringent exhaust emission standards and required ultra-low sulfur diesel fuel. The emission standards began taking effect in 2008 and will complete the phase in by 2015. The diesel fuel sulfur standards became effective in two steps: 2007 and 2010 (and for locomotive and marine diesel fuel 2012).

Locomotive and marine diesel engines – Tier 3 and Tier 4 standards – These standards for locomotives, commercial and recreational boats and ships established more stringent exhaust emissions standards for newly built engines, requiring highly efficient, advanced emission control technology, and established more stringent emissions standards for remanufactured marine and locomotive engines. The marine standards take effect in 2009 (tier 3) and 2014 (tier 4); the locomotive standards take effect in 2011 (tier 3) and 2015 (tier 4).

Ocean vessel strategy -- EPA's coordinated strategy includes Clean Air Act standards, as well as implementation of the international standards for marine engines and their fuels contained in Annex VI to the International Convention on the Prevention of Pollution from Ships (a treaty called MARPOL). The strategy also includes designation of U.S. coasts as an Emission Control Area (ECA) through an amendment to MARPOL Annex VI. The ECA became effective August 1, 2012. Additional stringent fuel standards and engine-based standards will phase in between 2015 and 2016.