Regulatory Impact Analysis

Control of Hazardous Air Pollutants from Mobile Sources

Executive Summary

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Executive Summary

EPA is adopting new standards to reduce emissions of mobile source air toxics (MSATs) including benzene and overall hydrocarbons from motor vehicles, motor vehicle fuels, and portable fuel containers (PFCs). This Regulatory Impact Analysis provides technical, economic, and environmental analyses of the new emission standards. The anticipated emission reductions will significantly reduce exposure to harmful pollutants and also provide assistance to states and regions facing ozone and particulate air quality problems that are causing a range of adverse health effects, especially in terms of respiratory impairment and related illnesses.

Chapter 1 reviews information related to the health effects of mobile source air toxics. Chapter 2 provides emissions inventory estimates, including estimates of anticipated emissions reductions. Chapter 3 presents air quality, and resulting health and welfare effects, associated with air toxics, ozone, and particulate matter (PM). Chapter 4 contains an overview of the affected refiners and manufacturers, including a description of the range of products involved and their place in the market. Chapters 5 through 7 summarize the available information supporting the specific standards we are adopting, providing a technical justification for the feasibility of the standards for vehicles, fuels, and PFCs, respectively. Chapters 8 through10 present cost estimates of complying with the new standards or vehicles, fuels, and PFCs, respectively. Chapter 11 compares the costs and the emission reductions to generate an estimate of the cost per ton of pollutant removed. Chapters 12 and 13 describe the estimated societal costs and benefits of the rulemaking. Chapter 14 presents our Regulatory Flexibility Analysis, as called for in the Regulatory Flexibility Act.

The following paragraphs briefly describe the standards that we are finalizing and the estimated impacts.

Emissions Standards

Vehicles

We are adopting new standards for both exhaust and evaporative emissions from passenger vehicles. The new exhaust emissions standards will significantly reduce non-methane hydrocarbon (NMHC) emissions from passenger vehicles at cold temperatures. These hydrocarbons include many mobile source air toxics (including benzene), as well as VOC.

The current NMHC standards are typically tested at 75˚ F, and recent research and analysis indicates that these standards are not resulting in robust control of NMHC at lower temperatures. (There is an existing cold temperature standard, but it applies only to CO.) We believe that cold temperature NMHC control can be substantially improved using the same technological approaches that are generally already being used in the Tier 2 vehicle fleet to meet the stringent standards at 75˚ F. We project that these cold-temperature NMHC controls will also result in lower direct PM emissions at cold temperatures.

Accordingly, we are requiring that light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles be subject to a new NMHC exhaust emissions standard at 20˚ F.

Vehicles at or below 6,000 pounds gross vehicle weight rating (GVWR) will be subject to a sales-weighted fleet average NMHC level of 0.3 grams/mile. Vehicles between 6,000 and 8,500 pounds GVWR and medium-duty passenger vehicles will be subject to a sales-weighted fleet average NMHC level of 0.5 grams/mile. For lighter vehicles, the standard will phase in between 2010 and 2013. For heavier vehicles, the new standards will phase in between 2012 and 2015. We are also adopting a credit program and other provisions designed to provide flexibility to manufacturers, especially during the phase-in periods. These provisions are designed to allow the earliest possible phase-in of standards and help minimize costs and ease the transition to new standards.

We are also adopting a set of nominally more stringent evaporative emission standards for all light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles. The new standards are equivalent to California's Low Emission Vehicle II (LEV II) standards, and they reflect the evaporative emissions levels that are already being achieved nationwide. The standards will codify the approach that manufacturers are already taking for 50-state evaporative systems, and thus the standards will prevent backsliding in the future. The new evaporative emission standards begin in 2009 for lighter vehicles and in 2010 for the heavier vehicles.

Gasoline Fuel Standards

We are requiring that beginning January 1, 2011, refiners and fuel importers will meet a refinery average gasoline benzene content standard of 0.62% by volume on all their gasoline, both reformulated and conventional (except for California, which is already covered by a similar relatively stringent state program).

This new fuel standard will result in air toxics emissions reductions that are greater than required under all existing gasoline toxics programs. As a result, EPA is establishing that upon full implementation in 2011, the regulatory provisions for the benzene control program will become the single regulatory mechanism used to implement the reformulated gasoline (RFG) and Anti-dumping annual average toxics requirements. The current RFG and Anti-dumping annual average provisions will be replaced by the new benzene control program. The MSAT2 benzene control program will also replace the MSAT1 requirements. In addition, the program will satisfy certain fuel MSAT conditions of the Energy Policy Act of 2005. In all of these ways, we will significantly consolidate and simplify the existing national fuel-related MSAT regulatory program.

We are also allowing that refiners could generate benzene credits and use or transfer them as a part of a nationwide averaging, banking, and trading (ABT) program. From 2007-2010 refiners can generate benzene credits by taking early steps to reduce gasoline benzene levels. Beginning in 2011 and continuing indefinitely, refiners can generate credits by producing gasoline with benzene levels below the 0.62 vol% refinery average standard. Refiners can apply the credits towards company compliance, "bank" the credits for later use, or transfer ("trade") them to other refiners nationwide (outside of California) under the new program. Under this program, refiners can use credits to achieve compliance with the benzene content standard. In addition, to the 0.62 vol% standards, refiners must also meet a maximum average benzene standard of 1.3 vol% beginning on July 1, 2012. A refinery's or importer's actual annual average gasoline benzene levels may not exceed this maximum average standard.

Portable Fuel Container Controls

Portable fuel containers (PFCs) include gasoline containers (gas cans) and kerosene and diesel containers. PFCs are consumer products used to refuel a wide variety of equipment, including lawn and garden equipment, generators, heaters, recreational equipment, and passenger vehicles that have run out of gas. We are adopting standards that will reduce hydrocarbon emissions from evaporation, permeation, and spillage. These standards will significantly reduce benzene and other toxics, as well as VOC more generally. VOC is an ozone precursor. We are also applying the new requirements to kerosene and diesel containers, which are identical to gas cans except for their color and could be used for gasoline.

We are adopting a performance-based standard of 0.3 grams per gallon per day of hydrocarbons, based on the emissions from the can over a diurnal test cycle. The standard will apply to PFCs manufactured on or after January 1, 2009. We are also adopting test procedures and a certification and compliance program, in order to ensure that PFCs will meet the emission standard over a range of in-use conditions. The new requirements will result in the best available control technologies, such as durable permeation barriers, automatically closing spouts, and cans that are well-sealed.

California implemented an emissions control program for PFCs in 2001, and since then, several other states have adopted the program. In 2005, California adopted a revised program, which will take effect July 1, 2007. The revised California program is very similar to the program we are adopting. Although a few aspects of the program we are adopting are different, we believe manufacturers will be able to meet both EPA and California requirements with the same container designs.

Projected Impacts

The following paragraphs and tables summarize the projected emission reductions and costs associated with the emission standards. See the detailed analysis later in this document for further discussion of these estimates.

Emissions Reductions

Toxics

sources as well due to lower benzene levels in gasoline. Annual benzene emissions from

Table 1: Estimated Reductions in Benzene Emissions from New Control Measures by Sector, 2020 and 2030 (tons per year)

	2020	2030
Fuels	17,618	19,643
Vehicles	27,097	45,037
PFCs	718	814
Total	42,760	61,035

Table 2: Estimated Reductions in MSAT Emissions from New Control Measures by Sector, 2020 and 2030 (tons per year)

	2020	2030
Fuels	17,618	19,643
Vehicles	177,007	294,284
PFCs	18,553	21,036
Total	210,303	330,844

VOC

VOC emissions will be reduced by the hydrocarbon emission standards for both light-duty vehicles and PFCs. Annual VOC emission reductions from these sources will be about 34% lower in 2030 because of the new rule.

Table 3: Estimated Reductions in VOC Emissions from Light-Duty Gasoline Vehicles and PFCs, 2020 and 2030 (tons per year)

	2020	2030
Vehicles	529,363	882,762
PFCs	216,294	245,255

Total	745,658	1,128,017

$PM_{2.5}$

We expect that only the vehicle control will reduce emissions of direct $PM_{2.5}$. As shown in Table 4, we expect this control to reduce direct $PM_{2.5}$ emissions by about 19,000 tons in 2030. In addition, the VOC reductions from the vehicle and PFC standards will also reduce secondary formation of $PM_{2.5}$.

Table 4. Estimated National Reductions in Direct $PM_{2.5}$ Exhaust Emissions from Light-Duty Gasoline Vehicles and Trucks, 2020 and 2030 (tons per year)

	2020	2030
$PM_{2.5}$ Reductions from Vehicle Standards (tons)	11,646	19,421

Costs

Fuels

The refinery model estimates that the benzene standard will cost 0.27 cents per gallon, averaged over the entire U.S. gasoline pool. (When averaged only over those refineries which are assumed to take steps to reduce their benzene levels, the average cost will be 0.40 cents per gallon.) This per-gallon cost will result from an industry-wide investment in capital equipment of $1,110 million to reduce gasoline benzene levels. This will amount to an average of $14 million in capital investment in each refinery that adds such equipment. The aggregate costs for the fuel program for 2020 and 2030 are provided in Table 5. The increase in costs is due to the projected increase in gasoline usage.

Table 5. Estimated Aggregate Annual Cost for the Benzene Standard, 2020 and 2030

	2020	2030
Fuels program	$398 million	$441 million

Vehicles

We project that the average incremental costs associated with the new cold temperature standards will be less than $1 per vehicle. We are not projecting changes to vehicle hardware as a result of the new standard. Costs are associated with vehicle R&D and recalibration as well as facilities upgrades to handle additional development testing under cold conditions. Also, we are not anticipating additional costs for the new evaporative emissions standard. We expect that manufacturers will continue to produce 50-state evaporative systems that meet LEV II standards. Therefore, harmonizing with California's LEV-II evaporative emission standards will streamline certification and be an "anti-backsliding" measure. It also will codify the approach manufacturers have already indicated they are taking for 50-state evaporative systems.

We also estimated annual aggregate costs associated with the new cold temperature emissions standards. These costs are projected to increase with the phase-in of standards and peak in 2014 at about $13.4 million per year, then decrease as the fixed costs are fully amortized. As shown in Table 6, we project the costs will be fully amortized by 2020.

Table 6. Estimated Aggregate Annual Cost for the Vehicle Standards, 2020 and 2030

	2020	2030
Vehicles program	$0	$0

PFCs

Table 7 summarizes the projected near-term and long-term per unit average costs to meet the new emission standards. Long-term impacts on PFCs are expected to decrease as manufacturers fully amortize their fixed costs. The table also shows our projections of average fuel savings over the life of the PFC when used with gasoline.

Table 7 Estimated Average PFC Costs and Lifetime Fuel Savings

	Cost
Near-Term Costs	$2.69
Long-Term Costs	$1.52
Gasoline Savings (NPV)	$4.24

We have also estimated aggregate costs and gasoline fuel savings which are projected to peak in 2013 at about $61 million and then drop to about $33 million once fixed costs are recovered. The aggregate annual costs and gasoline savings estimates for 2020 and 2030 are provided in Table 8.

Table 8. Estimated Aggregate Annual Cost and Gasoline Savings for the PFC Standards, 2020 and 2030

	2020	2030
PFC Costs	$37,542,748	$45,764,401
PFC Gasoline Savings	$109,589,064	$124,264,434

Cost Per Ton

We have calculated the cost per ton of HC, benzene, total MSATs, and PM emissions reductions associated with the new fuel, vehicle, and PFC programs. We have calculated the costs per ton using the net present value of the annualized costs of the program, including PFC gasoline fuel savings, from 2009 through 2030 and the net present value of the annual emission reductions through 2030. We have also calculated the cost per ton of emissions reduced in the year 2020 and 2030 using the annual costs and emissions reductions in that year alone. This number represents the long-term cost per ton of emissions reduced. For fuels, the cost per ton estimates include costs and emission reductions that will occur from all motor vehicles and nonroad engines fueled with gasoline as well as PFCs and gasoline distribution.

We have not attempted to apportion costs across these various pollutants for purposes of the cost per ton calculations since there is no distinction in the technologies, or associated costs, used to control the pollutants. Instead, we have calculated costs per ton by assigning all costs to each individual pollutant. If we apportioned costs among the pollutants, the costs per ton presented here would be proportionally lowered depending on what portion of costs were assigned to the various pollutants. The results of the analysis are provided in Tables 9 through 12.

The cost per ton estimates for each individual program are presented separately in the tables below, and are part of the justification for each of the programs. For informational purposes, we also present the cost per ton for the three programs combined.

Table 9. HC Aggregate Cost per Ton and Long-Term Annual Cost Per Ton ($2003)

	Discounted Lifetime Cost per ton at 3%	**Discounted Lifetime Cost per ton at 7%**	**Long-Term Cost per Ton in 2020**	**Long-Term Cost per Ton in 2030**
Vehicles	$14	$18	$0	$0
PFCs (without fuel savings)	$240	$270	$170	$190
PFCs (with fuel savings)	$0	$0	$0	$0
Combined (with fuel savings)	$0	$0	$0	$0

Table 10. Benzene Aggregate Cost per Ton and Long-Term Annual Cost Per Ton ($2003)

	Discounted Lifetime Cost per ton at 3%	**Discounted Lifetime Cost per ton at 7%**	**Long-Term Cost per Ton in 2020**	**Long-Term Cost per Ton in 2030**
Fuels	$22,400	$23,100	$22,600	$22,500
Vehicles	$270	$360	$0	$0
PFCs (without fuel savings)	$74,500	$82,900	$52,200	$56,200
PFCs (with fuel savings)	$0	$0	$0	$0
Combined (with fuel savings)	$8,200	$8,600	$7,600	$5,900

Table 11 MSAT Aggregate Cost per Ton and Long-Term Annual Cost Per Ton ($2003)

	Discounted Lifetime Cost per ton at 3%	Discounted Lifetime Cost per ton at 7%	Long-Term Cost per Ton in 2020	Long-Term Cost per Ton in 2030
Fuels	$22,400	$23,100	$22,600	$22,500
Vehicles	$42	$54	$0	$0
PFCs (without fuel savings)	$2,800	$3,100	$2,000	$2,200
PFCs (with fuel savings)	$0	$0	$0	$0
Combined (with fuel savings)	$1,700	$1,800	$1,600	$1,100

Table 12 Direct PM Aggregate Cost per Ton and Long-Term Annual Cost Per Ton ($2003)

	Discounted Lifetime Cost per ton at 3%	Discounted Lifetime Cost per ton at 7%	Long-Term Cost per Ton in 2020	Long-Term Cost per Ton in 2030
Vehicles	$650	$870	$0	$0

Benefits

This analysis projects significant benefits throughout the period from initial implementation of the new standards through 2030. When translating emission benefits to health effects and monetized values, however, we only quantify the PM-related benefits associated with the new cold temperature vehicle standards. The reductions in PM from the cold temperature vehicle standards will result in significant reductions in premature deaths and other serious human health effects, as well as other important public health and welfare effects. Table 13 provides the estimated monetized benefits of the cold temperature vehicle standards for 2020 and 2030. We estimate that in 2030, the benefits we are able to monetize are expected to be approximately $6.3 billion using a 3 percent discount rate and $5.7 billion using a 7 percent discount rate, assuming a background PM threshold of 3 $\mu g/m^3$ in the calculation of PM mortality. There are no compliance costs associated with the cold temperature vehicle program after 2019; vehicle compliance costs are primarily research and development, and facility costs are expected to be recovered by manufacturers over the first ten years of the program beginning in 2010. Total costs of the entire MSAT rule, which include both the PFC, vehicle, and fuel standards, are $400 million in 2030 (in 2003$, including fuel savings).

The $PM_{2.5}$ benefits are scaled based on relative changes in direct PM emissions between this rule and the proposed Clean Air Nonroad Diesel (CAND) rule. As explained in Section 12.2.1 of the RIA, the $PM_{2.5}$ benefits scaling approach is limited to those studies, health impacts, and assumptions that were used in the proposed CAND analysis. As a result, PM-related premature mortality is based on the updated analysis of the American Cancer Society cohort (ACS; Pope et al., 2002). However, it is important to note that since the CAND rule, EPA's Office of Air and Radiation (OAR) has adopted a different format for its benefits analysis in which characterization of the uncertainty in the concentration-response function is integrated into the main benefits analysis. Within this context, additional data sources are available, including a recent expert elicitation and updated analysis of the Six-Cities Study cohort (Laden et al., 2006). Please see the PM NAAQS RIA for an indication of the sensitivity of our results to use of alternative concentration-response functions.

The analysis presented here assumes a PM threshold of 3 μg/m3, equivalent to background. Through the RIA for the Clean Air Interstate Rule (CAIR), EPA's consistent approach had been to model premature mortality associated with PM exposure as a nonthreshold effect; that is, with harmful effects to exposed populations modeled regardless of the absolute level of ambient PM concentrations. This approach had been supported by advice from EPA's technical peer review panel, the Science Advisory Board's Health Effects Subcommittee (SAB-HES). However, EPA's most recent $PM_{2.5}$ Criteria Document concludes that "the available evidence does not either support or refute the existence of thresholds for the effects of PM on mortality across the range of concentrations in the studies," (p. 9-44). Furthermore, in the RIA for the PM NAAQS we used a threshold of 10 μg/m3 based on recommendations by the Clean Air Scientific Advisory Committee (CASAC) for the Staff Paper analysis. We consider the impact of a potential, assumed threshold in the PM-mortality concentration response function in Section 12.6.2.2 of the RIA

Table 13 Estimated Monetized PM-Related Health Benefits of the Mobile Source Air Toxics Standards: Cold Temperature Controls

	Total Benefits[a, b, c] (billions 2003$)	
	2020	**2030**
Using a 3% discount rate	$3.3 + B	$6.3 + B
Using a 7% discount rate	$3.0 + B	$5.7 + B

[a] Benefits include avoided cases of mortality, chronic illness, and other morbidity health endpoints. PM-related mortality benefits estimated using an assumed PM threshold at background levels (3 μg/m^3). There is uncertainty about which threshold to use and this may impact the magnitude of the total benefits estimate. For a more detailed discussion of this issue, please refer to Section 12.6 of the RIA.

[b] For notational purposes, unquantified benefits are indicated with a "B" to represent the sum of additional monetary benefits and disbenefits. A detailed listing of unquantified health and welfare effects is provided in Table 12.1-2 of the RIA.

[c] Results reflect the use of two different discount rates: 3 and 7 percent, which are recommended by EPA's *Guidelines for Preparing Economic Analyses* and OMB Circular A-4. Results are rounded to two significant digits for ease of presentation and computation.

Economic Impact Analysis

We prepared an Economic Impact Analysis (EIA) to estimate the economic impacts of the emission control program on the PFC, gasoline fuel, and light-duty vehicle markets. Our estimates of the net social costs of the program for 2020 and 2030 are provided in Table 14 below. These estimates reflect the estimated costs associated with the gasoline, PFC, and vehicle controls and the expected gasoline fuel savings from better evaporative controls on PFCs. The results of the economic impact modeling performed for the gasoline fuel and PFC control programs suggest that the social costs of those two programs are expected to be about $440.1 million in 2020 with consumers of these products expected to bear about 58 percent of these costs. We estimate fuel savings of about $80.7 million in 2020 that will accrue to consumers. There are no social costs associated with the vehicle program in 2020.

Table 14 Net Social Costs Estimates for the Program (Millions of 2003$)

	2020	**2030**
Net Social Costs	$359.4	$400.0

Impact on Small Businesses

We prepared a Regulatory Flexibility Analysis, which evaluates the potential impacts of new standards and fuel controls of this rule on small entities. As a part of this analysis, we interacted with several small entities representing the various affected sectors and convened a Small Business Advocacy Review Panel to gain feedback and advice from these representatives. This feedback was used to develop regulatory alternatives to address the impacts of the rule on small businesses. Small entities raised general concerns related to potential difficulties and costs of meeting the upcoming standards.

The Panel consisted of members from EPA, the Office of Management and Budget, and the Small Business Administration’s Office of Advocacy. We are adopting most of the Panel’s recommendations. These provisions will reduce the burden on small entities that will be subject to this rule’s requirements. We have included provisions that give small light-duty vehicle manufacturers, small gasoline refiners, and small PFC manufacturers several compliance options aimed specifically at reducing the burden on these small entities. In general, for vehicles and fuels, the options are similar to small entity provisions adopted in prior rulemakings where EPA set vehicle and fuel standards. The options included for small PFC manufacturers are unique to this rulemaking since we are adopting PFC standards for the first time.