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Regulatory Impact Analysis for the Proposed Greenhouse Gas Tailoring Rule

Final Report

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Section 1

Introduction

The Environmental Protection Agency (EPA) is proposing to phase-in the major source applicability thresholds for greenhouse gas (GHG) emissions under the Prevention of Significant Deterioration (PSD) and title V programs of the Clean Air Act (CAA or Act) and to set a PSD significance level for GHG emissions (proposal also referred to as tailoring rule). This proposal is necessary because of EPA's "Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act" determining GHGs emissions to be an air pollutant¹, and because EPA expects soon to promulgate regulations under the CAA to control GHG emissions from light-duty motor vehicles and, as a result, trigger PSD and title V requirements for GHG emissions.² If PSD and title V requirements apply at the applicability levels provided under the CAA, State permitting authorities would be paralyzed by enormous numbers of permit applications; the amounts are orders of magnitude greater than the current inventory of permits and would vastly exceed the current administrative resources of the permitting authorities. Given this circumstance, and relying on established legal doctrines as described in the proposal notice, this proposed rule would phase-in PSD and title V applicability by temporarily establishing revised applicability thresholds for both the PSD and title V programs, and temporarily establishing a PSD significance level. Concurrently EPA will conduct a study of the permitting authorities' ability to administer the programs going forward, and conduct a rulemaking to establish revised applicability levels or other methods for streamlining administration, all within six years of the effective date of final action of this proposal. EPA also proposes to identify as the pollutant subject to PSD and title V the group of up to six GHG emissions, each one weighted for its global warming potential, that are included in regulations for their control under the CAA. EPA also proposes to conform its action on PSD state implementation plans (SIPs) and title V programs to match the proposed Federal applicability requirements.

¹ Federal Register. April 24, 2009 (Volume 74, Number 78). Page 18885-18910. Docket ID No. EPA-HQ-OAR-2009-0171-0137

² EPA-HQ-OAR-2009-0472; NHTSA-2009-0059 <http://www.epa.gov/otaq/climate/regulations/ghg-preamble-regs.pdf>

This rule does not impose any new burden as it provides temporary regulatory relief for sources of GHG emissions below a level of 25,000 tpy CO₂e (carbon dioxide equivalents). The primary GHGs of concern directly emitted by human activities include CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). Different GHGs have different heat-trapping capacities. It is useful to compare them to each other through the use of the CO₂e metric. This metric incorporates both the heat-trapping ability and atmospheric lifetime of each GHG and can be used to adjust the quantities, in tpy, of all GHGs relative to the global warming potential (GWP) of CO₂. When quantities of the different GHGs are multiplied by their GWPs, the different GHGs can be summed and compared on a CO₂e basis. Depending on which GWP values are used, the calculated GHG emissions on a CO₂e basis will vary. Throughout this document, we are applying the GWP values established by the Intergovernmental Panel on Climate Change (IPCC) in its Second Assessment Report (SAR) (IPCC 1996).³

In the U.S., the combustion of fossil fuels (e.g., coal, oil, gas) is the largest source of CO₂ emissions and accounts for 80 percent of total GHG emissions. More than half the energy-related emissions come from large stationary sources such as power plants, while about a third comes from transportation. Of the six primary GHGs, four (CO₂, CH₄, N₂O, and HFCs) are emitted by motor vehicles. Industrial processes (such as the production of cement, steel, and aluminum), agriculture, forestry, other land use, and waste management are also important sources of GHG emissions in the U.S. These emissions are inventoried at a national level by EPA in the Inventory of U.S. Greenhouse Gas Emissions and Sinks.⁴ The entities affected by this rule are small stationary GHG emitting sources.

We have completed a Regulatory Impact Analysis (RIA) that estimates the cost savings to sources and permitting authorities achieved by this rule. Because the need for the tailoring rule is predicated on a separate action taken by the EPA to regulate GHG emissions under the CAA, this analysis focuses on the effects of regulation assuming that such an action occurs. However,

³ "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007," U.S. Environmental Protection Agency, EPA 430-R-09-004, April 15, 2009. Table 1-2, p. 1-6.
<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>.

⁴ For additional information about the Inventory of U.S. Greenhouse Gas Emissions and Sinks, and for more information about GHGs, climate change, climate science, etc., see EPA's climate change Web site at www.epa.gov/climatechange/.

because a triggering action may not yet have happened, there is at least some uncertainty about when it will occur. This uncertainty has been directly considered in developing regulatory alternatives considered in this RIA. Figure 1.0 below depicts alternative states of regulation considered in analyzing the impacts of the tailoring rule in this RIA. As shown in Figure 1.0, these states of the regulation may be initially divided into those where a triggering event has occurred or has not. The left branch of the figure shows the case where a triggering event has taken place. For purposes of this RIA, alternatives shown on the left branch of the figure (GHG Permitting Triggered) are directly considered in the regulatory alternatives analyzed in this report. Within these alternatives, the EPA will further consider regulatory relief threshold alternatives, as well as, the consequences likely to occur if the EPA takes no regulatory relief action. In contrast, those circumstances shown in the right branch (GHG Permitting Not Triggered) require no action on the part of sources or permitting authorities and the state of the regulation remains unchanged from the present. If GHG permitting is not triggered, there is no immediate need for the tailoring rule. However, if the tailoring rule is advanced before any triggering regulation, it would be in place in the event such an action takes place at some point in the future. If the EPA does not pursue reduction of GHG emissions in a separate regulatory action, the tailoring rule will have no impact.

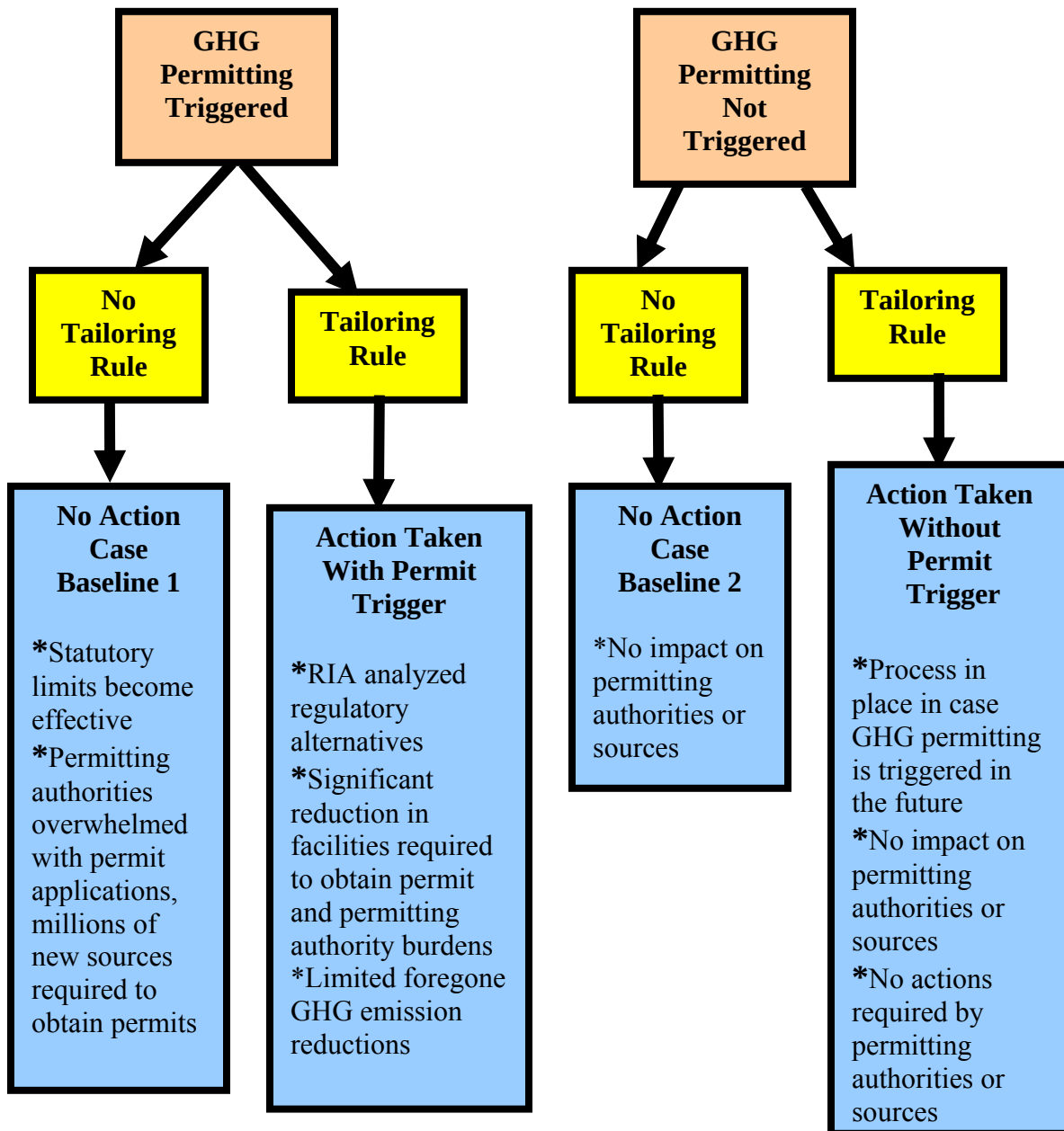
While this RIA does not directly consider these alternative states of the regulation in the analytics presented, it should be noted that the possibilities are feasible outcomes absent a triggering mechanism. Because of the existence of these possibilities, the regulatory analysis could plausibly have employed two baselines:

- 1) Estimation of cost savings of the tailoring rule assuming the triggered PSD and Title V requirements as outlined in this RIA;
- 2) Estimation of total costs associated with the tailoring rule assuming that the statutory requirements have not been triggered.

As noted above, this RIA examined the rule in detail using the Baseline 1 approach, but did not examine Baseline 2 in detail due to the negligible impact the tailoring rule would have prior to a GHG regulation triggering the statutory requirements. We seek comment on whether EPA should further conduct analysis using Baseline 2.

We also note that, under Baseline 1, for any of the thresholds analyzed, there is also a class of very large sources and modifications that will remain subject to PSD and/or title V for GHG following a GHG-triggering regulation. We do not analyze the magnitude of the costs and benefits of PSD/Title V regulation for those sources because they are, by definition, sources that are included in the baseline. The information in Appendix A indicates that at the proposed 25,000 tons/year CO₂e threshold, about 14,000 sources would be classified as major for GHG, and about 400 new sources and modifications each year would trigger PSD for GHG. We estimate that all but about 3,000 of the sources and about 60 of the modifications likely would already be major for other pollutants. The permitting burden for such sources is not attributable to the tailoring rule. However, under our analysis of Baseline 1, we consider alternatives to the 25,000 threshold that could result in greater or lesser coverage compared to the baseline, within the constraints imposed by the legal doctrines described in the preamble.

Figure 1.0. Alternative States of Regulation Relating to the GHG Tailoring Rule



1.1 Executive Summary

This RIA examines the benefits, costs, and economic impacts of the proposed rule for affected entities and society as a whole. This proposed rule lifts, for a period of six years, the burden to obtain a title V operating permit required by the CAA for smaller existing sources of GHGs and the burden of NSR requirements for smaller new or modifying sources of GHGs. Thus this rule may be viewed as providing regulatory relief rather than regulatory requirements for these smaller GHG sources for a period of six years. For larger sources of GHGs, there are no direct economic burdens or costs as a result of this proposed rule, because requirements to obtain a title V operating permit or to adhere to NSR requirements of the CAA are already mandated by the Act and by existing rules and are not imposed as a result of this proposed rulemaking. The RIA conducted for this proposed rule may be considered illustrative of the benefits in terms of regulatory relief that smaller GHG sources will experience in terms of costs avoided as a result of this proposed rule.

This rulemaking provides proposed permitting thresholds for sources of GHGs that exceed levels contained in the CAA. Specifically, sources with the potential to emit less than 25,000 tons per year (tpy) CO₂e are not required to obtain an operating permit or PSD permit for a period of at least five years at which time a study will be conducted and the decision revisited after six years. In the six years following promulgation of this rule, the EPA estimates that, compared to baseline estimates that do not include the effects of this rule, over six million sources of GHG emissions will be allowed to operate without a title V operating permits and tens of thousands of new sources or modifying sources will not be subject to NSR requirements for GHGs. For this large number of smaller sources, this rule alleviates the regulatory burden associated with obtaining an operating or PSD permit or complying with NSR BACT requirements. Therefore, this proposed action may be considered beneficial to these small entities as it provides relief from regulation that would otherwise be required. However, this decision does potentially have environmental consequences in the form of lesser emission reductions during the six year period of time. Given that these smaller sources of GHG account for an estimated 7 percent of the six directly emitted GHGs nationally from industrial, commercial, and residential source categories, while representing over 95 percent of the total number of sources potentially requiring a PSD permit for GHGs under current permitting thresholds in the CAA, the EPA believes this is a prudent decision. Requiring such a large

number of small sources to obtain permits for the first time would overtax the permitting authorities' abilities to process new permits without commensurate benefits. Moreover, reductions from these small sources will still be occurring, notwithstanding the fact that permitting requirements would not apply to them. These smaller sources of GHG will be the focus of voluntary emission reduction programs and energy efficiency measures that lead to reductions in GHGs. The EPA will also reevaluate this decision after a six year period and a study of the implications of permitting smaller GHG sources to those sources and permitting authorities.

1.2 Organization of this Report

The remainder of this report supports and details the methodology and the results of this illustrative Regulatory Impact Analysis.

Section 2 presents a discussion of regulatory alternatives and affected entities.

Section 3 describes the information collection costs.

Section 4 describes the methodology and the estimated economic impacts.

Section 5 provides a qualitative description of social costs.

Section 6 lists the references for the analyses included in this RIA.

Section 2

Regulatory Alternatives and Affected Entities

As previously stated, this proposed rule is essentially providing regulatory relief and does not include direct regulatory provisions for any industrial, commercial or residential entities. An analysis is presented for smaller sources that experience regulatory relief. This proposal increases the GHG threshold for title V applicability to obtain a title V operating permit potential to emit levels from 100 tpy to 25,000 tpy CO₂e or greater annual emissions or potential emissions. In addition, under the proposal, new sources of GHG emissions with the potential to emit 25,000 tpy CO₂e or more emissions rather than the CAA mandated 250 tpy are subject to NSR and are required to obtain a PSD permit and to comply with BACT regulatory requirements by the CAA. Major modifications at sources of GHG emissions are also required to obtain a PSD permit and to meet BACT regulatory requirements, when the projected emissions increase from such modification exceeds the NSR significant level (with the promulgated level to be selected from a proposed range of values between 10,000 and 25,000 tpy CO₂e). Impacts on new and modified sources of GHG emissions with the potential to emit 25,000 tpy CO₂e or greater annual emissions are not included in this RIA since these impacts are not associated with this rule. In addition to consideration of the proposed threshold of 25,000 CO₂e tpy potential to emit, this RIA examines alternative regulatory thresholds of 10,000 tpy CO₂e and 50,000 tpy CO₂e potential to emit, as well as, an alternative of no regulatory action that leaves the permitting thresholds in the CAA unaltered for sources of GHG emissions.

The information on number of affected sources utilized in this RIA is based on emission estimates that represent a facility's potential-to-emit (PTE). PTE is defined as the maximum capacity of a stationary source to emit a pollutant under its physical and operational design, including certain legal limitations, for example, on emissions or hours of operation. NSR and title V programs both use PTE for defining major sources. This is particularly relevant concern for determining the number of facilities in the commercial and residential sector that may be affected, where CO₂ emissions are primarily due to space heating/appliance usage and the combustion units are not likely to be used constantly at their maximum rated capacity. Our basis for these PTE adjustments in the residential and commercial sectors are based on information on heating equipment and appliance usage in these sectors, and resulted in a range of

85 to 90 percent upwards adjustment in emissions from actual emission values. A full description of the basis of these PTE adjustments can be found in Attachment B, *Technical Support Document for Greenhouse Gas Emissions Threshold Evaluation*.

The rationale for proposing the 25,000 tpy CO₂e threshold in the proposed tailoring rule is based in part on our review of the costs and benefits associated with the different thresholds evaluated and described in this RIA. However, the primary basis for choosing the 25,000 tpy CO₂e threshold was to ensure consistency with the legal doctrines set forth in the preamble of the proposed tailoring rule. To apply the statutory PSD and title V applicability thresholds to sources of GHG emissions would create immediate and insuperable administrative burdens for permitting authorities. By establishing the applicability thresholds at the 25,000-tpy levels for the first phase, we would avoid an administratively impossible scenario where each year tens of thousands of new sources and modifications would become subject to PSD review; and, in total, millions of sources would require title V operating permits. We used the results of this RIA to support the decision on proposing a 25,000 tpy CO₂e threshold, which we believe would result in a variance from existing statutory permitting thresholds that would – consistent with the supporting legal rationale -- be as limited as possible and with consideration given to costs and benefits as described in this RIA.

Table 2-1 describes qualitatively the benefits, costs and economic impacts analyzed for regulatory alternatives in this RIA. As shown on Table 2-1, leaving the CAA thresholds unchanged for sources of GHG emissions is the baseline or no action alternative that will render this tailoring rule as having no impact on sources or permitting authorities beyond the current CAA requirements. Thus this is a regulatory alternative with zero benefits and zero costs. Under this alternative, small and large sources of GHG emissions will be required to obtain operating and PSD permits as mandated by the Act. While this alternative is considered for analytical completeness, its impact is essentially the same as no GHG tailoring rule and no further discussion of this alternative is considered in this document.

The benefits of this proposed rule (and the alternatives considered) are the costs avoided at smaller sources by increasing the threshold levels above current CAA requirements as reflected on Table 2-1. Under this proposal, millions of title V sources and thousands of NSR sources are afforded regulatory relief. For the proposed regulatory alternative increasing the

2.1 Qualitative Description of Benefits and Cost of the Tailoring Rule

Description	No Action (Thresholds Remain at 100/250 tpy)¹	10,000 tpy GHG Emission Threshold²	Proposed 25,000 tpy GHG Emission Threshold²	50,000 tpy GHG Emission Threshold²
Benefits (Regulatory relief-avoided permitting requirements and associated costs)	No avoided permitting costs (i.e., Over 6 million title V sources and over 40 thousand PSD small new and modifying GHG sources remain subject to programs.)	Avoid permitting costs for 6.075 million title V sources and for 40.0 thousand new and modifying PSD sources	Avoid permitting costs for 6.089 million sources and for 40.5 thousand new and modifying PSD sources	Avoid permitting costs for 6.096 million sources and for 40.7 thousand new and modifying PSD sources
Social Costs (Foregone emission reductions due to regulating GHG sources)	No foregone emission reductions	Foregone GHG emission reductions for affected sources (addressed qualitatively)	Foregone GHG emission reductions for affected sources (addressed qualitatively)	Foregone GHG emission reductions for affected sources (addressed qualitatively)
Economic Impacts (Avoided costs compared to annual sales or revenue data for affected sources)	No avoided costs	Impact of avoided costs (benefits) compared to annual sales revenues of affected sources	Impact of avoided costs (benefits) compared to annual sales revenues of affected sources	Impact of avoided costs (benefits) compared to annual sales revenues of affected sources

¹ This table assumes that a separate action has regulated GHG, triggering permitting for sources. When this happens, sources with the potential to emit 100 tpy CO₂e will be required to obtain a Title V permit and new or modifying sources with the potential to emit 250 tpy will be required to obtain a PSD permit as required by the CAA. If current threshold levels in the CAA remain unchanged for GHG emissions, the tailoring rule has no effect on sources or permitting authorities and provides no regulatory relief to such sources.

² Alternative regulatory thresholds analyzed in the RIA. Threshold levels represent potential to emit levels for affected sources.

CAA threshold to the potential to emit threshold of 25,000 tpy CO₂e and for the 10,000 tpy and 50,000 tpy regulatory alternatives, the benefits of this tailoring rule are primarily the avoided permitting costs for affected small sources of GHG emissions. The information collection and reporting costs (ICR) avoided by small sources are quantified for the proposal and each of the regulatory alternatives in Section 3 of this document.

The industry categories anticipated to experience regulatory relief at the threshold levels proposed in this regulation are shown in Table 2-2. As Table 2-2 shows, this proposal lifts permitting requirements for over 6 million potential title V sources and tens of thousands of potential NSR new sources otherwise required by the CAA to obtain permits. For additional industry details including applicable affected industry North American Classification System (NAICS) codes see Attachment A, Table A-1.

Table 2-2. Estimated Number of Affected Sources Experiencing Regulatory Relief for Proposal and Regulatory Alternatives^{1,2}

Sector	Number of Sources Experiencing Regulatory Relief					
	< 10,000 tpy		Proposal < 25,000 tpy		< 50,000 tpy	
	Title V	New PSD	Title V	New PSD	Title V	New PSD
Electricity	42	7	161	20	326	29
Industrial	151,100	274	156,545	303	160,180	324
Energy	2,275	22	3,644	35	4,535	48
Waste Treatment	866	0	1,431	0	2,455	1
Agriculture	37,351	299	37,351	299	37,351	299
Commercial	1,350,261	11,945	1,354,760	12,034	1,355,321	12,038
Residential- Multifamily	609,100	6,380	610,340	6,397	610,480	6,400
Residential- Single Family	3,925,000	515	3,925,000	515	3,925,000	575
Totals	6,075,995	19,442	6,089,232	19,603	6,095,648	19,654
% Emissions Covered ³	5%		7%		10%	

¹ Number of sources is determined on a potential to emit basis. Estimates for PSD sources are for newly constructed facilities and do not include modifications at existing facilities that may also be subject to PSD requirements.

² See Attachment B for more details of how thresholds and sources affected were developed. US Environmental Protection Agency. July 7, 2009.

³ Percentage of emissions covered represent estimated actual emissions from sources expected to experience regulatory relief as a percentage of total stationary source GHG emissions.

The EPA considered a number of factors involving administrative burden and necessity in proposing a threshold of 25,000 tpy CO₂e. When comparing the regulatory alternatives discussed above, there is a non-trivial difference between them. The reason the 25,000 tpy threshold is preferred to 10,000 tpy is because permitting authorities cannot immediately accommodate a huge immediate increase in permitting. The proposed threshold of 25,000 tpy CO₂e is also superior to the 50,000 tpy CO₂e because there is evidence that permitting authorities

can run programs for the levels of permitting that would be required at 25,000 tpy CO₂e, and the EPA believes legal doctrine requires the threshold to be as low as administratively feasible. The choice of a threshold is a balancing act of administrative considerations between threshold levels that the EPA feels are not administratively feasible (i.e., 10,000 tpy CO₂e potential to emit threshold) compared to thresholds levels that are not impossible (i.e., 50,000 tpy CO₂e potential to emit threshold) with the proposed threshold of 25,000 tpy CO₂e achieving a reasonable balance. For more information on this issue see Attachment B.

Section 3

Information Collection Costs

EPA estimated the costs for small sources of GHG that will be postponed as a result of this rulemaking in the form of avoided information collection costs or burden costs associated with obtaining a title V or PSD permit. This analysis focuses upon the burdens that are being lifted for smaller sources as a result of this proposed rule. In addition, an accounting of the avoided costs to State, local, and tribal permitting authorities is provided. These avoided costs relate specifically to information collection costs or burden costs for sources of GHG emissions that would have been required to obtain an operating permit under title V or required to modify an existing permit to address GHGs if not for this rule. Avoided costs shown also include information collection requirements for additional PSD permits required for new or modifying sources of GHGs, as well as, the costs to state, local and tribal permitting authorities for extending their existing permitting programs to include sources of GHGs.

Time and costs associated with permit activities are derived from existing Information ICRs. Significant uncertainties exist in the following estimates due to the lack of historical record and permitting experience upon which to base resource needs for including GHG sources.

3.1 Burden Costs for Title V

Major sources of GHGs with the potential to emit 25,000 tpy CO₂e from the six directly emitted GHGs are required to obtain a title V operating permit. Those sources emitting less than 25,000 tpy CO₂e will experience regulatory relief under this proposal. Table 3-1 shows the estimated first-year information collection costs for an industrial source subject to title V postponed for small GHG sources.

As shown on Table 3-1, the cost for an industrial source to obtain an operating permit is estimated to be approximately \$46.4 thousand (2007\$) per permit. Over 195 thousand industrial sources are likely to benefit from this rule due to the postponement of permitting requirements. The burden cost to obtain a new commercial or multi-family residential operating permit is estimated to be approximately \$5.0 thousand (2007\$) per permit with approximately 6 million of these sources benefitting from this rule by avoiding these costs for at least six years. The total information collection costs postpones for smaller sources of GHGs amount to approximately \$38 billion (2007\$).

Table 3-1. Title V Avoided Costs for Sources of GHG - Regulatory Relief Estimates^{1,2}

Program/Affected Entities	Small GHG Sources Under Alternative Threshold Levels						
		(< 10,000 tpy Threshold)		Proposed (< 25,000 tpy Threshold)		(< 50,000 tpy Threshold)	
	Per Permit Cost (2007\$) ²	Number of Permits Avoided ²	Total Cost Avoided (millions 2007\$)	Number of Permits Avoided ²	Total Cost Avoided (millions 2007\$)	Number of Permits Avoided ²	Total Cost Avoided (millions 2007\$)
Title V Sources:							
New Industrial	46,350	192,442	8,919.69	195,895	9,079.73	197,679	9,162.42
New Commercial Residential &	4,986	5,950,668	29,670.03	5,956,513	29,699.17	5,957,221	29,702.70
Significant Permit Revisions	312	0	0	0	0	0	0
Permit Renewals	780	0	0	0	0	0	0
Subtotal Title V Source Permits		6,143,110	38,589.72	6,152,408	38,778.91	6,154,900	38,865.12
Title V Permitting Authority:							
New Industrial	19,688	192,442	3,788.80	195,895	3,856.78	197,679	3,891.90
New Commercial & Residential	1,978	5,950,668	11,770.42	5,956,513	11,781.98	5,957,221	11,783.38
Significant Permit Revisions	414	0	0	0	0	0	0
Permit Renewals	414	0	0	0	0	0	0
Subtotal Title V Permits		6,143,110	15,559.22	6,152,408	15,638.70	6,154,900	15,675.29
Total Title V Permit Costs			54,148.94		54,417.61		54,540.41
% Emission Covered			5%		7%		10%

¹Costs shown represent estimates of the regulatory burden relief proposed by this rule. Title V new operating permit costs represents one time costs, but these permits are subject to renewals every five years. New and modified PSD permits reflect the estimated annual number of new and modifying sources requiring permits and the associated ICR costs. Sums in columns may not add due to rounding.

²These estimates are explained in more detail in Attachment C “Summary of ICR-based Data Used to Estimate Avoided Burden and Evaluate Resource Requirements at Alternative GHG Permitting Thresholds.”

³Percentage of emissions covered represent estimated actual emissions from sources expected to experience regulatory relief as a percentage of total stationary source GHG emissions.

Avoided costs for sources at alternative threshold levels of <10,000 tpy and <50,000 tpy are also presented in Table 3-1. The avoided costs for title V represent initial costs expected to be incurred by sources when the program is extended to sources of GHG emissions absent this rule. Title V sources are required to obtain an operating permit and to renew this permit every five years.

State, local and tribal permitting authorities will also benefit from this rule by avoiding the administrative burden of processing over 6 million title V operating permits for small sources of GHGs. ICR cost estimates for permitting authorities and sources are calculated based on information obtained from the April 2007 *Information Collection Request for State Operating Permit Regulations*⁵. Annual values are derived from Tables 7 and 8 of this document. For consistency, the permitting authority labor costs are updated to 2007 dollars utilizing the 2007 *General Schedule Salary Table* from the Office of Personnel Management. For the purposes of this analysis, we assumed that commercial/residential sources that exceed the major source threshold due to GHG emissions will not likely have substantial applicable requirements in the near term. We also assumed that permits for such sources will not require as much time to prepare and issue as those for industrial sources, which have applicable requirements in addition to GHG. Therefore, it is estimated that new commercial/residential permits require 10% of the time needed for new industrial permits, or 43 hours compared to 428 hours for permitting authorities. For significant revisions and permit renewals, it is assumed that incorporating GHG information adds 9 hours, or an additional 10% to the current updating and processing time. For more information on the methods used to calculate ICR costs for permitting authorities for title V permitting, see Attachment C –“Summary of ICR-based Data Used to Estimate Avoided Burden and Evaluate Resource Requirements at Alternative GHG Permitting Thresholds”.

The cost savings for permitting authorities are summarized in Table 3-1 and are estimated to exceed \$15 billion (2007\$). Costs avoided for permitting authorities at alternative threshold levels are also shown on Table 3-1.

⁵ Information Collection Request for State Operating Permit Regulations (Renewal), EPA ICR Number 1587.07, OMB Control Number 2060-0243, 2007.

3-2. Information Collection Costs Associated with the NSR Program

This proposed rulemaking limits the new sources requiring PSD permits to those that meet a potential to emit threshold of 25,000 tpy CO₂e with a significance level for modifications from 10,000 to 25,000 tpy CO₂e considered. (Note: a significance level of 25,000 tpy CO₂e is assumed for analysis purposes.) Table 3-2 summarizes the estimated avoided burden cost afforded to small sources and permitting authorities by this proposed rule. The estimated burden or reporting and recordkeeping costs avoided by small GHG sources amounts to over \$900 million annually with the burden costs per permit expected to be \$131 thousand for new sources, \$84.5 thousand for modified industrial sources, \$21.9 thousand for new commercial or residential sources and \$16.9 thousand for modifying commercial or residential sources (2007\$). State, local and tribal permitting authorities are expected to avoid administrative costs of \$249 million annually.

Burden estimates for the PSD program permitting authorities are calculated based on listed values obtained from Tables 6-1 and 6-2 the August 2008 *Information Collection Request for Prevention of Significant Deterioration and Nonattainment New Source Review (NSR)*⁶. NSR ICR at 18-19. It is assumed that permit preparation and issuance for commercial/residential permits requires only 20% of the time necessary to prepare and issue industrial source permits since commercial/residential sources would likely be less complex in terms of numbers and types of emission sources and control requirements. Estimates obtained are additional burden and costs to those currently experienced by permitting authorities and sources. For more information on the estimates of ICR costs for PSD permits see Attachment C. Avoided costs for regulatory alternatives of <10,000 tpy and 50,000tpy CO₂e potential to emit are also shown on Table 3-2. The PSD estimated costs represent annual estimates of costs avoided for sources and permitting authorities.

This rule also alleviates the regulatory burden associated with complying with NSR BACT requirements for small new and modifying sources. The BACT costs foregone are not estimated or shown in Table 3-2 due to the significant uncertainties involved in these requirements for affected sources. Likewise the foregone emission reductions associated with

⁶ Prevention of Significant Deterioration and Non-Attainment Area New Source Review (Renewal), EPA ICR Number 123.23, OMB Control Number 2060-0003, 2008.

these BACT requirements for small sources are not estimated. This issue is discussed further in Section 5 of this RIA.

Table 3-2. PSD Annual Avoided Costs for Sources of GHG - Regulatory Relief Estimates^{1,2}

	Small GHG Sources Under Alternative Threshold Levels						
		(< 10,000 tpy Threshold)		Proposed (< 25,000 tpy Threshold)		(< 50,000 tpy Threshold)	
Program/Affected Entities	Per Permit Cost (2007\$) ²	Number of Permits Avoided ²	Total Cost Avoided (millions 2007\$)	Number of Permits Avoided ²	Total Cost Avoided (millions 2007\$)	Number of Permits Avoided ²	Total Cost Avoided (millions 2007\$)
PSD Source Permits:							
New & Modified Industrial	84,530	3,094	261.54	3,299	278.86	3,457	292.22
New & Modified Commercial & Residential	16,887	36,976	624.41	37,197	628.15	37,218	628.5
Subtotal PSD Permits		40,070	885.95	40,496	907.01	40,675	920.72
PSD Permitting Authority Permits:							
New & Modified Industrial	23,243	3,094	71.90	3,299	76.68	3,457	80.35
New & Modified Commercial & Residential	4,633	36,976	171.31	37,197	172.33	37,218	172.43
Subtotal PSD Permits		40,070	243.21	40,496	249.01	40,675	252.78
Total PSD Source and Permitting Authority Costs			1129.16		1156.02		1173.50
% Emission Covered			5%		7%		10%

¹ Costs shown represent estimates of the annual regulatory burden relief for PSD proposed by this rule. Sums in columns may not add due to rounding.

² Attachment C - "Summary of ICR-based Data Used to Estimate Avoided Burden and Evaluate Resource Requirements at Alternative GHG Permitting Thresholds."

³ Percentage of emissions covered represent estimated actual emissions from sources expected to experience regulatory relief as a percentage of total stationary source GHG emissions.

Section 4

Impacts of Regulatory Relief

This proposed rulemaking does not impose economic impacts on any sources or permitting authorities, but should be instead be viewed as regulatory relief for smaller GHG emission sources. This RIA illustrates the burden impacts avoided as a result of this proposed rule. The avoided impacts of extending these programs for state, local, and tribal permitting authorities are also reported. To estimate the avoided economic impacts, which include small business impacts, EPA conducted an assessment estimating cost-to-sales ratios by comparing the estimated total annualized compliance cost per permit per source avoided to industry average revenues per establishment. The EPA also evaluated cost-to-sales ratios by comparing burden costs to revenues of firms at different firm size categories recognizing that the sources required to comply with these CAA provisions are larger emissions sources and more likely to be large business entities.

4-1. Method for Analyzing Avoided Economic and Small Entity Impacts

EPA used cost-to-sales comparisons to evaluate the potential impacts to sources affected by this rule. Since this regulatory action provides regulatory relief, these cost-to-sales ratios represent the economic impacts that are avoided or postponed for small GHG sources as a result of this rule. For all regulatory actions, EPA must determine whether a rule will have a significant impact on a substantial number of small entities (SISNOSE). This rule provides regulatory relief to small sources and thus does not have a significant impact to a substantial number of small entities. The approach for estimating the postponed economic impacts and the small entity analysis are the same for this analysis. The steps followed include, gathering data to characterize the affected entities by size, selecting and describing the measures and economic impact thresholds used in the analysis, and determining cost-to-sales ratios for the affected industrial, commercial and residential categories.

4-1.1 Identifying Affected Sectors and Entities

The industrial, commercial and residential sectors covered by the rule were identified during the development of the cost analysis for the rule. For the industrial sector, these sources

are summarized with applicable NAICS codes in Table 4-1 through 4-4. For commercial and residential sources, the sources are listed in Tables 4-5 through 4-8.

4-1.2. Data Used to Characterize Affected Entities by Size

The Census Bureau’s Statistics of U.S. Businesses (SUSB) data provide national information on the distribution of economic variables by industry and size.⁷ Specifically, the tables report data for each industry on the number of firms (Table 4-1), number of establishments (Table 4-2), employment (Table 4-3), and receipts (Table 4-4) by enterprise size category in affected sectors. Similar results are shown for commercial and residential sources on Tables 4-5 through 4-8. The census definitions in these data elements are as follows:

- *establishment*: An establishment is a single physical location where business is conducted or where services or industrial operations are performed.
- *employment*: Paid employment consists of full- and part-time employees, including salaried officers and executives of corporations, who were on the payroll in the pay period including March 12. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.
- *receipts*: Receipts (net of taxes) are defined as the revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Receipts exclude all revenue collected for local, state, and federal taxes.
- *enterprise*: An enterprise is a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.⁸

The SBA small business size standard(s) is provided for each industry group in order to facilitate comparisons and different thresholds.

⁷ These data were developed in cooperation with, and partially funded by, the Office of Advocacy of the Small Business Administration (SBA).

⁸ Because the SBA’s business size definitions (SBA, 2008c) apply to an establishment’s “ultimate parent company,” we assume in this analysis that the “enterprise” definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses and the terms are used interchangeably.

The receipt data are reported in 2002 dollars. Therefore, to adjust to 2007 dollars for comparison to costs, the EPA utilized the U.S. Bureau of Labor Statistics' Consumer Price Index (CPI). Using the annual U.S. city average price index for all consumer goods revenues are adjusted to 2007 dollars.

Because the SBA's business size definitions (SBA, 2008c) apply to an establishment's "ultimate parent company," we assume in this analysis that the "enterprise" definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses and the terms are used interchangeably. We also report the SBA size standard(s) for each industry group, to facilitate comparisons and different thresholds.

Table 4-1. Number of Firms by Industry and Enterprise Size: 2002

Sector	Source Category	NAICS	SBA Size Standard	Total Firms	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Electricity Generating Units	Electricity Generating Units	22	¹	7,603	5,636	901	288	26	18	19
Industrial	Adipic Acid Production	325199	1000	443	157	95	59	16	3	10
Industrial	Aluminum Production	331312	1000	43	28	2	3	1	1	NA
Industrial	Ammonia Manufacturing	325311	1000	130	78	18	6	2	1	7
Industrial	Cement Production	327310	750	136	67	21	12	6	3	4
Industrial	Electronics Manufacturing	334	³	13,833	7,698	3,291	1,149	150	80	86
Industrial	Ferroalloy Production	331112	750	14	3	NA	5	NA	1	1
Industrial	Glass Production	327	500-1000	11,395	7,108	2,553	590	57	51	32
Industrial	HCFC-22 Production	325120	1000	87	45	12	8	NA	3	2
Industrial	Hydrogen Production	325120	1000	87	45	12	8	NA	3	2
Industrial	Iron and Steel Production	331111	1000	1,135	687	166	53	9	12	11
Industrial	Lead Production	3314	750-1000	760	384	161	74	14	8	5
Industrial	Lime Manufacturing	327410	500	41	16	10	4	1	2	1
Industrial	Magnesium Production	3314	750-1000	760	384	161	74	14	8	5
Industrial	Nitric Acid Production	325311	1,000	130	78	18	6	2	1	7
Industrial	Petrochemical Production	3251	500-1000	1,145	475	277	131	29	14	20
Industrial	Petroleum Refineries	324110	²	202	84	24	23	6	3	3
Industrial	Phosphoric Acid Production	325312	500	35	12	5	6	1	NA	2

Sector	Source Category	NAICS	SBA Size Standard	Total Firms	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Industrial	Pulp and Paper Manufacturing	3221	750	338	96	55	72	7	12	12
Industrial	Silicon Carbide Production	327910	500	299	161	94	25	2	NA	NA
Industrial	Soda Ash Manufacturing	325181	1,000	25	10	5	2	NA	1	1
Industrial	Titanium Dioxide Production	325188	1,000	367	139	92	43	11	6	3
Industrial	Zinc Production	3314	750-1000	760	384	161	74	14	8	5
Industrial	Ethanol Production	325193	1,000	60	19	16	3	1	NA	3
Industrial	Food Processing	311	500-1000	21,384	13,645	3,935	1,247	147	63	96
Energy	Underground Coal Mines	21211	500	802	387	246	67	6	6	3
Energy	Oil and Natural Gas Systems	211	500	6,317	5,184	354	89	13	11	5
Energy	Oil and Natural Gas Systems	486	4	244	110	22	16	8	3	2
Waste Treatment	Landfills	562	\$12.5 million	14,184	10,726	1,616	258	22	11	15
Waste Treatment	MWCs	562	\$12.5 million	14,184	10,726	1,616	258	22	11	15

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA size standards as of 8/11/08.

1: NAICS codes 221111, 221112, 221113, 221119, 221121, 221122 – A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours.

2: 500 to 1,500. For NAICS code 324110 – For purposes of Government procurement, the petroleum refiner must be a concern that has 1,500 employees or less or has 125,000 barrels per calendar day or less total Operable Atmospheric Crude Oil Distillation capacity. Capacity includes owned or leased facilities as well as facilities under a processing agreement or an arrangement such as an exchange agreement or a throughput. The total product to be delivered under the contract must be at least 90 percent refined by the successful bidder from either crude oil or bona fide feedstocks.

3. NAICS Subsectors 333, 334, 335 and 336 – For rebuilding machinery or equipment on a factory basis, or equivalent, use the NAICS code for a newly manufactured product. Concerns performing major rebuilding or overhaul activities do not necessarily have to meet the criteria for being a "manufacturer" although the activities may be classified under a manufacturing NAICS code. Ordinary repair services or preservation are not considered rebuilding.

4: Subsector 486 – Pipeline Transportation (486110 Pipeline Transportation of Crude Oil 1,500, 486210 Pipeline Transportation of Natural Gas \$7.0 million, 486910 Pipeline Transportation of Refined Petroleum Products 1,500, 486990 All Other Pipeline Transportation \$34.5 million)

Table 4-2. Number of Establishments by Affected Industry and Enterprise Size: 2002

Sector	Source Category	NAICS	SBA Size Standard	Total Establishments	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Electricity Generating Units	Electricity Generating Units	22	¹	18,432	5,715	1,423	1,126	282	144	209
Industrial	Adipic Acid Production	325199	1000	640	157	99	78	24	4	17
Industrial	Aluminum Production	331312	1000	50	28	2	4	1	1	NA
Industrial	Ammonia Manufacturing	325311	1000	157	78	18	15	5	1	12
Industrial	Cement Production	327310	750	253	67	29	22	11	9	20
Industrial	Electronics Manufacturing	334	³	15,883	7,709	3,435	1,497	282	130	174
Industrial	Ferroalloy Production	331112	750	17	3	NA	7	NA	1	1
Industrial	Glass Production	327	500-1000	16,674	7,161	3,302	1,788	306	438	337
Industrial	HCFC-22 Production	325120	1000	551	45	20	20	NA	30	55
Industrial	Hydrogen Production	325120	1000	551	45	20	20	NA	30	55
Industrial	Iron and Steel Production	331111	1000	1,242	690	169	62	9	19	18
Industrial	Lead Production	3314	750-1000	958	386	174	108	24	14	11
Industrial	Lime Manufacturing	327410	500	77	18	13	6	7	19	4
Industrial	Magnesium Production	3314	750-1000	958	386	174	108	24	14	11
Industrial	Nitric Acid Production	325311	1,000	157	78	18	15	5	1	12
Industrial	Petrochemical Production	3251	500-1000	2,287	478	316	231	68	63	97
Industrial	Petroleum Refineries	324110	²	349	85	29	28	10	7	3
Industrial	Phosphoric Acid Production	325312	500	50	12	5	6	2	NA	2
Industrial	Pulp and Paper Manufacturing	3221	750	628	97	55	88	13	34	21
Industrial	Silicon Carbide	327910	500						NA	NA

Sector	Source Category	NAICS	SBA Size Standard	Total Establishments	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
	Production			347	161	100	42	2		
Industrial	Soda Ash Manufacturing	325181	1,000	38	10	5	4	NA	1	1
Industrial	Titanium Dioxide Production	325188	1,000	611	141	111	69	38	25	6
Industrial	Zinc Production	3314	750-1000	958	386	174	108	24	14	11
Industrial	Ethanol Production	325193	1,000	66	20	16	5	1	NA	4
Industrial	Food Processing	311	500-1000	25,698	13,719	4,254	1,951	370	211	319
Energy	Underground Coal Mines	21211	500	1,194	390	279	138	23	20	24
Energy	Oil and Natural Gas Systems	211	500	7,629	5,239	456	292	60	64	31
Energy	Oil and Natural Gas Systems	486	4	2,701	110	59	79	115	5	42
Waste Treatment	Landfills	562	\$12.5 million	17,698	10,775	1,839	612	86	63	58
Waste Treatment	MWCs	562	\$12.5 million	17,698	10,775	1,839	612	86	63	58

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA Small Entity standards as of 8/11/08.

1: NAICS codes 221111, 221112, 221113, 221119, 221121, 221122 – A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours.

2: 500 to 1,500. For NAICS code 324110 – For purposes of Government procurement, the petroleum refiner must be a concern that has 1,500 employees or less and has 125,000 barrels or less per calendar day total Operable Atmospheric Crude Oil Distillation capacity. Capacity includes owned or leased facilities as well as facilities under a processing agreement or an arrangement such as an exchange agreement or a throughput. The total product to be delivered under the contract must be at least 90 percent refined by the successful bidder from either crude oil or bona fide feedstocks.

3. NAICS Subsectors 333, 334, 335 and 336 – For rebuilding machinery or equipment on a factory basis, or equivalent, use the NAICS code for a newly manufactured product. Concerns performing major rebuilding or overhaul activities do not necessarily have to meet the criteria for being a "manufacturer" although the activities may be classified under a manufacturing NAICS code. Ordinary repair services or preservation are not considered rebuilding.

4: Subsector 486 – Pipeline Transportation (486110 Pipeline Transportation of Crude Oil 1,500, 486210 Pipeline Transportation of Natural Gas \$7.0 million, 486910 Pipeline Transportation of Refined Petroleum Products 1,500, 486990 All Other Pipeline Transportation \$34.5 million)

Table 4-3. Number of Employees by Affected Industry and Enterprise Size: 2002

Sector	Source Category	NAICS	SBA Size Standard	Total Establishments	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Electricity Generating Units	Electricity Generating Units	22	1	648,254	24,257	39,391	46,942	12,042	6,519	14,653
Industrial	Adipic Acid Production	325199	1000	73,342	1,023	2,412	3,232	NA	754	NA
Industrial	Aluminum Production	331312	1000	10,158	38	NA	NA	NA	NA	NA
Industrial	Ammonia Manufacturing	325311	1000	4,949	363	210	NA	NA	NA	NA
Industrial	Cement Production	327310	750	16,905	493	418	1,157	NA	NA	2,051
Industrial	Electronics Manufacturing	334	3	1,300,411	50,279	139,966	186,772	53,138	33,589	43,361
Industrial	Ferroalloy Production	331112	750	2,266	NA	NA	NA	NA	NA	NA
Industrial	Glass Production	327	500-1000	475,476	47,315	98,637	85,569	17,516	17,946	17,512
Industrial	HCFC-22 Production	325120	1000	9,557	88	294	510	NA	NA	NA
Industrial	Hydrogen Production	325120	1000	9,557	88	294	510	NA	NA	NA
Industrial	Iron and Steel Production	331111	1000	124,703	1,434	6,235	3,227	1,456	NA	NA
Industrial	Lead Production	3314	750-1000	64,203	2,421	6,680	10,407	NA	NA	1,337
Industrial	Lime Manufacturing	327410	500	4,393	33	227	NA	NA	NA	NA
Industrial	Magnesium Production	3314	750-1000	64,203	2,421	6,680	10,407	NA	NA	1,337
Industrial	Nitric Acid Production	325311	1,000	4,949	363	210	NA	NA	NA	NA
Industrial	Petrochemical Production	3251	500-1000	172,964	3,171	10,392	16,525	5,548	3,354	5,001
Industrial	Petroleum Refineries	324110	2	62,132	454	942	2,870	2,903	NA	NA
Industrial	Phosphoric Acid	325312	500	6,288	27	NA	NA	NA	NA	NA

Sector	Source Category	NAICS	SBA Size Standard	Total Establishments	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Industrial	Pulp and Paper	3221	750	162,988	537	2,279	12,554	2,782	7,707	7,121
Industrial	Silicon Carbide Production	327910	500	16,079	1,237	3,637	3,536	NA	NA	NA
Industrial	Soda Ash Manufacturing	325181	1,000	4,483	56	NA	NA	NA	NA	NA
Industrial	Titanium Dioxide Production	325188	1,000	49,845	566	881	1,839	NA	NA	NA
Industrial	Zinc Production	3314	750-1000	64,203	2,421	6,680	10,407	NA	NA	1,337
Industrial	Ethanol Production	325193	1,000	64,203	2,421	6,680	10,407	NA	NA	1,337
Industrial	Food Processing	311	500-1000	1,735	NA	NA	NA	NA	NA	NA
Energy	Underground Coal Mines	21211	500	1,443,766	85,850	156,158	218,041	67,104	30,099	72,262
Energy	Oil and Natural Gas Systems	211	500	74,915	2,801	10,205	11,576	NA	1,773	NA
Energy	Oil and Natural Gas Systems	486	⁴	88,280	19,336	12,113	11,656	2,421	3,551	1,061
Waste Treatment	Landfills	562	\$12.5 million	300,580	56,529	59,245	37,530	5,122	3,401	3,645
Waste Treatment	MWCs	562	\$12.5 million	300,580	56,529	59,245	37,530	5,122	3,401	3,645

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA small entity definitions as of 8/11/08.

1: NAICS codes 221111, 221112, 221113, 221119, 221121, 221122 – A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours.

2: 500 to 1,500. For NAICS code 324110 – For purposes of Government procurement, the petroleum refiner must be a concern that has 1,500 employees or less or 125,000 barrels or less per calendar day total Operable Atmospheric Crude Oil Distillation capacity. Capacity includes owned or leased facilities as well as facilities under a processing agreement or an arrangement such as an exchange agreement or a throughput. The total product to be delivered under the contract must be at least 90 percent refined by the successful bidder from either crude oil or bona fide feedstocks.

3. NAICS Subsectors 333, 334, 335 and 336 – For rebuilding machinery or equipment on a factory basis, or equivalent, use the NAICS code for a newly manufactured product. Concerns performing major rebuilding or overhaul activities do not necessarily have to meet the criteria for being a "manufacturer" although the activities may be classified under a manufacturing NAICS code. Ordinary repair services or preservation are not considered rebuilding.

4: Subsector 486 – Pipeline Transportation (486110 Pipeline Transportation of Crude Oil 1,500, 486210 Pipeline Transportation of Natural Gas \$7.0 million, 486910 Pipeline Transportation of Refined Petroleum Products 1,500, 486990 All Other Pipeline Transportation \$34.5 million)

Table 4-4: Receipts by Industry and Enterprise Size: 2002 (in millions of 2007\$)

Sector	Source Category	NAICS	SBA Size Standard	Total Receipts(\$)	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Electricity Generating Units	Electricity Generating Units	22	¹	456,494	10,324	28,259	29,111	8,522	5,211	11,027
Industrial	Adipic Acid Production	325199	1000	54,024	437	880	2,117	NA	984	NA
Industrial	Aluminum Production	331312	1000	4,165	7	NA	NA	NA	NA	NA
Industrial	Ammonia Manufacturing	325311	1000	3,844	152	60	NA	NA	NA	NA
Industrial	Cement Production	327310	750	8,358	207	120	526	NA	NA	992
Industrial	Electronics Manufacturing	334	³	437,886	9,887	26,268	41,653	14,340	8,589	12,994
Industrial	Ferroalloy Production	331112	750	1,008	NA	NA	NA	NA	NA	NA
Industrial	Glass Production	327	500-1000	110,002	7,430	17,700	16,967	4,154	4,000	4,366
Industrial	HCFC-22 Production	325120	1000	6,662	25	337	82	NA	NA	NA
Industrial	Hydrogen Production	325120	1000	6,662	25	337	82	NA	NA	NA
Industrial	Iron and Steel Production	331111	1000	54,363	275	1,237	1,192	639	NA	NA
Industrial	Lead Production	3314	750-1000	24,584	582	2,391	3,007	NA	NA	364
Industrial	Lime Manufacturing	327410	500	1,173	7	64	NA	NA	NA	NA
Industrial	Magnesium Production	3314	750-1000	24,584	582	2,391	3,007	NA	NA	364
Industrial	Nitric Acid Production	325311	1,000	3,844	152	60	NA	NA	NA	NA
Industrial	Petrochemical Production	3251	500-1000	123,343	1,603	4,722	7,974	3,990	2,048	3,819
Industrial	Petroleum Refineries	324110	²	225,612	538	2,903	5,186	10,094	NA	NA
Industrial	Phosphoric Acid	325312	500			NA	NA	NA	NA	NA

Sector	Source Category	NAICS	SBA Size Standard	Total Receipts(\$)	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
	Production			4,607	7					
Industrial	Pulp and Paper Manufacturing	3221	750	81,766	146	719	5,269	805	3,294	2,833
Industrial	Silicon Carbide Production	327910	500	3,861	206	561	715	NA	NA	NA
Industrial	Soda Ash Manufacturing	325181	1,000	2,386	12	NA	NA	NA	NA	NA
Industrial	Titanium Dioxide Production	325188	1,000	18,803	199	267	685	NA	NA	NA
Industrial	Zinc Production	3314	750-1000	24,584	582	2,391	3,007	NA	NA	364
Industrial	Ethanol Production	325193	1,000	2,416	NA	NA	NA	NA	NA	NA
Industrial	Food Processing	311	500-1000	527,312	14,597	37,198	65,304	26,627	11,533	25,216
Energy	Underground Coal Mines	21211	500	22,873	501	2,415	3,328	NA	506	NA
Energy	Oil and Natural Gas Systems	211	500	185,420	8,465	7,826	11,075	5,312	4,600	3,233
Energy	Oil and Natural Gas Systems	486	4	51,926	1,163	158	258	NA	NA	NA
Waste Treatment	Landfills	562	\$12.5 million	55,557	7,451	8,366	5,940	965	858	586
Waste Treatment	MWCs	562	\$12.5 million	55,557	7,451	8,366	5,940	965	858	586

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA Small Business categorization as of 8/11/08.

1: NAICS codes 221111, 221112, 221113, 221119, 221121, 221122 – A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours.

2: 500 to 1,500. For NAICS code 324110 – For purposes of Government procurement, the petroleum refiner must be a concern that has 1,500 employees or less and 125,000 barrels or less per calendar day total Operable Atmospheric Crude Oil Distillation capacity. Capacity includes owned or leased facilities as well as facilities under a processing agreement or an arrangement such as an exchange agreement or a throughput. The total product to be delivered under the contract must be at least 90 percent refined by the successful bidder from either crude oil or bona fide feedstocks.

3: NAICS Subsectors 333, 334, 335 and 336 – For rebuilding machinery or equipment on a factory basis, or equivalent, use the NAICS code for a newly manufactured product. Concerns performing major rebuilding or overhaul activities do not necessarily have to meet the criteria for being a "manufacturer" although the activities may be classified under a manufacturing NAICS code. Ordinary repair services or preservation are not considered rebuilding.

4: Subsector 486 – Pipeline Transportation (486110 Pipeline Transportation of Crude Oil 1,500, 486210 Pipeline Transportation of Natural Gas \$7.0 million, 486910 Pipeline Transportation of Refined Petroleum Products 1,500, 486990 All Other Pipeline Transportation \$34.5 million)

Table 4-5: Number of Firms by Affected Industry and Enterprise Size in Commercial Sectors: 2002

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars	Total Firms	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Commercial	Education	61	\$7.0-35.0	65,933	40,824	12,379	3,071	289	174	187
Commercial	Enclosed mall	531120	7.0	28,241	22,509	1,077	329	43	32	30
Commercial	Food sales			NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	376,637	248,494	67,549	6,629	447	191	223
Commercial	Inpatient health care	622	34.5	4,548	427	487	1,590	384	237	333
Commercial	Laboratory	541380	12.0	4,708	3,335	680	148	22	6	12
Commercial	Laboratory	5417	7.0	11,418	7,365	1,478	532	72	29	39
Commercial	Lodging	721	7.0	51,168	33,326	7,968	1,428	135	70	77
Commercial	Nonrefrigerated warehouse	49311	25.5	3,152	2,005	514	199	15	10	19
Commercial	Nursing	623	7.0-13.5	32,720	14,632	8,486	5,836	418	179	174
Commercial	Office	531120	7.0	28,241	22,509	1,077	329	43	32	30
Commercial	Other	81	7.0-25.0	675,218	568,285	41,363	4,449	290	164	165
Commercial	Outpatient health care	621	7.0-34.5	424,694	351,540	27,991	4,699	428	216	238
Commercial	Public assembly	71	7.0	103,043	64,915	12,227	2,292	153	82	95
Commercial	Public order and safety			NA	NA	NA	NA	NA	NA	NA
Commercial	Refrigerated warehouse	49312	25.5	608	358	138	34	3	2	4
Commercial	Religious worship	813110	7.0	172,311	147,505	15,942	1,213	39	21	19

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars	Total Firms	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Commercial	Retail other than mall	44-45	7.0-29.0	736,130	579,905	59,639	8,723	577	289	338
Commercial	Service	81	7.0-25.0	675,218	568,285	41,363	4,449	290	164	165
Commercial	Strip shopping mall	531120	7.0	28,241	22,509	1,077	329	43	32	30
Residential	Residential	531110	7.0	52,190	44,477	1,799	441	55	29	30

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA size categories as of 8/11/08.

Table 4-6: Number of Establishments by Affected Industry and Enterprise Size: 2002

Sector	Source Category	NAICS	SBA Size Standard	Total Firms	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Commercial	Education	61	7.0-35.0	73,701	41,136	13,925	5,604	864	398	501
Commercial	Enclosed mall	531120	7.0	30,777	22,706	1,313	597	123	180	141
Commercial	Food sales			NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	503,354	249,889	79,906	31,769	7,297	4,524	6,819
Commercial	Inpatient health care	622	34.5	7,569	441	513	1,725	442	294	420
Commercial	Laboratory	541380	12.0	5,962	3,371	972	488	67	41	195
Commercial	Laboratory	5417	7.0	13,944	7,462	1,836	996	228	112	150
Commercial	Lodging	721	7.0	61,795	33,613	9,057	2,962	761	249	663
Commercial	Nonrefrigerated warehouse	49311	25.5	4,893	2,057	805	529	311	97	87
Commercial	Nursing	623	7.0-13.5	67,900	14,824	11,701	18,516	3,717	1,898	2,043
Commercial	Office	531120	7.0	30,777	22,706	1,313	597	123	180	141
Commercial	Other	81	7.0-25.0	740,118	573,318	54,021	16,431	2,960	1,850	2,317
Commercial	Outpatient health care	621	7.0-34.5	487,747	357,221	41,650	19,182	3,021	2,087	1,933
Commercial	Public assembly	71	7.0	110,375	65,195	13,408	3,715	566	591	394
Commercial	Public order and safety			NA	NA	NA	NA	NA	NA	NA
Commercial	Refrigerated warehouse	49312	25.5	970	367	204	96	20	13	36
Commercial	Religious worship	813110	7.0	172,562	147,510	16,009	1,272	115	25	27
Commercial	Retail other than mall	44-45	7.0-29.0	1,125,693	594,655	98,116	51,814	12,028	8,897	13,004
Commercial	Service	81	7.0-25.0							

Sector	Source Category	NAICS	SBA Size Standard	Total Firms	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
				740,118	573,318	54,021	16,431	2,960	1,850	2,317
Commercial	Strip shopping mall	531120	7.0	30,777	22,706	1,313	597	123	180	141
Residential	Residential	531110	7.0	57,748	45,104	2,992	2,491	479	132	205

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA small business categories as of 8/11/08.

Table 4-7: Number of Employees by Affected Industry and Commercial Enterprise Size: 2002

Sector	Source Category	NAICS	SBA Size Standard	Total Establishments	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Commercial	Education	61	7.0-35.0	2,701,675	223,695	516,135	535,272	148,370	121,656	190,930
Commercial	Enclosed mall	531120	7.0	163,501	73,311	32,364	22,319	5,066	3,583	4,095
Commercial	Food sales			NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	8,352,174	1,622,740	2,551,714	1,184,119	232,483	134,402	216,606
Commercial	Inpatient health care	622	34.5	5,121,584	2,374	30,243	389,501	220,984	192,908	385,312
Commercial	Laboratory	541380	12.0	100,797	18,415	25,714	19,918	3,920	2,677	4,786
Commercial	Laboratory	5417	7.0	399,213	35,669	60,951	84,936	22,983	9,641	15,808
Commercial	Lodging	721	7.0	1,696,701	202,509	292,528	232,976	56,837	37,156	53,296
Commercial	Nonrefrigerated warehouse	49311	25.5	94,316	11,294	18,392	21,859	3,802	2,144	2,654
Commercial	Nursing	623	7.0-13.5	2,770,665	92,274	409,004	965,200	172,278	91,599	132,119
Commercial	Office	531120	7.0	163,501	73,311	32,364	22,319	5,066	3,583	4,095
Commercial	Other	81	7.0-25.0	5,420,087	2,547,460	1,482,350	640,068	84,297	61,553	74,082
Commercial	Outpatient health care	621	7.0-34.5	4,917,156	1,829,546	1,029,355	751,711	134,712	89,264	107,577
Commercial	Public assembly	71	7.0	1,800,991	315,475	496,962	380,688	65,678	NA	72,282
Commercial	Public order and safety			NA	NA	NA	NA	NA	NA	NA
Commercial	Refrigerated warehouse	49312	25.5	28,100	2,238	5,427	5,010	NA	NA	1,545
Commercial	Religious worship	813110	7.0	1,638,915	722,630	607,209	197,037	20,211	13,453	14,081
Commercial	Retail other than mall	44-45	7.0-29.0	14,819,904	2,889,481	2,204,104	1,267,733	213,518	138,205	200,867
Commercial	Service	81	7.0-25.0							

Sector	Source Category	NAICS	SBA Size Standard	Total Establishments	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
				5,420,087	2,547,460	1,482,350	640,068	84,297	61,553	74,082
Commercial	Strip shopping mall	531120	7.0	163,501	73,311	32,364	22,319	5,066	3,583	4,095
Residential	Residential	531110	7.0	281,250	152,350	59,796	42,104	7,627	NA	NA

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA small business sizes as of 8/11/08.

Table 4-8: Receipts by Affected Industry and Enterprise Size: 2002 (Millions of 2007 \$)

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars	Total Receipts	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
Commercial	Education	61	7.0-35.0	207,779	15,586	30,849	38,207	10,456	7,620	11,997
Commercial	Enclosed mall	531120	7.0	52,796	21,467	8,090	6,609	2,148	2,145	3,281
Commercial	Food sales			NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	373,666	79,827	98,916	49,500	9,774	5,742	9,036
Commercial	Inpatient health care	622	34.5	575,286	845	2,892	33,554	20,075	18,448	41,167
Commercial	Laboratory	541380	12.0	11,854	2,018	2,763	2,091	478	319	574
Commercial	Laboratory	5417	7.0	72,013	6,419	10,785	15,439	4,422	1,942	2,802
Commercial	Lodging	721	7.0	141,193	15,159	18,413	15,047	4,287	2,869	4,431
Commercial	Nonrefrigerated warehouse	49311	25.5	10,705	1,546	2,199	2,281	508	286	301
Commercial	Nursing	623	7.0-13.5	145,529	4,624	18,714	49,332	9,058	4,989	7,319
Commercial	Office	531120	7.0	52,796	21,467	8,090	6,609	2,148	2,145	3,281
Commercial	Other	81	7.0-25.0	491,097	215,897	120,283	67,821	10,225	5,946	5,999
Commercial	Outpatient health care	621	7.0-34.5	582,829	229,611	118,216	73,667	12,923	8,277	10,556
Commercial	Public assembly	71	7.0	170,062	35,446	31,146	35,130	6,972	NA	7,610
Commercial	Public order and safety	NA	NA	NA	NA	NA	NA	NA	NA	NA
Commercial	Refrigerated warehouse	49312	25.5	4,889	325	765	586	NA	NA	233
Commercial	Religious worship	813110	7.0	95,558	37,076	34,178	13,933	1,681	1,165	1,025
Commercial	Retail other than	44-45	7.0-29.0							

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars	Total Receipts	<20 employees	20 to 99 employees	100 to 499 employees	500 to 749 employees	750 to 999 employees	1,000 to 1,499 employees
	mall			3,612,583	577,700	662,037	441,243	65,923	34,570	49,386
Commercial	Service	81	7.0-25.0	491,097	215,897	120,283	67,821	10,225	5,946	5,999
Commercial	Strip shopping mall	531120	7.0	52,796	21,467	8,090	6,609	2,148	2,145	3,281
Residential	Residential	531110	7.0	57,365	32,327	9,943	6,854	1,366	NA	NA

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses. SBA small business sizes as of 8/11/08.

4-2. Developing Economic and Small Entity Regulatory Relief Impact Measures

We measured the postponed impacts of the rule on small entities in each sector using methods presented in EPA's Final SBREFA Guidance. (EPA, 2006) Because the rule covers a large number of sectors and primarily covers businesses, the analysis generated a set of sales tests (represented as cost-to-receipt ratios)⁹ for NAICS codes associated with the affected sectors. Although the appropriate SBA size definition should be applied at the parent company (enterprise) level, data limitations allowed us only to compute and compare ratios for a *model establishment* for six *enterprise size* ranges (i.e., all categories, enterprises with 1 to 20 employees, 20 to 99 employees, 100 to 499 employees, 500 to 999 employees, and 1,000 to 1,499 employees. This approach allows us to account for differences in establishment receipts between large and small enterprises and differences in small business definitions across affected industries. It is also a conservative approach, because an establishment's parent company (the "enterprise") may have other economic resources that could be used to cover the costs of the reporting program.

4-3. Implementing the Sales Test to Measure Impacts on Industrial, Commercial and Multi-family Residential Sources

To implement the recommended sales test, EPA computed cost-to-sales ratios for affected sectors at the establishment (or facility) level.¹⁰ The ratios examine the ratio of the average establishment's total annualized mandatory reporting costs to the average establishment receipts for enterprises within several employment categories¹¹. The average entity costs used to compute the sales test are the same across all of these enterprise size categories. As a result, the sales-test will overstate the cost-to-receipt ratio for establishments owned by small businesses, because the reporting costs are likely lower than average entity estimates provided by the engineering cost analysis.

⁹The following metrics for other small entity economic impact measures (if applicable) would potentially include

- Small governments (if applicable): "Revenue" test; annualized compliance cost as a percentage of annual government revenues
- Small non-profits (if applicable): "Expenditure" test; annualized compliance cost as a percentage of annual operating expenses

¹⁰ Typically, SBREFA impact assessments are conducted at the ultimate parent company level. As noted above, we assume that Census definition of enterprise is equivalent to ultimate parent company. Theoretically, the comparison of compliance costs to sales should be conducted at the enterprise level. Because Census only provides data for typical establishments within various enterprise size categories, EPA chose to compute the cost-to-sales ratio at the establishment (or facility level). The same ratio could be computed at the enterprise level by multiplying both the numerator and the denominator by the typical number of establishments per enterprise in the appropriate enterprise size categories. Using the SUSB data on typical establishments means that the cost-to-sales ratios are identical, whether computed at the establishment level or at the enterprise level.

¹¹For the one to 20 employee category, we exclude SUSB data for enterprises with zero employees. These enterprises did not operate the entire year.

Cost-to-sales ratios for industrial categories are reported in Tables 4-9 through 4-11. Table 4-9 shows impacts avoided for small sources of GHGs for title V. On Tables 4-10 and 4-11 impacts avoided for new and modifying PSD sources, respectively are presented. These ratios are calculated using data on the average avoided cost of compliance per facility, and data on the average sales per establishment obtained from the Census Bureau. Cost-to-sales or Revenue ratios for commercial and residential categories are reported in Tables 4-12 through 4-14. Table 4-12 shows impacts avoided for small commercial and residential sources of GHGs for Title V. Tables 4-13 and 4-14 shows impacts avoided for modifying and new PSD commercial and residential sources, respectively.

The total national burden avoided per-entity costs of the rule are shown on Table 3-1. For title V, the avoided burden costs associated with obtaining an operating permit is \$46.4 thousand per source for industrial sources of GHG emissions and approximately \$5 thousand for commercial and residential sources. For modifying PSD sources, the avoided burden costs with obtaining a permit is \$84.5 thousand per source for industrial sources of GHG emissions and \$16.9 thousand per source for commercial and residential sources. Finally, for new PSD sources, the avoided burden costs are the sum of the avoided title V and modifying PSD costs. Thus, the avoided burden costs are approximately \$130.8 thousand per source for industrial sources of GHG emissions and approximately \$22 thousand per source for commercial and residential sources.

The cost-to-sales estimates show that the avoided costs for industrial sources typically are up to 2 percent of their sales, but they can be as high as 53 percent for certain sources (e.g., aluminum plants with less than 20 employees). For commercial sources, the avoided costs are typically up to 1 percent of their sales or revenues, but they can be as high as 9 percent for certain sources (e.g., refrigerated warehouses).

4-4. Economic Relief to Permitting Authorities

In this proposal the thresholds for requiring title V and PSD permits are increased to 25,000 tpy CO₂e potential to emit resulting in millions of potential title V sources and tens of thousands of new and modifying PSD sources being able to postpone obtaining a permit for a period of at least six years. This action will provide significant regulatory relief to States, local government, and tribal permitting authorities. The magnitude of permits that would need to be

addressed and the dollar estimate of the additional costs in labor and administrative costs permitting authorities would otherwise incur if GHG are a regulated pollutant absent this rulemaking are shown in Tables 3-1 and 3-2 above.

For title V permits, permitting authorities will experience avoided costs of approximately \$15.6 billion dollars relating to approximately 6 million new operating permits that otherwise would need to be processed. While this administrative burden represents a huge burden to these agencies, Part 70 of the CAA does provide for a mechanism for the affected permitting authorities to recoup the costs of operation associated with administering this expanded permit program. The EPA recognizes in this tailoring rule that the sheer magnitude and burden of these additional small GHG sources cannot feasibly be met by these permitting authorities on administrative burden grounds for a period of at least five years regardless of the ability to include these increased costs in fees charged to sources. However, the economic consequences to permitting authorities of this permitting program are offset in the fee structure these authorities are allowed to charge sources obtaining title V permits.

For PSD permitting authorities no such mitigating fee structure currently exists. Thus, the funding for administering a PSD permitting program to include tens of thousands additional new and modifying PSD sources annually would need to be met by these permitting authorities from current revenues sources. At present, there are approximately 58 State, local and tribal PSD permitting programs operating in the U.S. and approximately 49 additional State, local or tribal government authorities that are administering federal programs under delegation from the EPA. It is difficult to estimate the economic consequences of the regulatory relief afforded to the individual permitting authorities, because the number of PSD permits processed each year varies by permitting authority over time depending upon the number of new and modifying sources occurring in a given location. However, the National Association of Clean Air Agencies (NACAA) has, through a member survey, broadly assessed the additional resource and burden considerations of EPA treating GHG as a regulated pollutant. NACAA provided this information to EPA to help improve our understanding of agencies' burdens.¹² Under the current PSD program requirements, these permitting authorities process an average of 8 PSD permits for new and modifying sources each year (range of 0 to 56 for individual respondents). These

¹² Memorandum from Mary Stewart Douglas NACAA, to Juan E. Santiago, Group Leader, Operating Permits Group, U.S. EPA OAQPS. September 3, 2009.

surveyed permitting authorities indicate they would need an average of 12 new full time employees (range of 1 to 63) costing an average of \$1.1 million annually (range \$60 thousand to \$6.3 million) with a 10 fold increase in permits occurring due to including GHG as a regulated pollutant. Some of these permitting authorities indicated that hiring new employees is not possible at this time due to budget constraints and hiring freezes. All respondents indicated that new training would be needed to address GHGs permitting. Rather than the 10 fold increase in permits postulated in NACAA's survey, the EPA estimates the increase would more likely be 140 fold making these estimates a significant understatement of the potential impacts on permitting authorities.

Table 4-9: Avoided Title V Costs for Small Industrial Sources of GHG Emissions

Sector	Source Category	NAICS	SBA Size Standard	Average Cost Per Entity (2007\$)	Cost per entity for All Establishments (%)	Cost per entity for <20 employees (%)	Cost per entity for 20 to 99 employees (%)	Cost per entity 100 to 499 employees (%)	Cost per entity for 500 to 749 employees (%)	Cost per entity for 750 to 999 employees (%)	Cost per entity for 1,000 to 1,499 employees (%)
Electricity Generating Units	Electricity Generating Units	22	1	\$46,350	0.2%	2.6%	0.2%	0.2%	0.2%	0.1%	0.1%
Industrial	Adipic Acid Production	325199	1000	\$46,350	0.1%	1.7%	0.5%	0.2%	NA	0.0%	NA
Industrial	Aluminum Production	331312	1000	\$46,350	0.1%	19.0%	NA	NA	NA	NA	NA
Industrial	Ammonia Manufacturing	325311	1000	\$46,350	0.2%	2.4%	1.4%	NA	NA	NA	NA
Industrial	Cement Production	327310	750	\$46,350	0.1%	1.5%	1.1%	0.2%	NA	NA	0.1%
Industrial	Electronics Manufacturing	334	3	\$46,350	0.2%	3.6%	0.6%	0.2%	0.1%	0.1%	0.1%
Industrial	Ferroalloy Production	331112	750	\$46,350	0.1%	NA	NA	NA	NA	NA	NA
Industrial	Glass Production	327	500-1000	\$46,350	0.7%	4.5%	0.9%	0.5%	0.3%	0.5%	0.4%
Industrial	HCFC-22 Production	325120	1000	\$46,350	0.4%	8.3%	0.3%	1.1%	NA	NA	NA
Industrial	Hydrogen Production	325120	1000	\$46,350	0.4%	8.3%	0.3%	1.1%	NA	NA	NA
Industrial	Iron and Steel Production	331111	1000	\$46,350	0.1%	11.6%	0.6%	0.2%	0.1%	NA	NA
Industrial	Lead Production	3314	750-1000	\$46,350	0.2%	3.1%	0.3%	0.2%	NA	NA	0.1%
Industrial	Lime Manufacturing	327410	500	\$46,350	0.3%	12.8%	0.9%	NA	NA	NA	NA
Industrial	Magnesium Production	3314	750-1000	\$46,350	0.2%	3.1%	0.3%	0.2%	NA	NA	0.1%
Industrial	Nitric Acid Production	325311	1,000	\$46,350	0.2%	2.4%	1.4%	NA	NA	NA	NA
Industrial	Petrochemical	3251	500-1000	\$46,350	0.1%	1.4%	0.3%	0.1%	0.1%	0.1%	0.1%

Sector	Source Category	NAICS	SBA Size Standard	Average Cost Per Entity (2007\$)	Cost per entity for All Establishments (%)	Cost per entity for <20 employees (%)	Cost per entity for 20 to 99 employees (%)	Cost per entity 100 to 499 employees (%)	Cost per entity for 500 to 749 employees (%)	Cost per entity for 750 to 999 employees (%)	Cost per entity for 1,000 to 1,499 employees (%)
	Production										
Industrial	Petroleum Refineries	324110	²	\$46,350	0.0%	0.7%	0.0%	0.0%	0.0%	NA	NA
Industrial	Phosphoric Acid Production	325312	500	\$46,350	0.1%	7.8%	NA	NA	NA	NA	NA
Industrial	Pulp and Paper Manufacturing	3221	750	\$46,350	0.0%	3.1%	0.4%	0.1%	0.1%	0.0%	0.0%
Industrial	Silicon Carbide Production	327910	500	\$46,350	0.4%	3.6%	0.8%	0.3%	NA	NA	NA
Industrial	Soda Ash Manufacturing	325181	1,000	\$46,350	0.1%	3.8%	NA	NA	NA	NA	NA
Industrial	Titanium Dioxide Production	325188	1,000	\$46,350	0.2%	3.3%	1.9%	0.5%	NA	NA	NA
Industrial	Zinc Production	3314	750-1000	\$46,350	0.2%	3.1%	0.3%	0.2%	NA	NA	0.1%
Industrial	Ethanol Production	325193	1,000	\$46,350	0.1%	NA	NA	NA	NA	NA	NA
Industrial	Food Processing	311	500-1000	\$46,350	0.2%	4.4%	0.5%	0.1%	0.1%	0.1%	0.1%
Energy	Underground Coal Mines	21211	500	\$46,350	0.2%	3.6%	0.5%	0.2%	NA	0.2%	NA
Energy	Oil and Natural Gas Systems	211	500	\$46,350	0.2%	2.9%	0.3%	0.1%	0.1%	0.1%	0.0%
Energy	Oil and Natural Gas Systems	486	⁴	\$46,350	0.2%	0.4%	1.7%	1.4%	NA	NA	NA
Waste Treatment	Landfills	562	\$12.5 million	\$46,350	1.5%	6.7%	1.0%	0.5%	0.4%	0.3%	0.5%
Waste Treatment	MWCs	562	\$12.5 million	\$46,350	1.5%	6.7%	1.0%	0.5%	0.4%	0.3%	0.5%

Table 4-10. Avoided Costs to Small Modifying Industrial GHG PSD Emission Sources

Sector	Source Category	NAICS	SBA Size Standard (effective August 11, 2008)	Average Cost Per Entity (2007\$)	Cost per Entity for All Establishments (%)	Cost per entity for <20 employees (%)	Cost per entity for 20 to 99 employees (%)	Cost per entity 100 to 499 employees (%)	Cost per entity for 500 to 749 employees (%)	Cost per entity for 750 to 999 employees (%)	Cost per entity for 1,000 to 1,499 employees (%)
Electricity Generating Units	Electricity Generating Units	22	1	\$84,530	0.3%	4.7%	0.4%	0.3%	0.3%	0.2%	0.2%
Industrial	Adipic Acid Production	325199	1000	\$84530	0.1%	3.0%	1.0%	0.3%	NA	0.0%	NA
Industrial	Aluminum Production	331312	1000	\$84530	0.1%	34.6%	NA	NA	NA	NA	NA
Industrial	Ammonia Manufacturing	325311	1000	\$84530	0.3%	4.3%	2.5%	NA	NA	NA	NA
Industrial	Cement Production	327310	750	\$84530	0.3%	2.7%	2.0%	0.4%	NA	NA	0.2%
Industrial	Electronics Manufacturing	334	3	\$84530	0.3%	6.6%	1.1%	0.3%	0.2%	0.1%	0.1%
Industrial	Ferroalloy Production	331112	750	\$84530	0.1%	NA	NA	NA	NA	NA	NA
Industrial	Glass Production	327	500-1000	\$84530	1.3%	8.1%	1.6%	0.9%	0.6%	0.9%	0.7%
Industrial	HCFC-22 Production	325120	1000	\$84530	0.7%	15.1%	0.5%	2.1%	NA	NA	NA
Industrial	Hydrogen Production	325120	1000	\$84530	0.7%	15.1%	0.5%	2.1%	NA	NA	NA
Industrial	Iron and Steel Production	331111	1000	\$84530	0.2%	21.2%	1.2%	0.4%	0.1%	NA	NA
Industrial	Lead Production	3314	750-1000	\$84530	0.3%	5.6%	0.6%	0.3%	NA	NA	NA
Industrial	Lime Manufacturing	327410	500	\$84530	0.6%	23.3%	1.7%	NA	NA	NA	0.3%
Industrial	Magnesium Production	3314	750-1000	\$84530	0.3%	5.6%	0.6%	0.3%	NA	NA	NA
Industrial	Nitric Acid Production	325311	1,000	\$84530	0.3%	4.3%	2.5%	NA	NA	NA	0.3%
Industrial	Petrochemical Production	3251	500-1000	\$84530	0.2%	2.5%	0.6%	0.2%	0.1%	0.3%	NA

Sector	Source Category	NAICS	SBA Size Standard (effective August 11, 2008)	Average Cost Per Entity (2007\$)	Cost per Entity for All Establishments (%)	Cost per entity for <20 employees (%)	Cost per entity for 20 to 99 employees (%)	Cost per entity 100 to 499 employees (%)	Cost per entity for 500 to 749 employees (%)	Cost per entity for 750 to 999 employees (%)	Cost per entity for 1,000 to 1,499 employees (%)
Industrial	Petroleum Refineries	324110	²	\$84530	0.0%	1.3%	0.1%	0.0%	0.0%	NA	NA
Industrial	Phosphoric Acid Production	325312	500	\$84530	0.1%	14.2%	NA	NA	NA	NA	NA
Industrial	Pulp and Paper Manufacturing	3221	750	\$84530	0.1%	5.6%	0.6%	0.1%	0.1%	0.1%	0.1%
Industrial	Silicon Carbide Production	327910	500	\$84530	0.8%	6.6%	1.5%	0.5%	NA	NA	NA
Industrial	Soda Ash Manufacturing	325181	1,000	\$84530	0.1%	6.9%	NA	NA	NA	NA	NA
Industrial	Titanium Dioxide Production	325188	1,000	\$84530	0.3%	6.0%	3.5%	0.9%	NA	NA	NA
Industrial	Zinc Production	3314	750-1000	\$84530	0.3%	5.6%	0.6%	0.3%	NA	NA	0.3%
Industrial	Ethanol Production	325193	1,000	\$84530	0.2%	NA	NA	NA	NA	NA	NA
Industrial	Food Processing	311	500-1000	\$84530	0.4%	7.9%	1.0%	0.3%	0.1%	0.2%	0.1%
Energy	Underground Coal Mines	21211	500	\$84530	0.4%	6.6%	1.0%	0.4%	NA	0.3%	NA
Energy	Oil and Natural Gas Systems	211	500	\$84530	0.3%	5.2%	0.5%	0.2%	0.1%	0.1%	0.1%
Energy	Oil and Natural Gas Systems	486	⁴	\$84530	0.4%	0.8%	3.2%	2.6%	NA	NA	NA
Waste Treatment	Landfills	562	\$12.5 million	\$84530	2.7%	12.2%	1.9%	0.9%	0.8%	0.6%	0.8%
Waste Treatment	MWCs	562	\$12.5 million	\$84530	2.7%	12.2%	1.9%	0.9%	0.8%	0.6%	0.8%

Table 4-11. Avoided Costs to Small New PSD Industrial GHG Sources

Sector	Source Category	NAICS	SBA Size Standard (effective August 11, 2008)	Average Cost per Entity (2007\$)	Cost per Entity for All Enterprises	Cost per entity for <20 employees	Cost per entity for 20 to 99 employees	Cost per entity 100 to 499 employees	Cost per entity for 500 to 749 employees	Cost per entity for 750 to 999 employees	Cost per entity for 1,000 to 1,499 employees
Electricity Generating Units	Electricity Generating Units	22	¹	\$130,880	0.5%	7.2%	0.7%	0.5%	0.4%	0.4%	0.2%
Industrial	Adipic Acid Production	325199	1000	\$130,880	0.2%	4.7%	1.5%	0.5%	NA	0.1%	NA
Industrial	Aluminum Production	331312	1000	\$130,880	0.2%	53.6%	NA	NA	NA	NA	NA
Industrial	Ammonia Manufacturing	325311	1000	\$130,880	0.5%	6.7%	3.9%	NA	NA	NA	NA
Industrial	Cement Production	327310	750	\$130,880	0.4%	4.2%	3.2%	0.5%	NA	NA	0.3%
Industrial	Electronics Manufacturing	334	³	\$130,880	0.5%	10.2%	1.7%	0.5%	0.3%	0.2%	0.2%
Industrial	Ferroalloy Production	331112	750	\$130,880	0.2%	NA	NA	NA	NA	NA	NA
Industrial	Glass Production	327	500-1000	\$130,880	2.0%	12.6%	2.4%	1.4%	1.0%	1.4%	1.0%
Industrial	HCFC-22 Production	325120	1000	\$130,880	1.1%	23.3%	0.8%	3.2%	NA	NA	NA
Industrial	Hydrogen Production	325120	1000	\$130,880	1.1%	23.3%	0.8%	3.2%	NA	NA	NA
Industrial	Iron and Steel Production	331111	1000	\$130,880	0.3%	32.9%	1.8%	0.7%	0.2%	NA	NA
Industrial	Lead Production	3314	750-1000	\$130,880	0.5%	8.7%	1.0%	0.5%	NA	NA	0.4%
Industrial	Lime Manufacturing	327410	500	\$130,880	0.9%	36.1%	2.7%	NA	NA	NA	NA
Industrial	Magnesium Production	3314	750-1000	\$130,880	0.5%	8.7%	1.0%	0.5%	NA	NA	0.4%
Industrial	Nitric Acid Production	325311	1,000	\$130,880	0.5%	6.7%	3.9%	NA	NA	NA	NA
Industrial	Petrochemical Production	3251	500-1000	\$130,880	0.2%	3.9%	0.9%	0.4%	0.2%	0.4%	0.3%
Industrial	Petroleum	324110	²	\$130,880	0.0%	2.1%	0.1%	0.1%	0.0%	NA	NA

Sector	Source Category	NAICS	SBA Size Standard (effective August 11, 2008)	Average Cost per Entity (2007\$)	Cost per Entity for All Enterprises	Cost per entity for <20 employees	Cost per entity for 20 to 99 employees	Cost per entity 100 to 499 employees	Cost per entity for 500 to 749 employees	Cost per entity for 750 to 999 employees	Cost per entity for 1,000 to 1,499 employees
	Refineries										
Industrial	Phosphoric Acid Production	325312	500	\$130,880	0.1%	22.0%	NA	NA	NA	NA	NA
Industrial	Pulp and Paper Manufacturing	3221	750	\$130,880	0.1%	8.7%	1.0%	0.2%	0.2%	0.1%	0.1%
Industrial	Silicon Carbide Production	327910	500	\$130,880	1.2%	10.2%	2.3%	0.8%	NA	NA	NA
Industrial	Soda Ash Manufacturing	325181	1,000	\$130,880	0.2%	10.7%	NA	NA	NA	NA	NA
Industrial	Titanium Dioxide Production	325188	1,000	\$130,880	0.4%	9.3%	5.4%	1.3%	NA	NA	NA
Industrial	Zinc Production	3314	750-1000	\$130,880	0.5%	8.7%	1.0%	0.5%	NA	NA	0.4%
Industrial	Ethanol Production	325193	1,000	\$130,880	0.4%	NA	NA	NA	NA	NA	NA
Industrial	Food Processing	311	500-1000	\$130,880	0.6%	12.3%	1.5%	0.4%	0.2%	0.2%	0.2%
Energy	Underground Coal Mines	21211	500	\$130,880	0.7%	10.2%	1.5%	0.5%	NA	0.5%	NA
Energy	Oil and Natural Gas Systems	211	500	\$130,880	0.5%	8.1%	0.8%	0.3%	0.1%	0.2%	0.1%
Energy	Oil and Natural Gas Systems	486	⁴	\$130,880	0.7%	1.2%	4.9%	4.0%	NA	NA	NA
Waste Treatment	Landfills	562	\$12.5 million	\$130,880	4.2%	18.9%	2.9%	1.3%	1.2%	1.0%	1.3%
Waste Treatment	MWCs	562	\$12.5 million	\$130,880	4.2%	18.9%	2.9%	1.3%	1.2%	1.0%	1.3%

Footnotes for Tables 4-9. through 4-11.

NA – Not available.

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses.

1: NAICS codes 221111, 221112, 221113, 221119, 221121, 221122 – A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours.

2: 500 to 1,500. For NAICS code 324110 – For purposes of Government procurement, the petroleum refiner must be a concern that has no more than 1,500 employees nor more than 125,000 barrels per calendar day total Operable Atmospheric Crude Oil Distillation capacity. Capacity includes owned or leased facilities as well as facilities under a processing agreement or an arrangement such as an exchange agreement or a throughput. The total product to be delivered under the contract must be at least 90 percent refined by the successful bidder from either crude oil or bona fide feedstocks.

3. NAICS Subsectors 333, 334, 335 and 336 – For rebuilding machinery or equipment on a factory basis, or equivalent, use the NAICS code for a newly manufactured product. Concerns performing major rebuilding or overhaul activities do not necessarily have to meet the criteria for being a "manufacturer" although the activities may be classified under a manufacturing NAICS code. Ordinary repair services or preservation are not considered rebuilding.

4: Subsector 486 – Pipeline Transportation (486110 Pipeline Transportation of Crude Oil 1,500, 486210 Pipeline Transportation of Natural Gas \$7.0 million , 486910 Pipeline Transportation of Refined Petroleum Products 1,500, 486990 All Other Pipeline Transportation \$34.5 million)

Table 4-12: Avoided Title V Costs for Small New Commercial Sources of GHG Emissions

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars as of 8/11/08	Average Cost Per Entity (2007\$)	Average Cost per Entity for All Enterprises	Cost per Entity for <20 employees	Cost per Entity for 20 to 99 employees	Cost per Entity for 100 to 499 employees	Cost per Entity for 500 to 749 employees	Cost per Entity for 750 to 999 employees	Cost per Entity for 1,000 to 1,499 employees
Commercial	Education	61	\$7.0-35.0	\$4986	0.2%	1.3%	0.2%	0.1%	0.0%	0.0%	0.0%
Commercial	Enclosed mall	531120	7.0	\$4986	0.3%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%
Commercial	Food sales			\$4986	NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	\$4986	0.7%	1.6%	0.4%	0.3%	0.4%	0.4%	0.4%
Commercial	Inpatient health care	622	34.5	\$4986	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
Commercial	Laboratory	541380	12.0	\$4986	0.3%	0.8%	0.2%	0.1%	0.1%	0.1%	0.2%
Commercial	Laboratory	5417	7.0	\$4986	0.1%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%
Commercial	Lodging	721	7.0	\$4986	0.2%	1.1%	0.2%	0.1%	0.1%	0.0%	0.1%
Commercial	Nonrefrigerated warehouse	49311	25.5	\$4986	0.2%	0.7%	0.2%	0.1%	0.3%	0.2%	0.1%
Commercial	Nursing	623	7.0-13.5	\$4986	0.2%	1.6%	0.3%	0.2%	0.2%	0.2%	0.1%
Commercial	Office	531120	7.0	\$4986	0.3%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%
Commercial	Other	81	7.0-25.0	\$4986	0.8%	1.3%	0.2%	0.1%	0.1%	0.2%	0.2%
Commercial	Outpatient health care	621	7.0-34.5	\$4986	0.4%	0.8%	0.2%	0.1%	0.1%	0.1%	0.1%
Commercial	Public assembly	71	7.0	\$4986	0.3%	0.9%	0.2%	0.1%	0.0%	NA	0.0%
Commercial	Public order and safety	NA	NA	\$4986	NA	NA	NA	NA	NA	NA	NA
Commercial	Refrigerated warehouse	49312	25.5	\$4986	0.1%	0.6%	0.1%	0.1%	NA	NA	0.1%
Commercial	Religious worship	813110	7.0	\$4986	0.9%	2.0%	0.2%	0.0%	0.0%	0.0%	0.0%
Commercial	Retail other than mall	44-45	7.0-29.0	\$4986	0.2%	0.5%	0.1%	0.1%	0.1%	0.1%	0.1%
Commercial	Service	81	7.0-25.0	\$4986	0.8%	1.3%	0.2%	0.1%	0.1%	0.2%	0.2%
Commercial	Strip shopping mall	531120	7.0	\$4986	0.3%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%
Residential	Residential	531110	7.0	\$4986	0.5%	0.7%	0.2%	0.2%	0.2%	NA	NA

Table 4-13: Avoided Costs to Small Modifying Commercial PSD GHG Emission Sources

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars of revenue (8/11/08)	Average Cost per Entity (2007\$)	Cost per Entity for All Enterprises	Cost per Entity for <20 employees	Cost per Entity for 20 to 99 employees	Cost per Entity for 100 to 499 employees	Cost per Entity for 500 to 749 employees	Cost per Entity for 750 to 999 employees	Cost per Entity for 1,000 to 1,499 employees
Commercial	Education	61	\$7.0-35.0	\$16887	0.6%	4.5%	0.8%	0.2%	0.1%	0.1%	0.1%
Commercial	Enclosed mall	531120	7.0	\$16887	1.0%	1.8%	0.3%	0.2%	0.1%	0.1%	0.1%
Commercial	Food sales			\$16887	NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	\$16887	2.3%	5.3%	1.4%	1.1%	1.3%	1.3%	1.3%
Commercial	Inpatient health care	622	34.5	\$16887	0.0%	0.9%	0.3%	0.1%	0.0%	0.0%	0.0%
Commercial	Laboratory	541380	12.0	\$16887	0.8%	2.8%	0.6%	0.4%	0.2%	0.2%	0.6%
Commercial	Laboratory	5417	7.0	\$16887	0.3%	2.0%	0.3%	0.1%	0.1%	0.1%	0.1%
Commercial	Lodging	721	7.0	\$16887	0.7%	3.7%	0.8%	0.3%	0.3%	0.1%	0.3%
Commercial	Nonrefrigerated warehouse	49311	25.5	\$16887	0.8%	2.2%	0.6%	0.4%	1.0%	0.6%	0.5%
Commercial	Nursing	623	7.0-13.5	\$16887	0.8%	5.4%	1.1%	0.6%	0.7%	0.6%	0.5%
Commercial	Office	531120	7.0	\$16887	1.0%	1.8%	0.3%	0.2%	0.1%	0.1%	0.1%
Commercial	Other	81	7.0-25.0	\$16887	2.5%	4.5%	0.8%	0.4%	0.5%	0.5%	0.7%
Commercial	Outpatient health care	621	7.0-34.5	\$16887	1.4%	2.6%	0.6%	0.4%	0.4%	0.4%	0.3%
Commercial	Public assembly	71	7.0	\$16887	1.1%	3.1%	0.7%	0.2%	0.1%	NA	0.1%
Commercial	Public order and safety	NA	NA	\$16887	NA	NA	NA	NA	NA	NA	NA
Commercial	Refrigerated warehouse	49312	25.5	\$16887	0.3%	1.9%	0.5%	0.3%	NA	NA	0.3%
Commercial	Religious worship	813110	7.0	\$16887	3.0%	6.7%	0.8%	0.2%	0.1%	0.0%	0.0%
Commercial	Retail other than mall	44-45	7.0-29.0	\$16887	0.5%	1.7%	0.3%	0.2%	0.3%	0.4%	0.4%
Commercial	Service	81	7.0-25.0	\$16887	2.5%	4.5%	0.8%	0.4%	0.5%	0.5%	0.7%
Commercial	Strip shopping mall	531120	7.0	\$16887	1.0%	1.8%	0.3%	0.2%	0.1%	0.1%	0.1%
Residential	Residential	531110	7.0	\$16887	1.7%	2.4%	0.5%	0.6%	0.6%	NA	NA

Table 4-14: Avoided Costs to Small PSD New Commercial GHG Emission Sources

Sector	Source Category	NAICS	SBA Size Standard in millions of dollars in revenue (8/11/08)	Average Cost per Entity (2007\$)	Average Cost per Entity for All Enterprises	Cost per Entity for <20 employees	Cost per Entity for 20 to 99 employees	Cost per Entity for 100 to 499 employees	Cost per Entity for 500 to 749 employees	Cost per Entity for 750 to 999 employees	Cost per Entity for 1,000 to 1,499 employees
Commercial	Education	61	\$7.0-35.0	\$21873	0.8%	5.8%	1.0%	0.3%	0.2%	0.1%	0.1%
Commercial	Enclosed mall	531120	7.0	\$21873	1.3%	2.3%	0.4%	0.2%	0.1%	0.2%	0.1%
Commercial	Food sales			\$21873	NA	NA	NA	NA	NA	NA	NA
Commercial	Food service	722	7.0-20.5	\$21873	3.0%	6.9%	1.8%	1.4%	1.6%	1.7%	1.7%
Commercial	Inpatient health care	622	34.5	\$21873	0.0%	1.1%	0.4%	0.1%	0.0%	0.0%	0.0%
Commercial	Laboratory	541380	12.0	\$21873	1.1%	3.7%	0.8%	0.5%	0.3%	0.3%	0.7%
Commercial	Laboratory	5417	7.0	\$21873	0.4%	2.6%	0.4%	0.1%	0.1%	0.1%	0.1%
Commercial	Lodging	721	7.0	\$21873	1.0%	4.9%	1.1%	0.4%	0.4%	0.2%	0.3%
Commercial	Nonrefrigerated warehouse	49311	25.5	\$21873	1.0%	2.9%	0.8%	0.5%	1.3%	0.7%	0.6%
Commercial	Nursing	623	7.0-13.5	\$21873	1.0%	7.0%	1.4%	0.8%	0.9%	0.8%	0.6%
Commercial	Office	531120	7.0	\$21873	1.3%	2.3%	0.4%	0.2%	0.1%	0.2%	0.1%
Commercial	Other	81	7.0-25.0	\$21873	1.8%	3.4%	0.8%	0.6%	0.5%	0.6%	0.4%
Commercial	Outpatient health care	621	7.0-34.5	\$21873	1.4%	4.0%	0.9%	0.2%	0.2%	NA	0.1%
Commercial	Public assembly	71	7.0	\$21873	NA	NA	NA	NA	NA	NA	NA
Commercial	Public order and safety	NA	NA	\$21873	0.4%	2.5%	0.6%	0.4%	NA	NA	0.3%
Commercial	Refrigerated warehouse	49312	25.5	\$21873	4.0%	8.7%	1.0%	0.2%	0.2%	0.0%	0.1%
Commercial	Religious worship	813110	7.0	\$21873	4.0%	8.7%	1.0%	0.2%	0.2%	0.0%	0.1%
Commercial	Retail other than mall	44-45	7.0-29.0	\$21873	0.7%	2.3%	0.3%	0.3%	0.4%	0.6%	0.6%
Commercial	Service	81	7.0-25.0	\$21873	3.3%	5.8%	1.0%	0.5%	0.6%	0.7%	0.8%
Commercial	Strip shopping mall	531120	7.0	\$21873	1.3%	2.3%	0.4%	0.2%	0.1%	0.2%	0.1%
Residential	Residential	531110	7.0	\$21873	2.2%	3.1%	0.7%	0.8%	0.8%	NA	NA

Footnotes for Tables 4-12-4-14

The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll is summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses.

NAICS code 611519 – Job Corps Centers. For classifying a Federal procurement, the purpose of the solicitation must be for the management and operation of a U.S. Department of Labor Job Corps Center. The activities involved include admissions activities, life skills training, educational activities, comprehensive career preparation activities, career development activities, career transition activities, as well as the management and support functions and services needed to operate and maintain the facility. For SBA assistance as small business concern, other than for Federal Government procurements, a concern must be primarily engaged in providing the services to operate and maintain Federal Job Corps Centers

NAICS code 541711 and 541712 – For research and development contracts requiring the delivery of a manufactured product, the appropriate size standard is that of the manufacturing industry.

Section 5

Social Costs

EPA examined the social costs of this proposed rule. For this proposal, the social costs represent the foregone environmental benefits that would occur if regulatory relief were offered to small sources of GHG emissions as proposed. This proposal is one of regulatory relief since it increases the emissions thresholds for the title V and PSD programs, as they apply to sources of GHGs, to levels above those in the CAA. Previous sections have discussed the avoided cost of such relief, but there is also a social cost imposed by such relief because this rule may forego some of the possible benefits associated with title V and PSD programs for sources of GHG emissions below 25,000 tpy CO₂e but above the statutory 100/250 tpy levels. These benefits are those attributed to title V and PSD permitting programs in general. These benefits are based upon the relevance of these programs to policymaking, transparency issues, and market efficiency, and therefore are very difficult to quantify and monetize. For title V, they include the benefits of improved compliance with CAA requirements that stem from (1) improved clarity regarding applicability of requirements, (2) discovery and required correction of noncompliance prior to receiving a permit, (3) improving monitoring, recordkeeping, and reporting concerning compliance status, (4) self-certification of compliance with applicable requirements initially and annually, and prompt reporting of deviations from permit requirements, (5) enhanced opportunity for the public to understand and monitor sources' compliance obligations, and (6) improved ability of EPA, permitting authorities, and the public to enforce CAA requirements. However, it is important to remember that a title V permit does not add new requirements for pollution control itself, but rather collects all of a facility's applicable requirements under the CAA in one permit. Therefore, the compliance benefits above are less when title V permits contains few or no CAA applicable requirements. During the first phase under this proposal, when the title V threshold is 25,000 tpy, we expect that the vast majority of sources excluded from title V would be sources that have no CAA applicable requirements for GHG emissions and few or no requirements for other pollutants because their emissions of those pollutants are so small. For this reason while it is extremely difficult to measure the degree of improved compliance, if any, that would be foregone, or to quantify the social costs that would be imposed, we expect that they would be negligible.

For PSD, the primary social cost imposed by the tailoring rule stems from the foregone benefit of applying BACT to the tens of thousands of small new sources and modifications that will be below our proposed thresholds during the first phase. This social cost potentially weighs against the cost savings described above that stem (in part) from avoiding the administrative and control costs of applying BACT to these sources. The BACT requirement assures that new and modified sources, when they increase their emissions are using state-of-the-art emission controls and affords the public an opportunity to comment on the control decision. It does not prohibit increases but it assures that such controls are applied. Delaying the BACT requirement for numerous small sources during the first phase of this proposed rule could allow increases from these smaller sources that are greater than they would be if BACT were applied. A detailed analysis of this difference is beyond the scope of this rule because we do not have detailed information on the universe of these tens of thousands of small PSD actions, the candidate BACT technologies for each of them, how permitting authorities would make the BACT decisions, and how the BACT limit would compare to what would otherwise be installed absent BACT. Below we present an illustrative example of how BACT impacts might be determined for sources that would be excluded from review under the tailoring rule. This example illustrates the difficulty in quantifying the social costs of avoided BACT, but helps explain the nature of such costs.

To assess the effect of avoided BACT, we would identify the universe of source types that are affected by the tailoring rule. More specifically, we would have to project the number of various source types (within those affected by the tailoring rule) that would actually be constructing or modifying. We have generally characterized these sources as part of the tailoring rule threshold evaluation, and have determined a large proportion of these to consist of small commercial and residential sources. This determination was based on rough energy usage data, but to assess BACT, we would require more specific information about the proposed equipment that will actually be emitting GHG (e.g., water heaters, furnaces, cooking equipment, dryers, etc.) and more specific characterization would be subject to a very high degree of uncertainty.

Following characterization of new and modified sources, we would need to determine, for each category of source, what GHG control technologies are available for such equipment. For commercial sources, we may have to determine commercial availability of a range of lower emitting processes, more efficient technologies, and other techniques for improving energy

efficiency. Next, we would assess affected sources capital and operating costs of control options and determine energy and environmental impacts. Finally, we would need to apply judgment (as the permitting authority would do in each case) to select the technology that represented the maximum degree of control taking the costs, energy and environmental impacts into account.

The social cost component of the impact of foregoing BACT for sources that construct or modify during the first phase would be represented by the difference between the increased emissions that would result from such proposed sources absent BACT and the increase that would be allowed under the BACT requirement. However, while we can point to the existence of such differences, we cannot quantify them (though as explained below we expect that overall they will be very limited in scope and magnitude). Since there has been no regulatory experience with controlling GHG emissions from these sources, and limited permitting experience of any kind with mandatory control requirements on smaller commercial and residential sources, we are not in position at this point to identify the specific control technologies and quantify this difference to estimate the greater increases that might occur in the absence of applying the BACT process to these sources across the country. In addition, since the PSD BACT review and selection process is implemented on a case-by-case basis, there is additional uncertainty in predicting program-wide reductions because even for similar sources, permitting authorities may, ultimately weigh the BACT factors differently and adopt different control measures.

For all these reasons, it is not possible at this time to quantify the social costs of avoided BACT. However we note that the universe of possible emissions that would be regulated by sources excluded under the tailoring rule is small compared to those that would remain subject to PSD. The sources excluded in the first phase of this proposal comprise only 7 percent of total stationary source GHG emissions, while 68 percent remain subject to regulation. Furthermore, we expect the emissions differences due to BACT controls for such sources to be relatively small due to the lack of available capture and control technologies for GHG at such sources that are akin to those that exist for conventional pollutants and sources, as well as the likelihood that even in the absence of BACT such sources would already be installing relatively efficient GHG technologies to save on fuel costs. Thus, while potential benefits would be foregone by excluding smaller sources from the permitting programs, these benefits are likely to be small. Under the tailoring rule, we will be working during the six-year period to greatly improve our

understanding of both the administrative costs of regulating and the social costs of not regulating smaller sources under PSD and Title V, and we will be relying on that information to support our future threshold analyses called for under the proposal.

Since the EPA is unable to quantify these GHG emission reductions foregone at this time due to these uncertainties involved in this estimation, it is also not possible to provide a monetized estimate of the foregone benefits or social costs of this rule. If such emission reductions foregone were quantified, the EPA could use a social cost of carbon benefit estimates such as those used in the “Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards”¹³ recently published to compute the dollar value associated with the social costs of this proposed rule. Nonetheless, we expect that the value would be small because, as discussed above, the emissions differences from which this value would be computed are small.

In reaching the decisions for this GHG tailoring rule, the EPA recognizes the GHG emissions can remain in the atmosphere for decades to centuries, meaning that their concentrations become well-mixed throughout the global atmosphere regardless of emission origin, and their effects on climate are long lasting and significant. A detailed explanation of climate change and its impact on health, society, and the environment is included in EPA's technical support document for the endangerment finding proposal (Docket ID No. EPA-HQ-OAR-2009-0171). The EPA recognizes the importance of reducing climate change emissions for all sources of GHG emissions including those sources afforded regulatory relief in this rule and plans to address potential emission reductions from these small sources using voluntary and energy efficiency approaches. Elsewhere, we have discussed EPA's interest in continuing to use regulatory and/or non-regulatory tools for reducing emissions from smaller GHG sources because we believe that these tools will likely result in more efficient and cost-effective regulation than would case-by-case permitting.

¹³ US EPA (2009). Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. EPA-HQ-OAR-2009-0472.
<http://www.epa.gov/otaq/climate/regulations/ghg-preamble-regs.pdf>

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Attachment A

Source Categories Affected by the Rule with Industry Detail

Table A-1. Proposed and Alternative GHG Source Categories Affected by the Rule with Industry Detail

			<10,000 tpy		Proposed <25,000 tpy		<50,000 tpy	
Sector	Source Category	NAICS Code ¹	Title V	New PSD	Title V	New PSD	Title V	New PSD
Electricity Generation	Electricity Generating Units	22	42	7	161	20	326	29
Industrial	Adipic Acid Production	325199	0	0	0	0	0	0
Industrial	Aluminum Production	331312	0	0	0	0	0	0
Industrial	Ammonia Manufacturing	325311	0	0	0	0	0	0
Industrial	Cement Production	327310	0	0	0	0	0	0
Industrial	Electronics Manufacturing	334	111	0	134	0	145	0
Industrial	Ferroalloy Production	331112	0	0	0	0	0	0
Industrial	Glass Production	327	194	0	265	1	348	1
Industrial	HCFC-22 Production	325120	0	0	0	0	0	0
Industrial	Hydrogen Production	325120	24	0	33	0	37	0
Industrial	Iron and Steel Production	331111	2	0	7	0	14	0
Industrial	Lead Production	3314	1	0	4	0	5	0
Industrial	Lime Manufacturing	327410	0	0	3	0	23	0
Industrial	Magnesium Production	3314	2	0	2	0	4	0
Industrial	Nitric Acid Production	325311	0	0	1	0	2	0
Industrial	Petrochemical Production	3251	2	0	2	0	4	0
Industrial	Petroleum Refineries	324110	1	0	4	0	13	0
Industrial	Phosphoric Acid Production	325312	0	0	0	0	0	0
Industrial	Pulp and Paper Manufacturing	3221	0	0	0	0	3	0

			<10,000 tpy		Proposed <25,000 tpy		<50,000 tpy	
Sector	Source Category	NAICS Code ¹	Title V	New PSD	Title V	New PSD	Title V	New PSD
Industrial	Silicon Carbide	327910	0	0	0	0	0	0
Industrial	Soda Ash Manufacturing	325181	0	0	0	0	0	0
Industrial	Titanium Dioxide Production	325188	0	0	0	0	0	0
Industrial	Zinc Production	3314	1	0	4	0	4	0
Industrial	Ethanol Production	325193	47	3	54	4	54	4
Industrial	Food Processing	311	3,197	38	3,464	41	3,936	47
Industrial	Unspecified Industrial Stationary Combustion	Multiple	147,518	439	152,568	463	155,588	478
Energy	Underground Coal Mines	21211	115	0	135	0	160	0
Energy	Oil and Natural Gas Systems	211,486	2,160	22	3,509	35	4,375	48
Waste Treatment	Landfills	562	866	0	1,430	0	2,447	0
Waste Treatment	MWCs	562	0	0	1	0	8	1
Agriculture	Stationary Combustion Equipment (Generators)	81	37,351	299	37,351	299	37,351	299
Commercial	All Commercial - Stationary Fuel Combustion	Multiple	1,350,261	22,027	1,354,760	22,116	1,355,321	22,120
Residential	Multi-Family Fuel Combustion	531110	609,100	11,280	610,340	11,297	610,480	11,300
Residential	Single-Family Fuel Combustion	N/A	3,925,000	33,000	3,925,000	33,000	3,925,000	33,000
All	All		6,075,995	67,115	6,089,232	67,276	6,095,648	67,327

¹North American Industry Classification System. (NAICS) <http://www.census.gov/eos/www/naics/>.

²US Environmental Protection Agency. July 7, 2009. "Technical Support Document for Greenhouse Gas Emissions Threshold Evaluation". See docket at EPA-HQ-OAR-2009-0517. Estimates for PSD sources are for newly constructed facilities and do not include modifications at existing facilities that may also be subject to PSD requirements.

Attachment B

**Technical Support Document
for Greenhouse Gas Emissions Thresholds
Evaluation**

Air Quality Policy Division
Office of Air Quality Policy and Standards
U.S. Environmental Protection Agency

July 7, 2009

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Technical Support Document for Greenhouse Gas Emissions Thresholds Evaluation

1. Purpose

The purpose of this document is to provide the background information that was used to support EPA's decision process in evaluating and selecting proposed greenhouse gas (GHG) major source applicability thresholds for the Prevention of Significant Deterioration (PSD) and Title V permitting programs as part of its proposed rule "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule" (GHG Tailoring Rule). The document describes the methodology used to estimate the number of existing and new facilities (e.g., industrial plant or commercial building) that would exceed different GHG emission threshold levels. The document also summarizes the results of this analysis for each sector. The results of this analysis served as one of the bases for evaluating administrative burdens at both existing permitting thresholds under the Clean Air Act (CAA) and for evaluating and selecting proposed alternative permitting thresholds to address administrative necessity concerns.

2. Overview

In order to support EPA's assessment of the administrative burden created by adding GHGs to existing PSD and Title V permitting programs, it was necessary to develop information on the number of affected facilities at both the current CAA permitting major source thresholds (generally, 100 tons per year for Title V and 100 or 250 tons per year for PSD depending on the source category classification) and at alternative higher thresholds. An affected facility would be one whose annual emissions of the GHG equal or exceed the major source threshold being evaluated.

Eight threshold levels ranging from 100 to 100,000 tons per year of GHG emissions were evaluated. Some of the alternative thresholds evaluated are the same as ones (e.g., 25,000 tons per year CO₂-equivalents) considered in previous studies and in support of EPA's proposed GHG Mandatory Reporting Rule (GHG MRR, 74 FR 68, Pages 16447 – 16731). One key difference between the emissions data developed for this analysis and the emissions data developed to support the proposed GHG MRR is that this analysis is based on a facility's "potential to emit" (PTE) while the proposed GHG reporting rule is based on "actual" emissions (i.e., the emissions a facility actually emits in a given year). PTE is defined as the maximum capacity of a stationary source to emit a pollutant under its physical and operational design, including certain legal limitations, for example, on emissions or hours of operation. PSD and Title V programs both use PTE for defining major sources. The end result is generally that more facilities will exceed a given threshold on a PTE basis than on an actual basis. This is an important differentiation in terms of both evaluating the thresholds under this proposed rule and when comparing the results to other threshold analysis, such as the supporting data for the EPA's proposed GHG MRR.

Although the primary focus of this analysis was on the potential administrative burden associated with different GHG permitting emission levels as represented in terms of number of facilities potentially subject to permitting, information on GHG emissions from affected facilities was also collected to assess the relative coverage of national stationary source GHG emissions at the different threshold levels. While the environmental impact associated with the different GHG permitting levels was not used as the basis for the proposed temporary GHG thresholds in the proposed GHG Tailoring Rule, the information on national emissions coverage provides a useful measure to consider the potential scope of the proposed alternative thresholds, their coverage of key GHG emission source categories, and whether they promote the environmental purposes of the PSD and Title V programs.

3. Emissions-based Threshold Analysis

3.1 General Description of Overall Approach

This section presents a general description of the overall approach EPA used to evaluate a range of permitting thresholds in terms of the number of sources affected, and amount of emissions covered.

EPA made use of earlier analyses performed to develop emission thresholds for the proposed GHG MRR, or used the same data sources when additional analyses were required. EPA did not conduct primary research for this analysis, but instead relied on published research and publicly available government data, such as EPA's eGRID database of electric generating source emissions, Economic and Housing Census data, and Energy Information Agency (EIA) data on energy consumption.

3.1.1 Threshold Levels

EPA evaluated eight different potential to emit thresholds:

**GHG Thresholds
(tons per year)**

100
250
1,000
5,000
10,000
25,000
50,000
100,000

The first two thresholds (100 and 250 tons per year) are the current Clean Air Act major source criteria pollutant thresholds for the federal operating permit program under Title V, and the PSD construction permit program under Title I.

The six additional thresholds cover the range of thresholds evaluated for the proposed GHG MRR, and add two additional thresholds at 5,000 and 50,000 tons per year. Like the Clean Air Act, the permit thresholds are based on U.S. short tons (tons) instead of metric tons (mtons).

There is a three-orders-of-magnitude range in the thresholds which reflects the much higher quantity of GHG emissions compared to criteria pollutant emissions from the primary source of GHG emissions, fossil fuel combustion. For example, an uncontrolled natural gas-fired boiler that emits 100 tons of NO_x annually would at the same time emit about 100,000 tons of CO₂.

The threshold analysis of source counts and emissions was done on a "potential to emit" basis, because that is the basis that is relevant for the permit rule. Potential emissions (in short tons) from each source were evaluated against the threshold levels in order to determine whether or not a source would be included in the threshold count. When a source was identified as being covered by a given threshold level, the actual emissions from that source were included to determine the emissions covered by the threshold. In other words, where summary tables present "Tg GHG Emissions Covered per Year" these are the actual emissions that would be covered by the threshold level, given the source count arrived at considering potential to emit emission levels.

3.1.2 Greenhouse Gases

EPA evaluated emissions of the major GHGs that are directly emitted by human activities at the eight threshold levels. The GHGs evaluated are shown below in Table 1. For purposes of this analysis emissions were evaluated on both an individual GHG mass basis and CO₂-equivalent basis (CO₂e). CO₂e normalizes the different heat trapping capacities of the different GHGs to that of CO₂. A quantity of a GHG is converted to a CO₂e basis by multiplying the mass of the compound emitted by its Global Warming Potential (GWP). The GWP is a metric that incorporates both the heat-trapping ability and atmospheric lifetime of each GHG relative to CO₂.

Table 1
Major GHGs Directly Emitted by Human Activities

Greenhouse Gas	Chemical Formula or Acronym	Global Warming Potential (GWP)*
Carbon dioxide	CO ₂	1
Methane	CH ₄	21
Nitrous oxide	N ₂ O	310
Perfluorocarbons	PFCs	Varies by compound
Hydrofluorocarbons	HFCs	Varies by compound
Sulfur hexafluoride	SF ₆	23,900

* EPA has chosen to use GWPs published in the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR) published in 1996. For those fluorinated compounds that are not listed in the SAR, EPA is using the most recent available GWPs, either the IPCC Third Assessment Report (2001) or Fourth Assessment Report (2007). For more specific information about the GWP of specific GHGs, please see Table A-1 in the proposed GHG MRR.

Sector descriptions contained in this document include a discussion of GHGs evaluated for each sector. If the analysis included more than one GHG, the description includes gas-specific counts as well as a CO₂e count. The threshold analyses for stationary fossil fuel combustion were simplified by excluding CH₄ and N₂O emissions, because CO₂ comprises over 99 percent of GHG emissions from fossil fuel combustion.

3.1.3 Source Sectors

In this analysis EPA evaluated the same range of stationary source types with direct GHG emissions as identified in the proposed GHG MRR. The proposed GHG MRR source categories were based on a comprehensive review of all U.S. source categories with GHG emissions, to include the categories that emit the most significant amount of GHG emissions. The stationary sources evaluated in this analysis can be grouped in the sectors shown below:

- Electricity Generation (facilities with fossil fuel-fired electric generating units);
- Industry (range of industries with process and combustion GHG emissions);
- Energy (oil and gas extraction, transport, and processing; underground coal mining);
- Waste Treatment (landfills and municipal solid waste incinerators);
- Agriculture (stationary fuel combustion);
- Commercial (stationary fuel combustion); and
- Residential (stationary fuel combustion).

A number of direct emission source types included in the proposed reporting rule analysis were not included in the potential to emit analysis because the GHG emissions from these sources were primarily fugitive emissions. Fugitive emissions are emissions which are not released, or could not be reasonably released, through a stack or vent. Under the PSD rules, fugitive emissions are only included in potential to emit estimates if the source is one of 28 listed PSD source categories. Excluded fugitive emissions sources are listed below:

- Electrical equipment SF₆ emissions;
- Wastewater treatment plants not associated with one of 28 listed PSD source categories (combustion is captured in the commercial sector analysis); and
- Agricultural manure management.

3.1.4 Potential to Emit Methodology

As noted earlier, the potential to emit (PTE) is the amount of emissions that can be emitted from a source operating at full capacity. The annual PTE is based on operation at full equipment capacity, 24 hours per day, 365 days per year (8,760 hours per year). For example, if a boiler has a maximum rated heat input capacity of ten million Btu per hour, the annual PTE for that boiler is the amount of emissions from burning 87,600 million Btu of fuel:

$$10 \text{ mmBtu/hr} \times 8,760 \text{ hrs/yr} = 87,600 \text{ mmBtu/yr}$$

Capacity information and annual GHG emissions were available for some of the source categories from analyses performed to support the proposed GHG MRR. In some cases the supporting analyses had already calculated GHG emissions on a full capacity basis, in which

case EPA directly used those estimates as PTE estimates. Alternatively, some data from the supporting analysis estimated actual annual emissions using a baseline year. If capacity and baseline year production information was provided in the supporting data, EPA adjusted the source actual emissions estimate by the ratio of annual capacity to baseline production to estimate PTE. If capacity information was not available, EPA used capacity factors from other data sources to adjust actual emission estimates to PTE estimates. These capacity factors add varying uncertainty to the PTE estimate. Detailed descriptions of the different PTE calculation methodologies are included in the source descriptions in the following section.

Removal by pollution control equipment was considered in the PTE estimates, though control equipment removal was relevant in only a few cases (thermal oxidation of HPCs and CH₄). Also, as noted earlier, fugitive emissions, were only included in the PTE estimates if the source was one of the 28 listed PSD source categories. For example, fugitive CH₄ emissions from oil and gas processing plants were not included in CH₄ or CO₂e emissions when comparing to the different thresholds, but were included for iron and steel plants.

3.1.5 New and Modified Sources

The source population data from the analyses supporting the proposed reporting rule analyses, and other data sources provide information on existing sources and their emissions. The PSD and NSR program construction permit requirements, however, apply to new or modified sources.

The general approach for new sources was to apply growth rates in the number of units or facilities in a source category to the number of existing facilities at the different thresholds. Growth rates were available from a variety of sources including Economic Census data, EIA energy survey data, and various EPA regulatory impact analyses and information collection requests which require source population estimates. In some cases there was sufficient information to distribute new sources to different thresholds based on emission information specific to the new sources (electric generating, municipal solid waste combustors, and commercial stationary fuel combustion). Otherwise EPA assumed the same size and threshold distribution for new units as for existing units. For example, if the annual growth rate in a category was one percent, the number of existing facilities above a threshold was multiplied by the fractional growth rate to estimate the number of new facilities at that threshold per year.

EPA did not develop a method for estimating the number of modifications of existing sources for the permit threshold analysis.

3.2 Threshold Summary Results

The resulting counts of affected stationary source facilities and the amount of actual GHG emissions covered at different PTE thresholds for all sectors are shown in the tables below. GHG emissions covered at each threshold are in Tg, which is equivalent to million metric tons.

SI units were used for the covered emissions to be consistent with the U.S. GHG Inventory and the proposed GHG MRR. The complete data for the sectors and subsectors are provided in supporting spreadsheets that accompany this report. These spreadsheets are identified in Appendices A and B.

Table 2
CO₂e Threshold Summary -- All Stationary Source Sectors

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	6,102,893	67,404	3,865
250	1,058,296	19,731	3,782
1,000	278,340	4,330	3,708
5,000	52,888	532	3,602
10,000	26,898	289	3,545
25,000	13,661	128	3,464
50,000	7,245	77	3,310
100,000	4,850	66	3,240

Table 3
CO₂ Threshold Summary -- All Stationary Source Sectors

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	6,098,502	67,404	3,649
250	1,053,891	19,731	3,566
1,000	274,004	4,330	3,498
5,000	49,061	532	3,393
10,000	23,393	289	3,338
25,000	10,734	127	3,264
50,000	5,374	77	3,134
100,000	3,750	66	3,088

Table 4
CH₄ Threshold Summary -- All Stationary Source Sectors

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CH₄ Emissions Covered (Tg per year)
100	4,201	0	7.807
250	3,851	0	7.759
1,000	2,887	0	7.321
5,000	1,042	0	4.740
10,000	466	0	3.697
25,000	138	0	2.234
50,000	34	0	1.185
100,000	3	0	0.211

Table 5
N₂O Threshold Summary -- All Stationary Source Sectors

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	N₂O Emissions Covered (Tg per year)
100	47	0	0.074
250	46	0	0.074
1,000	31	0	0.068
5,000	5	0	0.022
10,000	0	0	0
25,000	0	0	0
50,000	0	0	0
100,000	0	0	0

Table 6
High GWP Gases Threshold Summary -- All Stationary Source Sectors

GHG	GHG Threshold* (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	GHG Emissions Covered (Tg per year)
HFC	100	3	0	0.001
HFC	250	3	0	0.001
HFC	1,000	1	0	0.001
HFC	5,000 and above	0	0	0
PFC	100 and above	0	0	0
SF ₆	100 and above	0	0	0

* Where a threshold is not listed for a particular GHG, threshold counts for that threshold and any higher thresholds can be assumed to be zero.

3.3 Electricity Generating Sector

Data Sources

The latest version of EPA's eGRID database (2006) was used to estimate the PTE of electricity generating facilities and counts of units above the different emission thresholds. The eGRID database includes year 2004 characteristics, operating information, and annual emissions (including CO₂) for U.S. facilities that have a generation capacity greater than one MW, and sell electric power to the grid.

A facility's PTE was estimated based on the eGRID generator table. The generator table, which is based on the 2004 EIA form 860 database, provides prime mover, generator nameplate capacity, and primary energy source (fuel type) for each generator down to 0.1 MW. To calculate PTE, we combined the nameplate capacity and primary fuel for each of the fossil-fired units with average fuel based prime mover heat rates (Btu/kWh) published by EIA (EIA, 2007).

Table 7
EGU Prime Mover Heat Rates
(EIA Electric Power Annual, Table A7, 2007)

Prime Mover	Fuel	Average Heat Rate (Btu/kWh)
Steam turbine	Coal	10,114
	Gas	10,466
	Oil	10,400
Simple combustion turbine	Gas	11,459
	Oil	13,216
Combined cycle combustion turbine	Gas	7,445
	Oil	11,015
Internal combustion engine	Gas	9,923
	Oil	10,149

The eGRID database includes cogeneration plants and generating units at industrial plants that primarily supply electric power and steam to a host facility. We eliminated these units from the electric generation facility population based on North American Industry Classification System (NAICS) code, so that the only facilities included were facilities with a NAICS code beginning with 22 (Utilities).

The generator-nameplate-heat-rate approach potentially underestimates PTE for cogeneration plants, where a portion of the burner heat input provides useful thermal energy in addition to electric output. This potential to underestimate PTE affects 321 of 2,237 or 14 percent of facilities evaluated.

Methodology for Existing Facilities

Fuel combustion was the only source of GHG emissions considered for the electricity generation sector. From the eGRID and EIA information EPA calculated a maximum annual fuel heat input based on 8,760 hours of operation for the combustors associated with the generator. This calculated maximum annual heat input was used with fuel combustion emission factors from the proposed reporting rule for the primary fuel, to calculate the facility PTE. The calculations covered 10,487 fossil fuel-fired generators with nameplate capacities down to 0.1 MW or 100,000 kW.

EPA also did not evaluate fugitive CH₄ emissions from facility coal piles. Fossil fuel-fired steam electric plants with heat input greater than 250 mmBtu/hr heat input are one of the 28 listed PSD source categories that include fugitive emissions when calculating PTE. However, the CO₂ PTE from combustion alone for this size facility is about 225,000 tons per year. This is

well over all of the emission thresholds considered in this analysis without consideration of the contribution of fugitive CH₄.

New Units

The eGRID generator table includes an online year field. To determine the number of new units per year at different thresholds EPA counted generators online each year and totaled the emissions associated with those generators at the facility level over the 15-year period from 1990 through 2004. Counts were made of the number of these facilities over the different PTE thresholds, and averaged over the 15 years to arrive at the number of new or modified facilities per year.

Threshold Summary

The table below shows the facilities and emissions covered at the different emission thresholds based on the described methodology. There were a total of 2,237 facilities in the electric generation population, so all facilities and all emissions are covered up to the 5,000 ton PTE threshold. Almost all emissions (99.9 percent), and about 75 percent of facilities are covered at the highest 100,000 ton PTE threshold.

Table 8
CO₂ Threshold Summary Results -- Electricity Generating Sector

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂Emissions Covered (Tg per year)
100	2,237	93	2,373
250	2,237	93	2,373
1,000	2,237	93	2,373
5,000	2,237	91	2,373
10,000	2,195	86	2,373
25,000	2,076	73	2,373
50,000	1,911	64	2,373
100,000	1,721	60	2,371

3.4 Industrial Sector

The industrial sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products, and specifically includes businesses classified in Sectors 31 – 33 according to the North American Industry Classification System (NAICS). Industrial source greenhouse gases result from manufacturing processes as well as combustion processes. Because there is a great deal of variability within the sector, this technical support document includes industry-specific discussions after a general sector overview.

For the industrial sector, EPA considered the six individual greenhouse gases separately, and also prepared an analysis considering CO₂e. In preparation of the GHG MRR, EPA identified 23 industrial sectors where the GHG emissions were significant; these sectors are listed in Table 9.

Table 9
Industrial Sectors and GHG Emissions

NAICS Code	Industrial Sector	CO ₂	CH ₄	N ₂ O	SF ₆	HFC	PFC
325199	Adipic Acid Production	X		X			
331312	Aluminum Production	X					X
325311	Ammonia Production	X					
327310	Cement Production	X					
334	Electronics Manufacturing	X			X	X	X
325193	Ethanol Production	X					
331112	Ferroalloy Production	X	X				
3116	Food Processing	X					
327	Glass Production	X					
325120	HCFC-22 Production	X				X	
	Hydrogen Production	X					
331111	Iron and Steel Production	X	X				
3314	Lead Production	X					
327410	Lime Manufacturing	X					
3314	Magnesium Production	X			X		
325311	Nitric Acid Production	X		X			
3251	Petrochemical Production	X	X				
324110	Petroleum Refineries	X	X				
325312	Phosphoric Acid Production	X					
3221	Pulp and Paper Manufacturing	X					
327910	Silicon Carbide Production	X	X				
325181	Soda Ash Manufacturing	X					
325188	Titanium Dioxide Production	X					
3314	Zinc Production	X					

In addition, there are a large number of industrial establishments across all industrial sectors that emit less significant amounts of GHGs (primarily CO₂) from stationary source fuel combustion. Combustion emissions from these establishments were analyzed under the Unspecified Industrial Stationary Combustion source category.

3.4.1 Data Sources

There were several primary data sources used in preparation of the permit threshold analysis. EPA consulted analyses prepared in support of the GHG MRR for the 23 industrial sectors for which combustion, process and fugitive emissions were significant. These documents can be found in the docket numbered EPA-HQ-OAR-2008-0508. The TSDs contain industry-specific analyses of process, fugitive, and combustion emissions for industries. Supporting analyses used to prepare the TSDs are found in entries 0046.7 and 0046.8 of the GHG MRR docket. These emissions estimate details were helpful in breaking down TSD emission estimates to compare facility-specific emissions against the additional threshold levels considered in the permit threshold analysis, including 100, 250, 5,000, and 50,000 tons per year.

Combustion emissions analyses for the Unspecified Industrial Stationary Combustion sectors used data from the 2002 Manufacturing Energy Combustion Survey (MECS) and the U.S. Census Bureau's 2002 Economic Census. MECS is a survey of manufacturing and industrial energy uses and costs prepared by the EIA (EIA, 2007). Data is collected by manufacturing establishment through mailed questionnaires. The 2002 MECS data reflects responses accounting for approximately 98 percent of the manufacturing payroll, and reports separate energy use estimates for 48 NAICS industrial sector groups. The MECS provided information on the amount of fuel burned in 2002 by sector on an employment basis. The 2002 Economic Census data provided information on the number of establishments sorted by three-digit NAICS code and disaggregated into specific size categories based on employment (U.S. Census, 2004).

3.4.2 Potential to Emit

As mentioned earlier in this document, permit threshold analyses considered both actual emissions and PTE. When capacity information was not available, the analyses applied utilization rates from the Industrial Production and Capacity Utilization, Federal Reserve Statistical Release G-17 in order to adjust actual emissions to determine PTE emissions. These utilization rates are prepared quarterly with annual revisions, and are published on the web (<http://www.federalreserve.gov/releases/g17>). The main data source for the industrial production and capacity utilization rates is the U.S. Census Bureau's Census of Manufactures. Data introduced from other Census Bureau publications include the Census of Services and the Services Annual Survey (for publishing) and selected Current Industrial Reports. Additional government source data include new annual data on minerals from the U.S. Geological Survey (USGS) and updated deflators from the Bureau of Economic Analysis (BEA). In addition, the annual revisions include monthly production estimates that reflect updated seasonal factors and the inclusion of monthly source data that became available (or were revised) after the closing of the regular four-month reporting window.

3.4.3 Methodology for New Units

To determine the number of new units per year, EPA compared the number of establishments by three-digit NAICS code in 1998 to the number of establishments by three-digit NAICS code in 2002, and determined an average annual growth rate for each three-digit NAICS code. The growth rates were applied to each threshold count to determine the number of annual new establishments per industry per threshold. If the growth rate was determined to be negative, EPA assumed that no new establishments would be added; however, establishments were not reduced to reflect negative growth rates. EPA also supplemented these growth rates with agency estimates of expected new sources from various information collection requests (ICR) and regulatory impact analyses (RIA) efforts.

3.5 Methodology for Existing Unspecified Industrial Stationary Combustion Source

Category Emissions

In order to determine establishment counts and emissions totals for the unspecified industrial stationary combustion sources, EPA used 2002 Economic Census data showing manufacturing employment by NAICS code and Manufacturing Energy Consumption Survey (MECS) data published by EIA. Calculating greenhouse gas emissions required determining energy consumption per employee by industry and applying emission factors specific to the consumption profile derived from MECS data.

The Economic Census data (2002) provide a count of establishments by employment category, where employment category is defined by number of employees (e.g., 1 – 4, 5 – 9, ..., 500 – 999, ..., more than 2,500). The MECS energy consumption data provide energy consumption by industry. Both the employment data and the energy consumption data are organized according to the NAICS codes.

As part of this analysis, EPA calculated industry-specific GHG emission factors. The factors were calculated by considering actual fuel consumption in 2002, as determined by EIA. Actual fuel consumed was multiplied by fuel-specific GHG emission factors to determine GHG emissions by fuel type by industry. To simplify the analysis, EPA only included CO₂ emissions and ignored CH₄ and N₂O in the CO₂e calculations. CO₂ makes up between 99.7 to 99.3 percent of estimated CO₂e emissions. Emissions for each fuel type were combined to determine total emissions for a sector. Total emissions per sector were divided by total energy consumption per sector to determine a factor to calculate GHG emissions per mmBtu of energy consumption specific to the industrial sector.

The GHG emission factors were then multiplied by the energy consumption per employee in order to determine emissions per employee. Multiplying the result by the average number employees per establishment, EPA determined total GHG emissions per establishment.

The total emissions numbers were used to determine number of establishments and volume of emissions that would be caught by each of the permit thresholds under consideration.

As discussed previously, a separate threshold analysis was conducted for 23 industrial sectors determined to have significant GHG emissions in the GHG MRR analysis. In order to quantify the unspecified industrial stationary combustion source emissions, the combustion emissions and establishment counts from 19 of these sectors were subtracted from the total industrial MECS analysis. For the remaining four industries, HCFC-22 production, hydrogen production, magnesium production, and nitric acid production, EPA could not readily isolate combustion emissions. For these industries, their establishment counts were subtracted from the unspecified industrial source threshold counts based on process emission threshold evaluations, assuming that any facility exceeding a threshold for process-based emissions would exceed the threshold regardless of their combustion CO₂ emissions.

Potential to Emit

In order to determine potential to emit from the MECS and Economic Census numbers, EPA applied the industry-specific Federal Reserve capacity utilization factors by NAICS category detailed in the analysis.

New Units

EPA applied industry-specific growth rates to each sector and summed across sectors in order to determine number of new units.

Threshold Summary

Table 12
CO₂e Threshold Summary -- Unspecified Industrial Stationary Combustion

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	156,783	481	370.834
250	91,472	295	363.825
1,000	40,013	139	343.367
5,000	14,812	69	299.910
10,000	9,265	42	273.575
25,000	4,215	18	223.894
50,000	1,195	3	153.344
100,000	740	0	132.847

3.6 Methodology for Existing Specific Industrial Sectors Considering Combustion, Process and Fugitive Emissions

These analyses were based primarily on the GHG MRR TSDs and the supporting analyses, including facility specific emission information. The estimates considered each greenhouse gas separately. The GHG MRR TSDs included threshold counts and emissions calculations for 1,000, 10,000, 25,000 and 100,000 metric tons per year. Two steps were required for permit threshold consideration. First, emissions were recalculated in order to conduct the analysis in short tons for comparison to the permit thresholds. Second, the emissions were considered against the finer threshold stratification considered in the permit threshold analysis.

For the permit threshold analysis, EPA determined that if the GHG MRR analysis showed all of the establishments exceeded a threshold, after adjustment for short tons, all of the establishments exceeded any lower thresholds. However, where fewer than 100 percent of the establishments exceeded a threshold, additional analysis was required to compare emissions to the permit thresholds of 100, 250, 5,000, and 50,000 tons per year. EPA used the supporting summaries for the GHG MRR which included facility-specific consumption, process, and fugitive emission reports in order to determine counts and emissions for each of the permit thresholds.

3.6.1 Adipic Acid Production

There are four Adipic Acid Production plants in the U.S., all of which are estimated to exceed the highest 100,000 metric tons per year emission threshold for CO₂e on an actual emissions basis. Therefore all plants will also exceed all PTE thresholds on a CO₂e basis. The CO₂e emission estimate includes N₂O process emissions that total about 5.9 million metric tons CO₂e, and 3.4 million metric tons of CO₂ from stationary fuel combustion sources.

N₂O

Individual plant production and emission estimates were not made available because of confidential business information (CBI) claims. However, from the *Technical Support Document for the Adipic Acid Production Sector: Proposed Rule for Mandatory Reporting of Greenhouse Gases* (EPA-HQ-OAR-2008-0508-0005), overall U.S. adipic acid production was estimated to total approximately one million metric tons in 2006. The smallest U.S. plant only produced about two percent of the total. This plant, however, is the only plant that is uncontrolled. The three larger plants with the bulk of production have control equipment with N₂O control efficiencies that range from 90 to 99 percent.

The uncontrolled N₂O emission factor is 300 kg N₂O/mton adipic acid. Based on the two percent production share, this uncontrolled plant emitted about 6,000 metric tons of N₂O (no GWP adjustment). This leaves about 13,100 metric tons of N₂O from the three larger controlled plants. Two plants representing about 64 percent of production have control efficiencies in the range of 90 to 95 percent, and one plant with about 34 percent of production has control close to 99 percent (EPA, 2001).

Assuming similar production shares today, the share of national production (which is assumed for this analysis to be equivalent to capacity) appears to range from 30 to 35 percent for the three plants. Therefore, emissions and PTE for the controlled plants range from to 4,000 metric tons to 4,700 metric tons of N₂O per year.

CO₂

The CO₂ emissions from fuel combustion can similarly be apportioned to the four plants. The smallest plant, with only two percent of national production, is estimated at CO₂ emissions of 67,500 metric tons, and the next smallest, with 30 percent of national production, is estimated at 101,300 metric tons.

Potential to Emit

The PTE for each facility was assumed to be equivalent to the emissions based on the apportionment described above.

New Units

EPA assumed that no new plants would be constructed for this sector.

Threshold Summary

Table 13
CO₂ Threshold Summary -- Adipic Acid Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	4	0	3.376
250	4	0	3.376
1,000	4	0	3.376
5,000	4	0	3.376
10,000	4	0	3.376
25,000	4	0	3.376
50,000	4	0	3.376
100,000	4	0	3.376

Table 14
N₂O Threshold Summary -- Adipic Acid Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	N₂O Emissions Covered (Tg per year)
100	4	0	0.019
250	4	0	0.019
1,000	4	0	0.019
5,000	1	0	0.006
10,000	0	0	0
25,000	0	0	0
50,000	0	0	0
100,000	0	0	0

Table 15
CO₂e Threshold Summary -- Adipic Acid Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	4	0	9.298
250	4	0	9.298
1,000	4	0	9.298
5,000	4	0	9.298
10,000	4	0	9.298
25,000	4	0	9.298
50,000	4	0	9.298
100,000	4	0	9.298

3.6.2 Aluminum Production

The primary aluminum production process results in emissions of CO₂ and PFCs. The reduction of the alumina occurs through electrolysis in a molten bath of natural or synthetic cryolite (Na₃AlF₆). The reduction cells contain a carbon lining that serves as the cathode. Carbon is also contained in the anode, which can be a carbon mass of paste, coke briquettes, or prebaked carbon blocks from petroleum coke. During reduction, most of the carbon in the anode is oxidized and released to the atmosphere as CO₂.

Potential to Emit

CO₂

The *Technical Support Document for Process Emissions from Primary Production of Aluminum: Proposed Rule for Mandatory Reporting of Greenhouse Gases* (EPA-HQ-OAR-2008-0508-0006) apportioned CO₂ emission estimates from the U.S. GHG inventory to the 13 operating smelters based on each smelters share of total capacity. Operating smelter emissions were all above 100,000 tons of CO₂, so no PTE estimate was required. Capacity information for the two idle smelters shows that these smelters are also capable of emitting over 100,000 tons of CO₂ per year.

PFCs

The reduction cells also emit two PFCs: perfluoromethane (CF₄) and perfluoroethane (C₂F₆). The GWPs of the two PFCs are 6,500 and 9,200 respectively. During the smelting process, when the alumina ore content of the electrolytic bath falls below critical levels required for electrolysis, rapid voltage increases occur, which are termed "anode effects." Anode effects cause carbon from the anode and fluorine from the dissociated molten cryolite bath to combine, and produce fugitive emissions of CF₄ and C₂F₆.

Anode effects released approximately 2.5 million metric tons of CF₄ and C₂F₆ in 2006 as documented in the GHG MRR TSD. CF₄ made up at least 85 percent of the combined emissions in 2006 (Inventory of U.S. GHG Emissions and Sinks: 1990 – 2007). These emissions on a CO₂e basis are equivalent to about 410 short tons of combined emissions as PFC. The proposed GHG MRR TSD estimated CO₂e emissions from primary aluminum smelters at full capacity. The largest smelter has 11 percent of U.S. operating capacity. Therefore the largest smelter has a PTE of not more than 45 tons of PFC, and no facilities have a PTE greater than 100 tons.

New Units

No new primary aluminum facilities are expected to be built. The growth rate in primary metals from the Economic Census data is only about 0.4 percent.

Threshold Summary

Threshold summaries are displayed below for CO₂ and CO₂e. All facilities have a PFC PTE less than 100 tons per year on a PFC basis.

Table 16
CO₂ Threshold Summary -- Primary Aluminum

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	GHG Emissions Covered (Tg per year)
100	15	0	3.800
250	15	0	3.800
1,000	15	0	3.800
5,000	15	0	3.800
10,000	15	0	3.800
25,000	15	0	3.800
50,000	15	0	3.800
100,000	15	0	3.800

Table 17
CO₂e Threshold Summary -- Primary Aluminum

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	GHG Emissions Covered (Tg per year)
100	15	0	3.951
250	15	0	3.951
1,000	15	0	3.951
5,000	15	0	3.951
10,000	15	0	3.951
25,000	15	0	3.951
50,000	15	0	3.951
100,000	15	0	3.951

3.6.3 Ammonia Production

EPA reviewed the proposed *Supporting Data for Threshold Analysis Subpart E – W, Greenhouse Gas Mandatory Reporting Rulemaking*, March 10, 2009 (EPA-HQ-OAR-2008-0508-0046.7) to determine actual emissions and calculate the potential to emit for 24 ammonia plants in operation. The analysis spreadsheet details CO₂ actual emission calculations for each plant based on ammonia production and urea production, and CO₂, CH₄ and N₂O emission calculations for stationary fuel combustion based on 2006 data. For purposes of permit threshold analysis, the CH₄ and N₂O emissions from combustion were not significant.

Potential to Emit

Capacity information in the spreadsheet is based on the engineering design capacity adjusted for 340 days per year of effective production capability, using information provided by the United States Geological Survey (USGS). The PTE estimates were made by multiplying the actual emission estimates by the ratio of annual ammonia capacity to annual ammonia production adjusted to 365 days a year of operation instead of 340. EPA assumed that ratio also held for stationary combustion units at the plant.

New Units

EPA assumed that no new plants would be constructed for this sector.

Threshold Summary

Table 18
CO₂ Threshold Summary -- Ammonia Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	24	0	14.543
250	24	0	14.543
1,000	24	0	14.543
5,000	24	0	14.543
10,000	24	0	14.543
25,000	24	0	14.543
50,000	24	0	14.543
100,000	22	0	14.450

3.6.4 Cement Production

Process-related CO₂ emissions from cement production are the second largest source of industrial CO₂ emissions in the United States. Cement production is done in two stages. The first stage is clinker production. In clinker production, raw materials (primarily limestone) are heated to induce calcination and produce lime. Lime reacts with silica-containing materials and iron ore and aluminum to form clinker. During the process, CO₂ is generated as a byproduct and released to the atmosphere. Also during clinker production, some of the clinker raw materials form partially or fully calcinated cement kiln dust instead of forming clinker, resulting in additional process-related CO₂ emissions. In the second stage of the production process, the clinker is ground and mixed with gypsum and other materials to make cement.

Potential to Emit

The *Technical Support Document for Process Emissions from Cement: Proposed Rule for Mandatory Reporting of Greenhouse Gases* (EPA-HQ-OAR-2008-0508-0008) shows 107 cement facilities in the U.S., 106 of which exceed all permit thresholds for CO₂ (according to the TSD, the one facility that does not exceed the 100,000 tons per year threshold accounted for over 90,000 metric tons of CO₂e and approximately one-tenth of one percent of the cement industry emissions in 2006).

New Units

Growth for the industrial sector was estimated at 0.4 percent, and as such, no additional facilities were included in this analysis.

Threshold Summary

Table 19
CO₂ Threshold Summary -- Cement Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	107	0	81.462
250	107	0	81.462
1,000	107	0	81.462
5,000	107	0	81.462
10,000	107	0	81.462
25,000	107	0	81.462
50,000	107	0	81.462

100,000	106	0	80.668
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3.6.5 Electronic Production

The *Technical Support Document for Process Emissions from Electronics Manufacture (Semiconductors, MEMs, Liquid Crystal Displays, and Photovoltaics)* (EPA-HQ-OAR-2008-0508-0009) examined emissions of high GWP gases for semiconductor and related industry plants. Emissions from stationary fuel combustion were not included in the source category analysis, but were instead captured by the unspecified industrial stationary combustion analysis. EPA has followed this approach here as well.

Approximately one million metric tons of SF₆ as CO₂e were emitted from the semiconductor industry in 2006 (Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007). This is equivalent to 46 short tons of SF₆. The semiconductor industry uses multiple long-lived fluorinated gases in plasma etching and plasma enhanced chemical vapor deposition (PECVD) processes to produce semiconductor products. These include PFCs, which are also used as heat transfer fluids. Approximately 3.5 million metric tons of PFCs as CO₂e were emitted from the semiconductor industry in 2006 (Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007).

Table 20
Electronic Production PFC Emissions

Semiconductor PFC	2006 CO ₂ e Emissions (million mtons)	PFC GWP	2006 PFC Emissions (tons)
CF ₄	1.2	6,500	204
C ₂ F ₆	2.2	9,200	264
C ₄ F ₈	0.1	8,700	13
Total	3.5	--	481

Potential to Emit

The Federal Reserve capacity utilization factor for the electronics industry in 2006 was 79.8 percent. Based on this capacity utilization factor the PTE of all of the semiconductor plants combined is estimated at 56 tons of SF₆ and 600 tons of PFC.

EPA identified 216 facilities in the semiconductor-electronics sector. Of these, the largest facility emitted six percent of total semiconductor emissions on a CO₂e basis (includes non-PFCs), which is a maximum of 30 tons of PFC. On a PTE basis, the largest facility would

emit 36 tons, based on an assumption that the industry capacity is distributed similarly to emissions. Therefore no facility exceeds 100 tons per year on an actual or PTE basis for PFC.

New Units

Growth for the industrial sector was estimated at -1.8 percent, and as such, no additional facilities were included in this analysis.

Threshold Summary

Electronics industry emissions from plant processes only exceed emission thresholds on a CO₂e basis. Facility stationary fuel combustion emissions are not included in the threshold comparisons for the industry.

Table 21
CO₂e Threshold Summary -- Electronics Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	199	0	5.948
250	191	0	5.947
1,000	159	0	5.934
5,000	109	0	5.819
10,000	88	0	5.701
25,000	65	0	5.399
50,000	54	0	5.100
100,000	22	0	3.417

3.6.6 Ethanol Production

In the proposed GHG MRR, EPA determined that the sources of GHG emissions at ethanol production facilities that must be reported under the proposed rule are stationary fuel combustion, onsite landfills, and onsite wastewater treatment. For the GHG MRR supporting analysis, data were unavailable to estimate facility emissions from these combined sources. Instead, data on stationary fuel combustion requirements for different plant capacities were used to estimate the minimum number of facilities that would meet each of the examined reporting rule facility-level thresholds. CO₂ emissions from combustion constitute the majority of the

GHG emissions from ethanol production and therefore provide an adequate measure for determining threshold counts.

Table 22
Ethanol Fuel Combustion CO₂e Emissions by Plant Size
(from the Proposed GHG MRR TSD Spreadsheet)

Ethanol Produced (wet milling process) (million gallons)	Coal Combustion Emissions (mtons CO₂e/year)	Natural Gas Combustion Emissions (mtons CO₂e/year)
290	1,519,585	853,536
245	1,283,787	721,091
200	1,047,990	588,646
200	1,047,990	588,646
100	523,995	294,323
85	445,396	250,174
40	209,598	117,729
35	183,398	103,013
20	104,799	58,865
2.6	13,624	7,652

Table 23
Proposed Reporting Rule Threshold Analysis Results

Threshold CO₂e (tons per year)	Number of Existing Sources -- Actual Basis	Percent of Existing National Sources*
1,000	101	72%
10,000	93	66%
25,000	86	61%
100,000	43	31%

* National ethanol production source population was estimated at 140 plants nationwide.

Potential to Emit

The permit threshold PTE analysis relied on this same approach and data. Therefore CH₄ emissions from onsite landfills and wastewater treatment plant digesters were not included in the

PTE analysis, and we did not estimate emission coverage at each threshold. Also, the analysis for the proposed GHG MRR did not evaluate thresholds of 100, 250, 5,000, and 50,000 tons per year. EPA assumed that all existing plants would exceed the 100 and 250 ton per year thresholds based on fuel combustion associated with the wet milling process. For the 5,000 and 50,000 thresholds, EPA included the number of sources exceeding the next highest threshold. For example, the count of sources exceeding the 5,000 tons per year level only includes the sources exceeding the 10,000 ton threshold in the *Technical Support Document for Ethanol Facilities: Proposed Rule for Mandatory Reporting of Greenhouse Gases* (EPA-HQ-OAR-2008-0508-0010).

New Units

EPA estimates that ten new ethanol production facilities will be built per year.

Threshold Summary

Table 24
CO₂e Threshold Summary -- Ethanol

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Sources Added per Year
100	140	10
250	140	10
1,000	101	7
5,000	101	7
10,000	93	7
25,000	86	6
50,000	86	6
100,000	43	3

3.6.7 Ferroalloy Production

In evaluating ferroalloy production in the U.S., EPA considered actual production at six facilities, as published in the U.S. Inventory of Greenhouse Gas Emissions and Sinks: 1990 – 2007 for 2006, and the capacity to produce at three facilities for which production information was not published due to competitive concerns.

Potential to Emit

EPA's PTE calculations consider the Federal Reserve's 2006 monthly industrial capacity utilization estimates for the primary metals industry classification which shows utilization at 85.9 percent for 2006. The PTE calculations do not affect the threshold analysis, because all facilities emit over 100,000 metric tons of CO₂e per year.

New Units

Applying the growth factor for the industrial sector, 0.4 percent, results in no additional facilities for the analysis.

Threshold Summary

Table 25
CO₂ Threshold Summary -- Ferroalloy Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	9	0	1.717
250	9	0	1.717
1,000	9	0	1.717
5,000	9	0	1.717
10,000	9	0	1.717
25,000	9	0	1.717
50,000	9	0	1.717
100,000	9	0	1.717

Table 26
CH₄ Threshold Summary -- Ferroalloy Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CH₄ Emissions Covered (Tg per year)
100	3	0	0.0003
250	0	0	0

Table 27
CO₂e Threshold Summary -- Ferroalloy Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	9	0	1.726
250	9	0	1.726
1,000	9	0	1.726
5,000	9	0	1.726
10,000	9	0	1.726
25,000	9	0	1.726
50,000	9	0	1.726
100,000	9	0	1.726

3.6.8 Food Processing

Food processing includes meat, poultry and fruit and vegetable processing. Emissions derive from combustion and fugitive methane related to wastewater treatment. For purposes of this permit threshold analysis, EPA did not consider the fugitive methane from wastewater treatment because these are the only greenhouse gas emissions from the source category other than combustion, and food processing is not a listed PSD source category. Consequently, emissions from this subsector considered in this analysis were limited to combustion emissions and were calculated using the MECS approach.

Potential to Emit

EPA used the Federal Reserve's 2004 capacity utilization factor of 79.3 percent for the food industry to calculate PTE emissions.

New Units

In addition, new establishments were calculated assuming a continuation of the growth rate of 1.2 percent, as calculated using the methodology described earlier in this document.

Threshold Summary

Table 28
CO₂ Threshold Summary -- Food Processing

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	3946	47	16.848
250	2281	27	16.709
1,000	1499	18	16.379
5,000	1030	12	15.723
10,000	749	9	14.354
25,000	482	6	12.568
50,000	10	0	0.596
100,000	0	0	0

3.6.9 Glass Manufacturing

EPA used the *Supporting Data for Threshold Analysis Subpart E – W, Greenhouse Gas Mandatory Reporting Rulemaking*, March 10, 2009 (EPA-HQ-OAR-2008-0508-0046.7).to analyze emissions for permit thresholds from glass manufacturing. Annual fuel combustion and glass production are estimated for each plant based on 2004 estimated plant sales and 2002 MECS energy intensity (energy per sales dollars). The spreadsheet shows CO₂ emission estimates from industrial processes and stationary fuel combustion, as well as CH₄ and N₂O emission estimates from stationary fuel combustion.

Potential to Emit

Plant capacities are not available in the spreadsheet. To estimate PTE, EPA divided the actual annual emissions by a capacity utilization factor of 0.79 or 79 percent, based on the Federal Reserve's 2004 monthly industrial capacity utilization estimates for the non-metallic minerals industry.

New Units

EPA used an estimated annual growth rate of 0.4 percent for the nonmetallic mineral product manufacturing sector to determine the number of new units for this analysis.

Threshold Summary

Table 29
CO₂e Threshold Summary -- Glass Manufacturing

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	368	1	4.425
250	362	1	4.424
1,000	222	1	4.341
5,000	200	1	4.298
10,000	171	1	4.131
25,000	87	0	2.594
50,000	16	0	1.015
100,000	1	0	0.208

3.6.10 HCFC-22 Production

Chlorodifluoromethane (HCFC-22) is produced for use in refrigeration and air conditioning systems and as a chemical feedstock for manufacturing synthetic polymers. Because HCFC-22 depletes stratospheric ozone, its production for non-feedstock uses is scheduled to be phased out by 2020 under the U.S. Clean Air Act. Feedstock production, however, is permitted to continue indefinitely.

A high global warming potential (GWP) greenhouse gas, trifluoromethane (HFC-23), is generated as a byproduct during the manufacture of HCFC-22. Emissions of HFC-23 in 2006 were estimated to be 13.8 million metric tons on a CO₂e basis from three HCFC-22 production plants. Estimates were based on the plants operating at capacity. Annual emissions in terms of both metric tons CO₂e and tons HFC-23 are summarized in Table 30 below.

Table 30
HCFC-22 Production HFC-23 Emissions

HCFC-22 Production	2006 CO₂e Emissions (million metric tons)	HFC GWP	2006 HFC Emissions (short tons)
HFC-23	13.8	11,700	1,300

Source: Reporting Rule TSD

Potential to Emit

Confidential business information (CBI) claims on production information limited EPA's PTE analysis. The *Technical Support Document for Emissions of HFC-23 from Production of HCFC-22: Proposed Rule for Mandatory Reporting of Greenhouse Gases* (EPA-HQ-OAR-2008-0508-0015) estimated that all three plants emit over 100,000 metric tons CO₂e on a capacity basis by a factor of 85 or more, or a minimum of 800 short tons of HFC-23. These estimates did not account for HFC-23 capture and destruction at two of the three plants. Therefore, actual emissions at two of the plants will be lower, and can be limited through permitting. We assumed that all three plants exceed the 100 and 250 ton actual and PTE thresholds, and that one plant (uncontrolled) exceeds the 1,000 ton PTE threshold.

Because the TSD did not include estimates of CO₂ emissions from fuel combustion, and the CBI claims noted above, the PTE analysis does not quantify fuel combustion emissions specifically for the three plants. Stationary fuel combustion emissions from the plants were instead captured under the analysis for unspecified industrial stationary combustion.

New Units

U.S. production between 1990 and 2006 increased by 11 percent while emissions declined by 62 percent. The declines in emissions from control equipment and process changes offset the production increases. Therefore we did not estimate any new facilities or modifications that would increase facility emissions more than 100 tons per year.

Threshold Summary

Table 31
HFC Threshold Summary -- HCFC-22 Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	HFC Emissions Covered (Tg per year)
100	3	0	0.001
250	3	0	0.001
1,000	1	0	0.001
5,000	0	0	0

Table 32
CO₂e Threshold Summary -- HCFC-22 Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	3	0	13.848
250	3	0	13.848
1,000	3	0	13.848
5,000	3	0	13.848
10,000	3	0	13.848
25,000	3	0	13.848
50,000	3	0	13.848
100,000	3	0	13.848

3.6.11 Hydrogen Production

EPA estimated CO₂ emissions from merchant hydrogen production using the process and combustion ratio of 8.62 tons of CO₂ emissions per ton of hydrogen production. About 95 percent of all hydrogen (not just merchant hydrogen) produced in the U.S. today is made from natural gas via steam methane reforming. In steam methane reforming fueled by natural gas combustion, the process and combustion emissions go up the same stack from the

boiler/reformer unit. Because the emissions are predominately process emissions and because the natural gas combustion products are emitted from the same stack, EPA has treated all the emissions as process emissions.

Potential to Emit

EPA developed estimates assuming hydrogen production at capacity level. Therefore, no adjustment to the emissions estimates is needed to account for PTE emissions.

New Units

Based on the industry growth factor of -0.1 percent for chemical manufacturing, EPA assumed that no new plants would be constructed.

Threshold Summary

Table 33
CO₂ Threshold Summary -- Hydrogen Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	75	0	15.227
250	75	0	15.227
1,000	73	0	15.225
5,000	62	0	15.202
10,000	51	0	15.130
25,000	41	0	14.984
50,000	37	0	14.845
100,000	30	0	14.251

3.6.12 Iron and Steel Production

EPA used the *Supporting Data for Threshold Analysis Subpart E – W, Greenhouse Gas Mandatory Reporting Rulemaking*, March 10, 2009 (EPA-HQ-OAR-2008-0508-0046.7) for the proposed GHG MRR threshold analysis to determine process and combustion CO₂ and process CH₄. The iron and steel production source category includes taconite iron ore processing facilities, integrated iron and steel making facilities, electric arc furnace (EAF) steelmaking

facilities that are not located at integrated iron and steel facilities, and coke oven facilities that are not located at integrated iron and steel facilities. Facility processes and facilities covered in the spreadsheet are shown in the table below.

Table 34
Iron and Steel Processes, Facilities, and Capacity Information

Iron and Steel Process	Number of Facilities	Capacity Information
Basic oxygen furnace (BOF)	18	Yes
Blast Furnace (BF)	17	Yes
Sintering	5	Yes
Coke ovens	18	Yes
Electric arc furnace (EAF)	92	No
Taconite furnace	8	Yes
Integrated steel plant fuel combustion*	19	No
Coke oven gas combustion*	9	No
EAF steel plant fuel combustion	92	No

* Six plants had emissions from coke oven gas combustion was included in integrated steel plant fuel combustion.

Potential to Emit

The analysis covered 130 plants, and in all cases, except for EAF plants, GHG emissions were estimated based on operations at plant capacity. For EAF plants, EPA used the 2007 Federal Reserve industrial capacity utilization percentage of 86.6 percent for primary metal -- iron and steel production, to adjust estimated actual emissions to PTE.

The spreadsheet contained emission CO₂e estimates which included CO₂, CH₄, and N₂O emissions. Process CH₄ emissions were backed out of the CO₂e totals using the process CH₄ emissions reported in the U.S. GHG Inventory, and apportioning these emissions to the different plants based on their capacity in those processes. N₂O emissions are primarily related to fuel combustion and were not backed out for separate treatment.

New Units

No new iron and steel facilities are expected to be built. The growth rate in primary metals from the Economic Census data is only about 0.4 percent.

Threshold Summary

Table 35
CO₂ Threshold Summary -- Iron and Steel Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per year	CO₂ Emissions Covered (Tg per year)
100	130	0	85.150
250	130	0	85.150
1,000	130	0	85.150
5,000	129	0	85.148
10,000	128	0	85.141
25,000	123	0	85.057
50,000	116	0	84.831
100,000	113	0	84.655

Table 36
CH₄ Threshold Summary -- Iron and Steel Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CH₄ Emissions Covered (Tg per year)
100	18	0	0.034
250	17	0	0.033
1,000	16	0	0.032
5,000	0	0	0

Table 37
CO₂e Threshold Summary -- Iron and Steel Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	130	0	85.151
250	130	0	85.151
1,000	130	0	85.151
5,000	129	0	85.149
10,000	128	0	85.141
25,000	123	0	85.058
50,000	116	0	84.832
100,000	113	0	84.656

3.6.13 Lead Production

According to the 2006 U.S. Geological Survey (USGS), lead production in the U.S. includes both the primary, direct smelting (one facility) and secondary lead production (16 facilities). Process emissions of CO₂ are a byproduct of the coke consumed during the smelting or reforming processes. EPA calculated total process emissions based on lead production as reported in the USGS.

In the *Supporting Data for Threshold Analysis Subpart E – W, Greenhouse Gas Mandatory Reporting Rulemaking* (EPA-HQ-OAR-2008-0508-0046.7), combustion emissions are combined with process emissions to determine total actual emissions.

Potential to Emit

In order to determine PTE emissions, EPA considered the Federal Reserve's 2006 monthly industrial capacity utilization estimates for primary metals industry classification which shows utilization at 85.9 percent for 2006, and adjusted to achieve 100 percent utilization.

New Units

EPA assumed no new facilities would be added for the industry, given an expected growth rate of 0.4 percent per year for primary metal manufacturing industry.

Threshold Summary

Table 38
CO₂e Threshold Summary -- Lead Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	17	0	0.861
250	17	0	0.861
1,000	17	0	0.861
5,000	17	0	0.861
10,000	16	0	0.855
25,000	13	0	0.799
50,000	12	0	0.761
100,000	1	0	0.089

3.6.14 Lime

The *Supporting Data for Threshold Analysis Subpart E – W, Greenhouse Gas Mandatory Reporting Rulemaking*, March 10, 2009 (EPA-HQ-OAR-2008-0508-0046.7) was also used to estimate GHG PTE for lime plants.

Potential to Emit

To estimate PTE, EPA divided annual actual CO₂ emissions from the calcining process and fuel combustion emissions of CO₂, CH₄ and N₂O by regional capacity factors available in the spreadsheet for each plant. The capacity factors ranged from 43 to 136 percent.

New Units

EPA assumed no new facilities would be added for the industry.

Threshold Summary

Table 39
CO₂ Threshold Summary -- Lime Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	89	0	27.262
250	89	0	27.262
1,000	89	0	27.262
5,000	89	0	27.262
10,000	89	0	27.262
25,000	86	0	27.237
50,000	71	0	26.533
100,000	60	0	26.180

3.6.15 Magnesium Production and Processing

The magnesium metal production (primary and secondary) and casting industry typically uses SF₆ as a cover gas to prevent the rapid oxidation and burning of molten magnesium in the presence of air. A dilute gaseous mixture of SF₆ with dry air and/or CO₂ is blown over molten magnesium metal to induce and stabilize the formation of a protective crust. A small portion of the SF₆ reacts with the magnesium to form a thin molecular film of mostly magnesium oxide and magnesium fluoride. The amount of SF₆ reacting in magnesium production and processing is being studied but presently assumed to be negligible, and therefore all SF₆ used is assumed to be emitted into the atmosphere.

For the proposed GHG MRR *Technical Support Document for Process Emissions from Magnesium Production and Processing: Proposed Rule for Mandatory Reporting of Greenhouse Gases*, EPA reported that national annual SF₆ emissions from magnesium production and processing totaled approximately 3.2 million metric tons CO₂e in 2006. The facility population totaled 13 facilities that emitted 3.0 million metric tons CO₂e. The SF₆ emissions (no GWP adjustment) were 148 and 138 short tons respectively. Ten magnesium die casting facilities accounted for 29 percent (44 tons), and primary and secondary production accounted for 64 percent (96 tons) of the total emissions. Other small casting activities accounted for the remaining 7 percent (ten tons).

Potential to Emit

EPA used the analysis in the TSD for the proposed GHG MRR, where EPA had evaluated thresholds of 1,000, 10,000, 25,000, and 100,000 metric tons per year. Facility-level information is not made publicly available because of confidential business information (CBI) claims. From that earlier analysis EPA estimated that the same number of facilities exceeded the 100, 250, and 1,000 tons CO₂e per year PTE threshold as determined in the GHG MRR TSD for the 1,000 metric tons per year threshold. In a similar fashion, EPA used the GHG MRR TSD facility counts at 10,000 metric tons CO₂e per year to estimate facilities at the 5,000 tons per year PTE threshold, and 100,000 metric tons per year for the 50,000 tons CO₂e per year PTE threshold. The permit threshold analysis did not include CO₂ emissions from fuel combustion. That information was not available in the TSD for the proposed GHG MRR.

On an SF₆ mass basis, the average emissions per facility are only 11 tons of SF₆, well below 100 tons per year. Therefore we assumed that none of the facilities have a potential to emit more than 100 tons per year of SF₆.

New Units

EPA assumed no new units would be added for the sector.

Threshold Summary

Table 40
CO₂e Threshold Summary -- Magnesium Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	13	0	2.955
250	13	0	2.955
1,000	13	0	2.955
5,000	11	0	2.94
10,000	11	0	2.94
25,000	11	0	2.94
50,000	9	0	2.781
100,000	9	0	2.781

3.6.16 Nitric Acid Production

EPA used the 2006 nameplate capacity (metric tons of HNO₃ 100 percent acid basis) for 45 nitric acid plants and 2006 acid production from the GHG MRR TSD supporting spreadsheet (EPA-HQ-OAR-2008-0508-0046.7) to determine N₂O emissions.

Potential to Emit

The GHG PTE was calculated by multiplying actual N₂O emissions as CO₂e by the ratio of nameplate capacity to 2006 production. The permit threshold analysis, based on the GHG MRR TSD, does not include GHG emissions from co-located stationary combustion units. Also the permit threshold analysis does not account for overlap between facilities in the Nitric Acid and Ammonia categories, which have both ammonia and nitric acid production processes.

New Units

EPA assumed no new units would be constructed for this sector.

Threshold Summary

Table 41
N₂O Threshold Summary -- Nitric Acid Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	N₂O Emissions Covered (Tg per year)
100	43	0	0.055
250	42	0	0.055
1,000	27	0	0.049
5,000	4	0	0.016
10,000	0	0	0
25,000	0	0	0
50,000	0	0	0
100,000	0	0	0

Table 42
CO₂e Threshold Summary -- Nitric Acid Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	45	0	17.732
250	45	0	17.732
1,000	45	0	17.732
5,000	45	0	17.732
10,000	45	0	17.732
25,000	44	0	17.724
50,000	43	0	17.706
100,000	42	0	17.667

3.6.17 Petrochemical Production

EPA determined that the portion of the petrochemical production sector most relevant for permit threshold analysis includes the manufacture and production of acrylonitrile, carbon black, ethylene, ethylene dichloride, ethylene oxide, and methanol, because the IPCC considers production of greenhouse gases from these processes significant compared to other petrochemical processes.

Emissions from the manufacturing processes vary significantly, and process emissions take many forms. Process emissions include direct oxidation of CO₂, off-gassing of CH₄ and CO₂, and the direct release of CO₂ and CH₄ from equipment leaks. Process emissions are the primary consideration for acrylonitrile, ethylene, and ethylene oxide processes. In addition, some processes require combustion of supplemental fuel. Both process and combustion emissions are significant for carbon black and methanol processes.

Potential to Emit

EPA's analysis assumed petrochemical production at the capacity level. Therefore, no adjustment to the emissions estimates is needed to account for PTE.

New Units

Based on an industry growth factor of -0.1 percent for chemical manufacturing, EPA assumed that no new plants would be constructed.

Threshold Summary

Table 43
CO₂ Threshold Summary -- Petrochemical Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	98	0	52.081
250	98	0	52.081
1,000	98	0	52.081
5,000	97	0	52.080
10,000	96	0	52.073
25,000	96	0	52.073
50,000	94	0	52.005
100,000	91	0	51.806

Table 44
CH₄ Threshold Summary -- Petrochemical Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CH₄ Emissions Covered (Tg per year)
100	55	0	0.130
250	52	0	0.129
1,000	37	0	0.121
5,000	5	0	0.035
10,000	1	0	0.010
25,000	0	0	0
50,000	0	0	0
100,000	0	0	0

Table 45
CO₂e Threshold Summary -- Petrochemical Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	98	0	54.826
250	98	0	54.826
1,000	98	0	54.826
5,000	97	0	54.825
10,000	96	0	54.818
25,000	96	0	54.818
50,000	94	0	54.748
100,000	91	0	54.595

3.6.18 Petroleum Refineries

In developing the permit threshold analysis for petroleum refineries, EPA quantified CH₄ process emissions from wastewater, fugitive, flares, and storage tanks. Process CO₂ emissions derived from flares, hydrogen plant emissions, and sulfur plant emissions. In addition, on-site combustion emissions were calculated considering fuel consumed by type.

Potential to Emit

EPA assumed that petroleum refineries were operating at capacity level. Therefore, no adjustment to the emissions estimates was needed to account for PTE.

New Units

According to the ICR prepared for the New Source Performance Standard (NSPS), EPA expects that no new refineries will be built over the next few years.

Threshold Summary

Table 46
CO₂ Threshold Summary -- Petroleum Refineries

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	150	0	202.947
250	150	0	202.947
1,000	150	0	202.947
5,000	150	0	202.947
10,000	149	0	202.938
25,000	146	0	202.887
50,000	137	0	202.575
100,000	129	0	202.065

Table 47
CH₄ Threshold Summary -- Petroleum Refineries

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CH₄ Emissions Covered (Tg per year)
100	129	0	0.083
250	109	0	0.080
1,000	31	0	0.042
5,000	0	0	0

Table 48
CO₂e Threshold Summary -- Petroleum Refineries

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	150	0	204.897
250	150	0	204.897
1,000	150	0	204.897
5,000	150	0	204.897
10,000	149	0	204.888
25,000	146	0	204.835
50,000	137	0	204.513
100,000	129	0	203.988

3.6.19 Phosphoric Acid Production

Phosphoric acid is produced by combining sulfuric acid and phosphate rock. CO₂ is emitted when the limestone component of phosphate rock reacts with the sulfuric acid.

Potential to Emit

When these process emissions are combined with combustion emissions, all 14 plants have emissions that exceed the highest threshold level; consequently, no PTE analysis was required.

New Units

Based on an industry growth factor of -0.1 percent for chemical manufacturing, EPA assumed that no new plants would be constructed.

Threshold Summary

Table 49
CO₂ Threshold Summary -- Phosphoric Acid Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	14	0	3.838
250	14	0	3.838
1,000	14	0	3.838
5,000	14	0	3.838
10,000	14	0	3.838
25,000	14	0	3.838
50,000	14	0	3.838
100,000	14	0	3.838

3.6.20 Pulp and Paper Manufacturing

Permit threshold analysis for this sector is focused on the energy intensive, fugitive emitting pulp, paper, and paperboard manufacturing subsectors. Process emissions include CO₂ which is emitted in the recovery cycle at kraft and soda facilities associated with the chemical pulp process. The CO₂ emitted from kraft mill lime kilns originates from two sources: (1) fossil fuels burned in the kiln, and (2) conversion of calcium carbonate (or "lime mud") generated in the recovery process to calcium oxide.

The bulk of the emissions considered derive from combustion. Many boilers use biomass fuel, and the burning of spent pulping liquors to produce steam for facility processes is considered biomass combustion for the GHG MRR. The emissions numbers considered for the permit threshold analysis are non-biogenic (net of any biogenic emissions). Considering only non-biogenic emissions, 96.5 percent of the facilities and 99.7 percent of the emissions are captured by all of the thresholds proposed for consideration of the permit threshold rule.

Potential to Emit

Because 99.7 percent of emissions were captured at even the highest threshold, no additional PTE estimate was calculated in this analysis.

New Units

Based on an industry growth factor of -2.5 percent for paper manufacturing, and previous EPA analysis for the pulp and paper NSPS ICR, EPA assumed that no new plants would be constructed.

Threshold Summary

Table 50
CO₂e Threshold Summary -- Pulp and Paper Manufacturing

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	425	0	57.700
250	425	0	57.700
1,000	425	0	57.700
5,000	425	0	57.700
10,000	425	0	57.700
25,000	425	0	57.700
50,000	422	0	57.688
100,000	410	0	57.527

3.6.21 Silicon Carbide Manufacturing

In 2006, one facility produced silicon carbide in the U.S. Silicon carbide is primarily an industrial abrasive manufactured from silica sand or quartz and petroleum coke. Approximately 35 percent of the carbon from the petroleum coke is retained with the silicon carbide, and the rest is emitted as both CO₂ and CH₄. In addition, emissions from combustion account for approximately ten percent of total emissions.

Potential to Emit

Emissions from this plant exceed all permit threshold levels; as a result, EPA did not consider PTE calculations.

New Units

EPA assumed there would be no new facilities constructed.

Threshold Summary

Table 51
CO₂ Threshold Summary -- Silicon Carbide Manufacturing

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	1	0	0.101
250	1	0	0.101
1,000	1	0	0.101
5,000	1	0	0.101
10,000	1	0	0.101
25,000	1	0	0.101
50,000	1	0	0.101
100,000	1	0	0.101

Table 52
CH₄ Threshold Summary -- Silicon Carbide Manufacturing

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CH₄ Emissions Covered (Tg per year)
100	1	0	0.0004
250	1	0	0.0004
1,000	0	0	0

Table 53
CO₂e Threshold Summary -- Silicon Carbide Manufacturing

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	1	0	0.109
250	1	0	0.109
1,000	1	0	0.109
5,000	1	0	0.109
10,000	1	0	0.109
25,000	1	0	0.109
50,000	1	0	0.109
100,000	1	0	0.109

3.6.22 Soda Ash Production

Soda Ash production emissions were nearly evenly split between process and combustion emissions. Process emissions result from calcining trona ore to produce soda ash.

Potential to Emit

PTE emissions were calculated based on the capacities of the production units.

New Units

In 2006, there was a glut of soda ash in the domestic market; EPA assumed no new units would be constructed.

Threshold Summary

Table 54
CO₂e Threshold Summary -- Soda Ash Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	5	0	3.121
250	5	0	3.121
1,000	5	0	3.121
5,000	5	0	3.121
10,000	5	0	3.121
25,000	5	0	3.121
50,000	5	0	3.121
100,000	5	0	3.121

3.6.23 Titanium Dioxide Production

EPA used USGS as the source for production capacity for the eight facilities that produced titanium dioxide in 2006.

Potential to Emit

Emissions were assumed to represent PTE operating levels.

New Units

EPA assumed that no new plants would be constructed.

Threshold Summary

Table 55
CO₂e Threshold Summary -- Titanium Dioxide Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	8	0	3.686
250	8	0	3.686
1,000	8	0	3.686
5,000	8	0	3.686
10,000	8	0	3.686
25,000	8	0	3.686
50,000	8	0	3.686
100,000	7	0	3.628

3.6.24 Zinc Production

The Zinc production emissions and facility count estimates include process and combustion emissions associated with primary smelting and secondary recycling facilities.

Potential to Emit

For PTE estimates, EPA considered the Federal Reserve's 2006 monthly industrial capacity utilization estimates for primary metals industry classification which shows utilization at 85.9 percent for 2006, and adjusted to achieve 100 percent utilization.

New Units

EPA assumed that no new units would be constructed.

Threshold Summary

Table 56
CO₂e Threshold Summary -- Zinc Production

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	9	0	0.852
250	9	0	0.852
1,000	9	0	0.852
5,000	9	0	0.852
10,000	8	0	0.843
25,000	5	0	0.802
50,000	5	0	0.802
100,000	5	0	0.802

3.7 Energy Sector

3.7.1 Oil and Gas Systems

In consideration of the permit thresholds, EPA considered the *Fugitive Emissions Reporting from the Petroleum and Natural Gas Industry: Background Technical Support Document* (EPA-HQ-OAR-2008-0508-0023). This document details combustion emissions and fugitive emissions from offshore petroleum and natural gas facilities, onshore natural gas processors, onshore natural gas transmission, underground natural gas storage, and liquid natural gas storage. EPA determined that oil and gas exploration, development, transmission, and distribution are not listed PSD source categories, and therefore fugitive emissions from these activities were not considered for PSD applicability as it relates to major source thresholds. EPA's analysis focused on combustion emissions from these sources.

Potential to Emit

EPA considered capacity utilization figure of 90 percent as published in the Federal Reserve's capacity utilization data to determine PTE emission estimates and counts.

New Units

EPA determined new units based on a growth factor of 1.0 percent for the sector.

Threshold Summary

Table 57
CO₂e Threshold Summary -- Oil and Gas Systems

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	4762	48	88.264
250	4762	48	88.264
1,000	4762	48	88.264
5,000	3443	34	85.113
10,000	2602	26	80.314
25,000	1253	13	61.547
50,000	387	0	32.750
100,000	129	0	18.541

3.7.2 Underground Coal Mining

GHG emissions from underground coal mining include CH₄ fugitive emissions released from the coal seam and surrounding rock during mining and post-mining activities (coal bed CH₄), and fuel combustion emissions of CO₂, CH₄, and N₂O. Fugitive CH₄ emissions are captured and vented by ventilation systems and degassing systems. Captured and vented CH₄ emissions from active mines were considered in the PTE analysis. Because underground coal mining is not one of the 28 PSD source categories for which fugitive emissions were required to be included in the emissions determination, fugitive emissions from post mining operations, surface mines, and inactive mines were not included in the permit thresholds analysis.

The *Technical Support Document for Underground Coal Mines: Proposed Rule for Mandatory Reporting of Greenhouse Gases* (EPA-HQ-OAR-2008-0508-0032) identified 612 active underground coal mining facilities but analysis of CH₄ emissions was limited to 128 "gassy" mines where CH₄ monitoring was already in place (due to existing CH₄ emissions above Mine Safety and Health Administration (MSHA) threshold levels). The U.S. GHG Inventory (EPA, 2008) reports that 233 underground coal mines (including 133 gassy mines) ventilated

CH₄ in 2007. Fuel combustion emission estimates for the GHG MRR TSD from all underground coal mines, based on U.S. Census energy use data, were found to comprise between one and three percent of total CO₂e emissions, with coal bed CH₄ accounting for the bulk of GHG emissions.

In addition to the emissions data on the 128 gassy mines contained in the GHG MRR TSD, EPA considered combustion emissions from 289 bituminous underground coal mines, using U.S. Census data from 2002.

Potential to Emit

CH₄

CH₄ emission estimates that were developed for the GHG MRR TSD were used for both actual emissions and PTE emissions permit threshold analysis. EPA assumed that venting and degassing were continuous throughout the year; therefore, actual emission estimates equal PTE emission estimates. The estimates considered 128 gassy mines, which were assumed to be the largest emitters of vented CH₄. The smallest mine of this group had annual CH₄ emissions of 26 tons; therefore EPA assumed that the annual CH₄ emissions from the 105 vented mines that were not included in the TSD analysis were less than 26 tons.

CO₂

CO₂ emissions were estimated in the same manner as for other Unspecified Industrial Stationary Combustion categories, based on the ICF analysis (ICF, 2007) using the MECS approach. Emissions were estimated based on Census information including fuel consumption per employee and the distribution of establishments by the number of employees. PTE was estimated by using a capacity utilization factor of 86.3 percent as published by the Federal Reserve.

New Units

The number of underground bituminous coal mines in the U.S. is on the decline. EIA data show that only Colorado had an increase in the number of underground coal mines between 2006 and 2007 (EIA, 2008). The EIA data show that overall the number of underground coal mines decreased from 2006 to 2007 by eight percent; consequently, EPA assumed no new underground mines would be built. <http://www.eia.doe.gov/cneaf/coal/page/acr/table1.html>

Threshold Summaries

Threshold summary tables are shown below for CH₄ (vented fugitive emissions), CO₂ (fuel combustion), and CO₂e (vented fugitive CH₄ and combustion CO₂).

Table 58
CO₂ Threshold Summary -- Underground Coal Mining

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	238	0	0.783
250	202	0	0.778
1,000	63	0	0.692
5,000	30	0	0.577
10,000	30	0	0.577
25,000	0	0	0

Table 59
CH₄ Threshold Summary -- Underground Coal Mining

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	110	0	1.586
250	110	0	1.586
1,000	110	0	1.586
5,000	53	0	1.420
10,000	38	0	1.361
25,000	24	0	1.147
50,000	13	0	0.784
100,000	1	0	0.105

Table 60
CO₂e Threshold Summary -- Underground Coal Mining

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂e Emissions Covered (Tg per year)
100	238	0	39.520
250	238	0	39.520
1,000	126	0	33.945
5,000	124	0	33.943
10,000	123	0	33.936
25,000	103	0	33.606
50,000	78	0	32.800
100,000	55	0	31.241

3.8 Waste Sector

3.8.1 Landfills

The landfill PTE analysis includes both municipal solid waste (MSW) landfills and onsite industrial landfills associated with pulp and paper and food processing. The analysis used a modification of the landfill emission modeling approach used for the proposed GHG MRR threshold analysis. Like the GHG MRR analysis, the permit threshold PTE analysis did not include onsite industrial landfills for ethanol processing facilities or industrial land application systems.

GHG Emissions

Decomposition of waste in landfills generates CH₄ and CO₂. The amount of CH₄ generated from a given landfill is a function of several factors: the total amount of waste disposed in the landfill, the characteristics of the waste, and the climatic conditions. The amount of CH₄ emitted is the amount of CH₄ generated minus the amount of CH₄ oxidized by aerobic microorganisms in the landfill cover material. Also subtracted from the total is the amount of CH₄ that is destroyed by combustion of the vented gas. The CO₂ produced by decaying waste is not considered an anthropogenic emission, and is not counted in GHG emission totals. Likewise, CO₂ resulting from the combustion of landfill CH₄ is not accounted for as an anthropogenic emission under international accounting guidance.

According to the 2008 U.S. Inventory, MSW landfills emitted 111.2 million metric tons CH₄ (CO₂e basis) in 2006. The majority of the CH₄ emissions from on-site industrial landfills occurs at pulp and paper facilities and food processing facilities. In 2006, these landfills emitted 14.6 million metric tons CO₂e

Potential to Emit

The methodology used for the proposed GHG MRR threshold analysis was also used to estimate CH₄ generation rates and emissions in 2006 for the PTE analysis. A landfill-specific model developed by EPA to support its proposed GHG MRR was used to estimate CH₄ generation and potential generation from municipal landfills. The generation estimate was adjusted with assumptions on oxidation in landfill cover, and destruction by combustion for energy recovery or flaring. The industrial landfill generation and emission estimates are based on the U.S. GHG Inventory. Industrial landfills were assumed not to have energy recovery or flaring, so there was no difference between generation and emissions.

New Units

EPA did not estimate the number of new facilities added each year with CH₄ emissions above the different thresholds due to the time delay between landfill construction and emission generation.

3.8.2 Municipal Solid Waste Combustors

The threshold analysis for the proposed GHG MRR included municipal solid waste combustors (MWC) in the general stationary fuel combustion category. The analysis used the eGRID database, which is discussed in the PTE methodology description for electric generating units.

Data and Methodology

EPA used the latest version of the eGRID database (2006) to estimate the PTE of MWC facilities and counts of facilities above the different emission thresholds. The eGRID database includes year 2004 characteristics, operating information, and annual CO₂ emissions for U.S. facilities that have a generation capacity greater than one MW and sell electric power to the grid. By using eGRID, EPA assumed that all MWC facilities sell power to the grid.

Potential to Emit

EPA identified 75 MWC facilities based on the generator primary fuel in the generator table (primary fuel equals MSW) in the eGRID database. The eGRID database contains CO₂ annual emissions estimates for the facilities. For CO₂ emissions, eGRID uses a standard assumption that 70 percent of the heat value of the waste stream comes from renewable materials

and 30 percent comes from nonrenewable materials. The renewable fraction has a CO₂ emission rate of zero; therefore, the PTE threshold analysis is based on the nonrenewable or fossil fraction assumption. EPA estimated PTE by dividing the annual emissions from eGRID by the eGRID plant capacity factor.

New Units

To determine the number of new per year at different thresholds, EPA counted the number of generators online each year, and totaled the nameplate capacity for each online year. This information was compared to the total facility nameplate capacity, and the PTE for the increased capacity was calculated by multiplying the facility PTE by the fraction of nameplate capacity associated with the new generators. EPA counted the facilities that exceeded the PTE thresholds during each period, and computed a 15-year average to determine the number of new or modified facilities per year.

Threshold Summary

Table 61
CO₂ Threshold Summary -- Municipal Solid Waste Combustors -

GHG Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	75	2	6.255
250	75	2	6.255
1,000	75	2	6.255
5,000	75	2	6.255
10,000	75	2	6.255
25,000	74	2	6.24
50,000	67	1	6.071
100,000	40	1	4.958

3.9 Agriculture (Stationary Fuel Combustion)

The analysis for the Agriculture sector was limited to stationary fuel combustion CO₂ emissions from internal combustion diesel engine generators. Fugitive emissions of CH₄ from enteric fermentation, and CO₂, CH₄ and N₂O from manure management were not included because farms and related operations are not in the 28 PSD source categories that require

quantification of fugitive emission PTE for determining major source status, and because of the large uncertainties and lack of information on determining what component of the non-combustion emissions at agricultural operations would be defined as non-fugitive for PSD purposes. Fuel combustion for building space heating and other farm purposes were not included in the estimates, but would be a component of farm PTE.

Data and Methodology

EPA used the 2007 ICF analysis to estimate the number of farms covered by the different thresholds (ICF, 2007). Emissions from diesel generators on farms were estimated using data on the average generator size in Delaware (EEA, 2004), and data on energy use on farms for non-transport/non-machinery motors (Brown and Neal 2005). Using these data, EPA estimated the number of diesel generators on farms and apportioned the generators across farm sizes, assuming no farm has more than one generator.

Potential to Emit

EPA assumed that a high proportion of farms would run the generators infrequently, and a smaller proportion would have a generator as the only power source, requiring nearly constant operation. EPA used this distribution to determine actual and potential emissions, with PTE emissions based on the assumption that the generators ran 24 hours per day, 365 days per year.

EPA recognizes that this approach underestimates the PTE for all farm stationary fuel combustion sources, because it is limited to diesel engine generators used primarily to run pumps and motors, and does not include additional sources such as fuel combustion for drying and curing, space heating, and water heating.

New Units

New generator installations were estimated based on information in the Regulatory Impact Analysis (RIA) for the spark ignition stationary combustion engine NSPS and area NESHAPS (EPA, 2007). The on-farm engine population of diesel generators used for irrigation increased four percent between 1998 and 2003, or about 0.8 percent annually.

Threshold Summary

Table 62
CO₂ Threshold Summary -- Farm Stationary IC Engines

CO₂ Threshold (tons per year)	Number of Existing Sources	Number of New Engines Added per Year	CO₂ Emissions Covered (Tg per year)
100	37,351	299	0.512
250	37,351	299	0.512
1,000	0	0	0
5,000	0	0	0
10,000	0	0	0
25,000	0	0	0
50,000	0	0	0
100,000	0	0	0

3.10 Commercial Stationary Fuel Combustion

Data Source

EPA used EIA's Commercial Building Energy Consumption Survey (CBECS) to estimate commercial sector stationary fuel combustion GHG emissions and PTE. CBECS is a national sample survey that collects information on the stock of U.S. commercial buildings, their energy-related building characteristics, and their energy consumption and expenditures. Commercial buildings include all buildings in which at least half of the floor space is used for a purpose that is not residential, industrial, or agricultural; thus, the source category includes building types that might not traditionally be considered "commercial," such as schools, correctional institutions, and buildings used for religious worship. The CBECS survey is conducted every four years and the most recent survey was completed for 2003.

The CBECS survey sample was designed so that survey responses could be used to estimate characteristics of the entire nationwide commercial building stock. The 2003 survey selected 6,955 potential case buildings for sampling. The sampling procedures resulted in 5,215 completed building interviews for a response rate of 82 percent. To make national estimates from the sample data, EIA calculated base sampling weights for each building (the reciprocal of the probability of that building being selected into the sample). In other words, the base

sampling weight is the number of national buildings represented by the sampled building. The base weight was further adjusted to account for nonresponsive bias.

EIA publishes summary tables from the survey, and posts "microdata" files on the EIA website. The CBECS microdata consist of the 5,215 sampled building records, which each correspond to a single sampled building. For each building, these files contain information such as the building size, climatic region, census region, year constructed, types of energy used, and energy consumption and expenditures. These individual building microdata records are also the basis for the summary tables published by EIA.

Emissions Methodology

EPA used the CBECS microdata to estimate commercial building emissions and populations above emission thresholds. Each of the 5,215 microdata records corresponds to a single sampled building. EIA has made available 20 different data files of the microdata records which contain a wide range of information on characteristics and energy use for each building.

EPA's analysis relied on guidance provided by EIA on how to use the data. As noted above, the CBECS sample was designed so that survey responses could be used to estimate characteristics of the entire commercial building stock nationwide. The table below provides examples from EIA on how to calculate national commercial building characteristics from the sample building data.

Table 63
EIA Website Examples

To Find the National Estimate for:	Do This...	And You Should Get...
Total number of buildings	Sum ADJWT8 (weight factor)	4,858,749.82 (or 4,859 thousand)
Total number of office buildings	Sum ADJWT8 for cases where PBA8 (building code) = "02"	823,805.47 (or 824 thousand)
Total floor space	Create a new variable (weighted square footage) by multiplying ADJWT8 by SQFT8 (floor space) for each case, then sum this new variable	71,657,900,522 (or 71,658 million ft ²)
Total floor space in buildings with air conditioning	Sum the new weighted square footage variable (see above) for cases where COOL8 (air conditioning) = "1"	63,559,999,624 (or 63,560 million ft ²)
Total electricity consumption in KWh	Create a new variable (weighted electricity consumption) by multiplying ADJWT8 by ELCNS8 (electricity consumption) for each case, then sum this new variable	1,043,175,710,751 (or 1,043 billion kWh)

Source: http://www.eia.doe.gov/emeu/cbecs/cbecs2003/public_use_2003/cbecs_pudata2003.html

EIA calculated base sampling weights for each surveyed building (these are the reciprocal of the probability of that building being selected into the sample). Therefore, a building with a base weight of 1,000 represents itself and 999 similar but unsampled buildings in the total building stock. The base weight is further adjusted to account for non-response bias. The variable "ADJWT8" in the data file is the final weight. The ADJWT8 weight factor is used as described in Table 63 to extrapolate the survey sample to a national scale for any value. In order to obtain a national value each sample building's value must be multiplied by the building's weight (ADJWT8). All of the weighted values are then summed.

2003 CO₂ Emissions

EPA calculated the CO₂ emissions for each of the 5,215 buildings based on the annual natural gas and oil consumption reported for the building. For national emission estimates and counts of buildings with annual CO₂ emissions over any threshold, EPA multiplied the base weights by the sample emission totals to determine the national estimate of buildings with emissions over the threshold.

Potential to Emit

EPA estimates that commercial buildings operate at 15 percent of capacity. EPA considered several sources in making the PTE factor determination:

- A report prepared by Energy and Environmental Analysis, Inc. for Oak Ridge National Laboratory describing the industrial and commercial boiler population in the United States (EEA, 2005). The report estimated an average commercial boiler capacity factor of 16 percent.
- Reports on cooking equipment energy use by the Food Service Technology Center in California suggesting that the cooking equipment in food service establishments operate at about ten percent of a theoretical maximum capacity based on 8,760 hours per year (Pechan, et.al, 2008).
- A study of Los Angeles dry cleaners performed by the Pollution Prevention Education and Research Center (PPEREC) in 2004 which demonstrates that dry cleaners operate boilers at about ten to 15 percent of maximum capacity over a normal year (Pechan, et al., 2008).

New Buildings

The CBECS data identifies the year the sampled buildings were constructed. We used the construction year information to identify the number of new buildings built each year in the 1990 to 2003 period. Counts of the average number of these buildings built per year were then made at the different emissions and PTE thresholds.

Threshold Summary

The count of buildings and emissions at the threshold levels for the entire sector are shown in the table below. Threshold results by commercial building categories (e.g., offices, public assembly, schools) are provided in Appendix B.

Table 64
CO₂ Threshold Summary -- Commercial Sector Stationary Fuel Combustion

CO₂ Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO₂ Emissions Covered (Tg per year)
100	1,355,921	22,123	119.262
250	731,477	12,041	105.306
1,000	172,654	2,922	69.885
5,000	18,167	196	29.384
10,000	5,660	96	17.765
25,000	1,161	7	8.790
50,000	600	3	6.003
100,000	51	2	1.012

3.11 Residential Buildings

Data Sources

EPA used residential fuel consumption data from EIA's Residential Energy Consumption Survey, and multi-family building and unit data from U.S. Census (Census) surveys to estimate CO₂ emissions and PTE for fuel combustion at single and multi-family residential properties. The RECS is a national area-probability sample survey that collects energy-related data for occupied primary housing units. The most recent 2005 survey collected data from 4,382 households in housing units statistically selected to represent the 111.1 million housing units in the United States. RECS data are tabulated for the four Census regions, the nine Census divisions, and for the four most populous States -- California, Florida, New York, and Texas.

The RECS sample was designed so that survey responses could be used to estimate characteristics of the national stock of occupied housing units. In order to arrive at national estimates from the RECS sample, EPA calculated base sampling weights for each housing unit as the reciprocal of the probability of that building being selected into the sample. Therefore, a housing unit with a base weight of 10,000 represents itself and 9,999 similar, but not sampled housing units in the total stock of occupied residential housing units. The base weight is further adjusted to account for non-response bias. Ratio adjustments were also used to ensure that the

RECS weights add up to Census Current Population Survey estimates of the number of households.

The RECS data are provided at the housing unit level, and not at the building level. EPA used additional data from the Census on multi-family building population characteristics to estimate total property emissions and PTE for multi-unit properties. Census data were from two sources: the Property Owner and Manager Survey (POMS, 1996) and the American Housing Survey (AHS, 2005).

3.11.1 Single-Family Homes

The RECS data was used directly to estimate CO₂ emissions from fossil fuel combustion at single-family housing units for space heating, water heating, and appliances. EPA assumed that each unit in an attached single-family building was a separate source, with combustion equipment under different ownership.

The annual energy consumption by fuel (1,000 Btu's) for the surveyed unit was multiplied by the fuel CO₂ emission factor to estimate annual emissions. Total single-family unit emissions for the entire country were calculated by multiplying CO₂ emissions for each units by the base sampling weight.

Potential to Emit

The PTE for a single-family unit was calculated by dividing the CO₂ emissions from the unit by a capacity factor of 0.1. This factor was estimated by comparing the average annual CO₂ emissions per heated floor space area per hour by climate zone, to required heat input capacity. The required heat input capacity was based on rule of thumb heating system requirements for the different climate zones. The table below shows the average Btu/ft²-hour from the RECS data and Heating Requirement (Btu/ft²) by climate zone. A heating system efficiency of 80 percent was used to estimate the required space heating capacity.

Table 65
Single-Family Detached and Attached
Households with Fossil Fuel-Fired Space Heating
(from RECS, 2005)

Households (millions)	Climate Zone(s)	Heating Degree Day Range	Average Annual Fuel Consumption (Btu/ft ² -hour)	Space Heating Requirement* (Btu/ft ²)
6.8	5	> 7,000	4.8	50 – 60
16.7	4	5,500 – 7,000	5.4	45 – 50
17.0	3	4,000 – 5,499	4.6	40 – 45

18.9	1 and 2	< 4,000	3.8	Zone 2: 35 – 40 Zone 1: 30 – 35
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* Heating requirement ranges are from www.acdirect.com/systemsize.php

3.11.2 Multi-Family Residential Buildings

Emission Rates

As noted earlier in the Data Source section, the RECS data are on an individual unit basis, not building or property basis, so a different approach was required for multi-family units where EPA assumed common ownership of the property fuel combustion equipment. In order to estimate property emissions and the number of properties above different emission and PTE thresholds, EPA combined the RECS data with data from the POMS and AHS.

From the RECS data, EPA first calculated average residential unit CO₂ emissions for the two most common fuels (natural gas and oil) by multi-family category. These are shown in the table below.

Table 66
Multi-Family Residential Unit -- Average Annual CO₂ Emissions
(from RECS, 2005)

Multi-Family Category (number of units)	Natural Gas Space Heating (tons CO₂/residential unit-year)	Fuel Oil Space Heating (tons CO₂/residential unit-year)
2 to 4 units	4.8	8.3
5 or more units	3.0	8.9

EPA also obtained annual CO₂ emission rates from an EPA analysis that was based on Lawrence Berkeley National Lab (LBNL) modeling studies. Those rates were estimated for old and new building units (see Table 67). The pre-1980 building estimate compares with the overall average from the RECS data. The post-1980 building estimates are much lower, particularly for units burning fuel oil.

Table 67
Multi-Family Residential Unit -- Average Annual CO₂ Emissions
(from 2008 EPA Analysis based on LBNL, 1997)

Multi-Family Category (building age)	Gas Serviced Units (tons CO₂/residential unit-year)	Fuel Oil Serviced Units (tons CO₂/residential unit-year)
Pre-1980 building	4.75	7.17
Post-1980 building	2.65	3.87

Existing Property Characteristics

Information on the distribution of multi-family properties by number of units per property was taken from the 1995 – 1996 POMS. The data are aggregated by different housing unit ranges. The table below shows the property size distribution from unpublished POMS data (NMHC Quick Facts -- Apartment Stocks (<http://www.nmhc.org>)). The POMS data were for privately owned housing only, and excluded public housing projects (about 13,500 buildings and 1,326,000 units). For our estimates, the building numbers were adjusted to current (2005) levels based on the RECS unit data (unit ratio of RECS to POMS). EPA assumed the same unit distribution in the adjustment.

Table 68
Multi-Family Residential Property Size Distribution
(from National Multi-Housing Council tabulation of unpublished POMS data 1995 – 1996)

Number of Rental Units on Property	Number of Properties (1995 – 1996)	Number of Units (1995 – 1996)	Average Number of Units per Property
2	1,558,700	3,093,200	2
3	336,030	1,025,900	3
4	341,350	1,436,800	4
5 – 9	281,500	1,897,700	7
10 – 14	70,390	862,280	12
15 – 19	36,780	602,260	16
20 – 29	38,000	916,750	24
30 – 39	18,166	604,240	33
40 – 49	14,431	702,790	49
50 – 99	26,694	2,009,400	75
100 – 199	19,804	2,952,300	149

200 – 299	7,775	1,948,400	251
300 – 399	2,966	1,058,800	357
400 – 499	1,307	605,130	463
500 – 749	723	431,360	597
Over 750	307	437,670	1,426
Total	2,754,923	20,584,980	

The adjusted POMS size distribution and average number of units in each category were combined with information from RECS on the percentage of units that use gas or oil for space heating. The gas and oil emission factors from the previous tables were applied to the average number of units in each property size category by fuel to estimate property annual CO₂ emissions.

For our final estimates we used the LBNL based emission factors for post-1980 buildings, over the RECS based factor. We found that these lower emission factors resulted in total emissions more in line with the total based on all RECS units and residential sector estimates in the U.S. Greenhouse Gas Inventory. The RECS-based factors combined with the POMS property distribution data resulted in a larger overestimate in overall category annual emissions. The lack of information on the building population over 50 units, and lack of information on the correlation between unit emissions and the building/property size are large sources of uncertainty in the estimates at thresholds above 1,000 tons.

Potential to Emit

PTE was estimated using the same ten percent capacity factor as used for the single family residential units

New Properties

The AHS data provided information on new construction used to estimate the number of new buildings and new units with natural gas space heating that were constructed in the 1999 – 2005 period. To simplify the analysis, EPA ignored the limited use of fuel oil for space heating in new units.

The AHS data provided separately the number of new buildings with gas space heating per year, and a size distribution for all new buildings per year. The AHS size distribution stopped at 50 and larger, and was slightly different in other categories from the POMS data. EPA adjusted the distribution based on the POMS distribution and then used the same emission and capacity factor approach as used for existing units.

Table 69
American Housing Survey New Building Data

Building Size: Number of Units per Building	Number of New Buildings per Year (1999 – 2005) (thousands)	Fraction of All New Buildings per Year (1999 – 2005)	New Gas Buildings per Year (1999 – 2005) (thousands)	Number of New Gas Buildings per Year
2	6.3	0.22	16.0	3,468
3 – 4	5.4	0.19		2,995
5 – 9	6.1	0.21		3,389
10 – 19	6.0	0.21		3,310
20 – 29	3.1	0.11		1,734
30 – 49	1.0	0.03		552
50 or more	1.0	0.03		552
Total	29.0	1.00	16.0	16,000

Threshold Summary

Table 70
CO₂ Threshold Summaries -- Residential Sectors

Threshold (tons per year)	Number of Existing Sources	Number of New Facilities Added per Year	CO ₂ Emissions Covered (Tg per year)
Multi-Family Residential			
100	610,500	11,300	54.285
250	137,000	6,400	42.192
1,000	51,200	1,100	32.399
5,000	7,800	120	14.934
10,000	1,400	20	4.933
25,000	160	3	1.392
50,000	20	0	0.006
100,000	0	0	0
Single-Family Residential			
100	3,925,000	33,000	51.408
250	45,350	515	1.670
1,000	0	0	0
Total Residential Sector			
100	4,535,500	44,300	105.693
250	182,350	6,915	43.862
1,000	51,200	1,100	32.399
5,000	7,800	120	14.934
100,00	1,400	20	4.933
25,000	160	3	1.392
50,000	20	0	0.006
100,000	0	0	0

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Appendix A

Sector Permit Threshold Counts and Emissions by GHG

The listed electronic spreadsheet files contain the permit threshold counts and emissions for each sector and subsector by GHG. These listed files are included in separate files in the docket (EPA-HQ-OAR-2009-0517). Please refer to the following file names for additional information on specific sectors and GHGs:

- GHG Data for Permitting Threshold Rule Development - CO2e.xls
- GHG Data for Permitting Threshold Rule Development - CO2.xls
- GHG Data for Permitting Threshold Rule Development - CH4.xls
- GHG Data for Permitting Threshold Rule Development - N2O.xls
- GHG Data for Permitting Threshold Rule Development - HFC.xls
- GHG Data for Permitting Threshold Rule Development - PFC.xls
- GHG Data for Permitting Threshold Rule Development - SF6.xls

Appendix B

Commercial Building Sector -- Permit Threshold Results by Commercial Category

Please refer to the electronic file "Commercial Building Category CO2 Permit Threshold Results.xls." in the docket for EPA-HQ-OAR-2009-0517.

Attachment C

Summary of ICR-based Data Used to Estimate Avoided Burden and Evaluate Resource Requirements at Alternative GHG Permitting Thresholds

Prepared by EPA Staff

August 2009

1. Introduction

This paper summarizes an assessment of the potential resource requirements for permitting authorities to include GHGs at different possible major source permitting thresholds and the avoided burden and costs for permitting authorities and sources as a result of including GHGs at a 25,000 tpy permitting threshold for Title V and Prevention of Significant Deterioration (PSD) permitting programs. The analysis was performed using a GHG permitting threshold metric based on CO₂-equivalents (CO₂e), which represents the sum of the six primary GHGs with their global warming potentials (GWP) applied. Time and costs associated with permit activities are derived from existing Information Collection Requests (ICRs). Estimates for the number of affected permits used in this analysis were obtained from two technical support documents developed for the proposed GHG tailoring rule: *Technical Support Document for Greenhouse Gas Emissions Thresholds Evaluation* (GHG Thresholds TSD) and *Methodology for Estimating New and Modified Sources that Would Be Subject to PSD Permitting for GHGs* (GHG PSD Sources TSD), both of which can be found at EPA-HQ-OAR-2009-0517. Significant uncertainties exist in the following estimates due to the lack of historical record and permitting experience upon which to base resource needs for including GHG sources.

2. Evaluation of ICR-based Resource Requirements for Permitting Authorities at Different Possible GHG Permitting Thresholds

Title V Permits

Table 2-1 presents the estimated burden estimates for permitting authorities at different possible Title V GHG major source applicability thresholds. Descriptions of the different thresholds selected are provided below. Burden estimates are calculated based on information obtained from the April 2007 *Information Collection Request for State Operating Permit*

*Regulations*¹⁴. Annual values are derived from Tables 7 and 8 of the ICR. For consistency, the permitting authority labor costs are updated to 2007 dollars utilizing the *2007 General Schedule Salary Table* from the Office of Personnel Management. For the purposes of this analysis, we assumed that commercial/residential sources that exceed the major source threshold due to GHG emissions will not likely have substantial applicable requirements in the near term. We also assumed that permits for such sources will not require as much time to prepare and issue as those for industrial sources, which have applicable requirements in addition to GHG. Therefore, it is estimated that new commercial/residential permits require 10% of the time needed for new industrial permits, or 43 hours compared to 428 hours for permitting authorities. For significant revisions and permit renewals, it is assumed that incorporating GHG information adds 9 hours, or an additional 10% to the current updating and processing time. Out of the 14,700 existing Title V permits, the Title V ICR estimates that 3,267 permits annually undergo renewal. It is estimated that the remaining 11,433 permits would need to undergo significant revision.

Baseline

To determine the impact under current Title V program conditions, baseline burden and cost are calculated at the 100 tpy threshold level, which is the generally applied major source applicability level under Title V. The GHG Thresholds TSD results indicate that 97% of the new sources that would need to apply for a Title V permit will be commercial/residential. All existing sources with operating permits will need to undergo significant revisions or permit renewals. The estimated total additional burden for permitting authorities is 340,957,876 hours, which, assuming 2000 hours per year per full time employee (FTE), equates to 170,479 new FTE's at a cost of \$15,684,062,296.

Alternate Threshold Scenarios

In addition to the baseline scenario, permitting authority burden was examined at three different GHG permitting threshold levels (10,000 tpy, 25,000 tpy, and 50,000 tpy) to evaluate the relative differences in impacts to permitting authorities. All assumptions for Title V listed above remain the same for these scenarios.

¹⁴ Information Collection Request for State Operating Permit Regulations (Renewal), EPA ICR Number 1587.07, OMB Control Number 2060-0243, 2007.

The GHG Thresholds TSD indicates that 12,487 new and existing sources will be affected if the threshold is set at 10,000 tpy. All remaining existing sources have operating permits and will need to undergo significant revisions or permit renewals. Of the new sources, 57% represent commercial/residential sources, while 43% represent industrial sources. Similar to the baseline analysis, a weighted average was developed for newly permitted sources to reflect differences between commercial/residential and industrial source permits. The total estimated burden at this threshold for permitting authorities is 2,713,976 hours requiring 1,357 new FTEs at a cost of \$1,148,804.

The GHG Thresholds TSD indicates there will be 3,189 new and existing sources that will need to obtain an operating permit at a threshold of 25,000 tpy. Of these new sources, 1331, or 42% will require commercial/residential permits, with the remainder needing industrial permits. The total estimated burden at this threshold for permitting authorities is 984,757 hours, or 492 FTE's, at a cost of \$45,298,822.

Finally, at a 50,000 tpy threshold, the GHG Thresholds TSD indicates there will be 697 new and existing affected sources that will need to apply for and obtain operating permits. The total estimated burden at this threshold for permitting authorities is 190,761 hours, requiring 95 new FTEs at a cost of \$8,775,006.

Table 2-1. Estimated Permitting Authority Title V Burden with GHG (First Year)					
Activity		Burden Hour per Permit ^a	Affected Permits	Total Burden (hours)	Total Cost (\$2007) ^b
100 tpy (Baseline)					
	New Permit Preparation and Issuance - Industrial	428	197,753	84,638,284	\$3,893,361,064
	New Permit Preparation and Issuance - Commercial/Residential	43	5,957,844	256,187,292	\$11,784,615,432
	Significant Revisions of Current Permits ^c	9	11,433	102,897	\$4,733,262
	Permit Renewals ^d	9	3,267	29,403	\$1,352,538
	Total Additional Burden			340,957,876	\$15,684,062,296
10,000 tpy					
	New Permit Preparation and Issuance - Industrial	428	5,311	2,273,108	\$104,562,968
	New Permit Preparation and Issuance - Commercial/Residential	43	7,176	308,568	\$14,194,128
	Significant Revisions of Current Permits ^c	9	11,433	102,897	\$4,733,262
	Permit Renewals ^d	9	3,267	29,403	\$1,352,538
	Total Additional Burden			2,713,976	\$124,842,896
25,000 tpy					
	New Permit Preparation and Issuance - Industrial	428	1,858	795,224	\$36,580,304
	New Permit Preparation and Issuance - Commercial/Residential	43	1,331	57,233	\$2,632,718
	Significant Revisions of Current Permits ^c	9	11,433	102,897	\$4,733,262
	Permit Renewals ^d	9	3,267	29,403	\$1,352,538
	Total Additional Burden			984,757	\$45,298,822
50,000 tpy					
	New Permit Preparation and Issuance - Industrial	428	74	31,672	\$1,456,912
	New Permit Preparation and Issuance - Commercial/Residential	43	623	26,789	\$1,232,294
	Significant Revisions of Current Permits ^c	9	11,433	102,897	\$4,733,262
	Permit Renewals ^d	9	3,267	29,403	\$1,352,538
	Total Additional Burden			190,761	\$8,775,006

^aNew commercial/residential permits take 10% of the time needed for new industrial permits

^bSalaries from Title V ICR adjusted to 2007 dollars using 2007 OPM General Schedule Salary Table available at: <http://www.opm.gov/oqa/07tables/index.asp>

^cIncorporating GHG information/requirements into significant revisions and permit renewals adds an additional 10% of the current time (90 hours each)

^dThe Title V ICR estimates that 3,267 permits annually undergo renewal, and the remaining 14,700 existing permits will need to undergo significant revisions.

PSD Permits

Table 2-2 presents the estimated burden estimates for permitting authorities at different possible PSD GHG major source applicability thresholds. Descriptions of the different thresholds selected are provided below. Burden estimates for the PSD program are calculated based on listed values obtained from Tables 6-1 and 6-2 the August 2008 *Information Collection Request for Prevention of Significant Deterioration and Nonattainment New Source Review* (NSR)¹⁵. NSR ICR at 18-19. It is assumed that permit preparation and issuance for commercial/residential permits requires only 20% of the time necessary to prepare and issue industrial source permits since commercial/residential sources would likely be less complex in terms of numbers and types of emission sources and control requirements. Estimates obtained are additional burden and costs to those currently experienced by permitting authorities and sources. In addition to utilizing the GHG Thresholds TSD to determine new sources, modification numbers are derived from the GHG PSD Sources TSD. Both of these TSDs can be found at EPA-HQ-OAR-2009-0517.

Baseline

In order to determine the impact under current PSD program conditions, baseline burden and cost were calculated at the 250 tpy permitting threshold. The general 250 tpy PSD threshold, rather than the 100 tpy PSD threshold for selected industries/sources, is selected for calculations because it provides results more representative of the general population of sources that would exceed the major stationary source GHG threshold and potentially be subject to PSD requirements. At the 250 tpy threshold, the GHG Thresholds TSD indicates that 87% of all new NSR permits for GHG will be commercial/residential, with the remaining 13% for industrial sources. It is assumed for this analysis that a commercial/residential permit will be less complex and generally limited to GHGs such that emission of additional pollutants is not expected and therefore the permitting process is simplified. To account for the resource requirement differences between the two categories of permits, it is assumed that preparing and issuing a commercial/residential PSD permit requires only 20% of the time necessary for an industrial

¹⁵ Prevention of Significant Deterioration and Non-Attainment Area New Source Review (Renewal), EPA ICR Number 123.23, OMB Control Number 2060-0003, 2008.

permit. The additional annual permitting burden for permitting authorities is 3,336,844 hours, which equates to approximately 1,668 new FTE's, at a cost of \$257,671,094.

Alternate Threshold Scenarios

After determining the baseline, additional burden was determined at three different major stationary source threshold levels (10,000 tpy, 25,000 tpy, and 50,000 tpy) to evaluate the relative differences in impacts to permitting authorities. All assumptions for PSD permits listed above remain the same for these scenarios.

The GHG Thresholds TSD and the PSD Sources TSD indicate that 827 sources will be affected if the permitting applicability threshold is set at 10,000 tpy. Of these sources, it is estimated that 69% would consist of industrial source categories, while 31% fall under the commercial/residential categories. The total burden at this threshold for permitting authorities is estimated at 186,990 hours, requiring ninety-three new FTE's at a cost of \$14,439,368

The GHG Thresholds TSD and PSD Sources TSD indicate there will be 401 affected sources at a threshold of 25,000 tpy. Of these new sources, approximately 9% will fall under the commercial/residential source categories. For permitting authorities, the total estimate burden at this threshold is 112,025 hours, or 56 new FTE's, at a cost of \$8,650,571.

At a 50,000 tpy threshold, the GHG Thresholds TSD and PSD Sources TSD indicate there will be 222 affected sources. Of these affected sources, we estimate that 15 will be associated with commercial sources, while the remaining will be for industrial sources due to the higher threshold applicability level. For permitting authorities, the total estimated additional burden for permitting authorities will be 63,207 hours, requiring 32 new FTEs at a cost of \$4,880,845.

Table 2-2. Estimated Permitting Authority PSD Burden with GHG (First Year)				
Activity	Burden Hours per Permit ^a	Affected Permits	Total Burden (hours)	Total Cost (\$2007) ^b
Baseline				
PSD Permit Preparation and Issuance - Industrial	301	3,664	1,102,864	\$85,163,158
PSD Permit Preparation and Issuance - Commercial/Residential	60	37,233	2,233,980	\$172,507,936
Total Additional Burden			3,336,844	\$257,671,094
10,000 tpy				
PSD Permit Preparation and Issuance - Industrial	301	570	171,570	\$13,248,635
PSD Permit Preparation and Issuance - Commercial/Residential	60	257	15,420	\$1,190,732
Total Additional Burden			186,990	\$14,439,368
25,000 tpy				
PSD Permit Preparation and Issuance - Industrial	301	365	109,865	\$8,483,775
PSD Permit Preparation and Issuance - Commercial/Residential	60	36	2,160	\$166,795
Total Additional Burden			112,025	\$8,650,571
50,000 tpy				
PSD Permit Preparation and Issuance - Industrial	301	207	62,307	\$4,811,347
PSD Permit Preparation and Issuance - Commercial/Residential	60	15	900	\$69,498
Total Additional Burden			63,207	\$4,880,845
^a Assume permit preparation and issuance for commercial/residential permits takes 20% the amount of time needed to prepare and issue an industrial permit.				
^b Labor cost of \$77.22/hr from Prevention of Significant Deterioration and Non-Attainment Area New Source Review (Renewal), EPA ICR Number 1230.23, OMB Control Number 2060-0003, 2008.				

3. Estimates of Avoided ICR-based Burden for Permitting Authorities and Sources at Different Possible GHG Major Source Applicability Threshold for Title V and PSD

The following tables indicate the burden avoided from the baseline scenarios by establishing a 10,000 tpy, 25,000 tpy, or 50,000 tpy major source applicability threshold for both the Title V and PSD programs. In Tables 3-1 through 3-3, the first three columns indicate the cost per permit and total cost to permitting authorities if the threshold level for carbon dioxide equivalents was set at the current threshold levels for Title V and PSD (100 and 250 tpy, respectively). The next three columns reflect the estimated costs for permitting authorities with the threshold set at the specified tons per year CO₂e. In the final three columns, the avoided burden is estimated – the time and costs alleviated relative to the baseline scenario by establishing a GHG major source applicability level of 10,000 tpy, 25,000 tpy, or 50,000 tpy CO₂e respectively. On average, permitting authorities would avoid an estimated \$15 billion in costs.

Set up similarly to the permitting authority table, Tables 3-4, 3-5, and 3-6 below indicate the avoided burden for sources that emit less than 10,000 tpy, 25,000 tpy, or 50,000 tpy CO₂e respectively. On average, an estimated \$39 billion in costs are avoided. Most of the sources that will not be required to obtain Title V or PSD permits at this time are commercial or residential.

Table 3-1. Estimated ICR-based Costs Avoided for Permitting Authorities at 10,000 tpy Threshold										
		All Title V 100tpy and PSD 250 tpy			10,000 tpy or Greater			Avoided Burden		
Activity		Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)
Title V Permits										
	New Industrial	\$19,688	197,753	\$3,893,361,064	\$19,688	5,311	\$104,562,968	\$19,688	192,442	\$3,788,798,096
	New Commercial/Residential	\$1,978	5,957,844	\$11,784,615,432	\$1,978	7,176	\$14,194,128	\$1,978	5,950,668	\$11,770,421,304
	Significant Permit Revisions	\$414	11,433	\$4,733,262	\$414	11,433	\$4,733,262	\$414	0	\$0
	Permit Renewals	\$414	3,267	\$1,352,538	\$414	3,267	\$1,352,538	\$414	0	\$0
	Total Permits Affected		6,170,297			27,187			6,143,110	
PSD Permits										
	New Industrial	\$23,243	3,664	\$85,162,352	\$23,243	570	\$13,248,510	\$23,243	3,094	\$71,913,842
	New Commercial/Residential	\$4,633	37,233	\$172,500,489	\$4,633	257	\$1,190,681	\$4,633	36,976	\$171,309,808
	Total Permits Affected		40,897			827			40,070	
Total Permitting Authority Costs				\$15,941,725,137			\$139,282,087			\$15,802,443,050

Table 3-2. Estimated ICR-based Costs Avoided for Permitting Authorities at 25,000 tpy Threshold									
	Baseline (Title V 100tpy and PSD 250 tpy)			25,000 tpy or Greater			Avoided Burden		
Activity	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)
Title V Permits									
New Industrial	\$19,688	197,753	\$3,893,361,064	\$19,688	1,858	\$36,580,304	\$19,688	195,895	\$3,856,780,760
New Commercial/Residential	\$1,978	5,957,844	\$11,784,615,432	\$1,978	1,331	\$2,632,718	\$1,978	5,956,513	\$11,781,982,714
Significant Permit Revisions	\$414	11,433	\$4,733,262	\$414	11,433	\$4,733,262	\$414	0	\$0
Permit Renewals	\$414	3,267	\$1,352,538	\$414	3,267	\$1,352,538	\$414	0	\$0
Total Permits Affected		6,170,297			17,889			6,152,408	
PSD Permits									
New Industrial	\$23,243	3,664	\$85,162,352	\$23,243	365	\$8,483,695	\$23,243	3,299	\$76,678,657
New Commercial/Residential	\$4,633	37,233	\$172,500,489	\$4,633	36	\$166,788	\$4,633	37,197	\$172,333,701
Total Permits Affected		40,897			401			40,496	
Total Permitting Authority Costs			\$15,941,725,137			\$53,949,305			\$15,887,775,832

Table 3-3. Estimated ICR-based Costs Avoided for Permitting Authorities at 50,000 tpy Threshold									
	All Title V 100tpy and PSD 250 tpy			50,000 tpy or Greater			Avoided Burden		
Activity	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)
Title V Permits									
New Industrial	\$19,688	197,753	\$3,893,361,064	\$19,688	74	\$1,456,912	\$19,688	197,679	\$3,891,904,152
New Commercial/Residential	\$1,978	5,957,844	\$11,784,615,432	\$1,978	623	\$1,232,294	\$1,978	5,957,221	\$11,783,383,138
Significant Permit Revisions	\$414	11,433	\$4,733,262	\$414	11,433	\$4,733,262	\$414	0	\$0
Permit Renewals	\$414	3,267	\$1,352,538	\$414	3,267	\$1,352,538	\$414	0	\$0
Total Permits Affected		6,170,297			15,397			6,154,900	
PSD Permits									
New Industrial	\$23,243	3,664	\$85,162,352	\$23,243	207	\$4,811,301	\$23,243	3,457	\$80,351,051
New Commercial/Residential	\$4,633	37,233	\$172,500,489	\$4,633	15	\$69,495	\$4,633	37,218	\$172,430,994
Total Permits Affected		40,897			222			40,675	
Total Permitting Authority Costs			\$15,941,725,137			\$13,655,802			\$15,928,069,335

Table 3-4. Estimated ICR-based Costs Avoided for Sources at 10,000 tpy Threshold									
	All Title V 100tpy and PSD 250 tpy			10,000 tpy or Greater			Avoided Burden		
Activity	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)
Title V Permits									
New Industrial	\$46,350	197,753	\$9,165,851,550	\$46,350	5,311	\$246,164,850	\$46,350	192,442	\$8,919,686,700
New Commercial/Residential	\$4,986	5,957,844	\$29,705,810,184	\$4,986	7,176	\$35,779,536	\$4,986	5,950,668	\$29,670,030,648
Significant Permit Revisions	\$312	11,433	\$3,567,096	\$312	11,433	\$3,567,096	\$312	0	\$0
Permit Renewals	\$780	3,267	\$2,548,260	\$780	3,267	\$2,548,260	\$780	0	\$0
Total Permits Affected		6,170,297			27,187			6,143,110	
PSD Permits									
New Industrial	\$84,530	3,664	\$309,717,920	\$84,530	570	\$48,182,100	\$84,530	3,094	\$261,535,820
New Commercial/Residential	\$16,887	37,233	\$628,753,671	\$16,887	257	\$4,339,959	\$16,887	36,976	\$624,413,712
Total Permits Affected		40,897			827			40,070	
Total Source Costs			\$39,816,248,681			\$340,581,801			\$39,475,666,880

Table 3-5. Estimated ICR-based Costs Avoided for Sources at 25,000 tpy Threshold									
	Baseline (Title V 100tpy and PSD 250 tpy)			25,000 tpy or Greater			Avoided Burden		
Activity	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)
Title V Permits									
New Industrial	\$46,350	197,753	\$9,165,851,550	\$46,350	1,858	\$86,118,300	\$46,350	195,895	\$9,079,733,250
New Commercial/Residential	\$4,986	5,957,844	\$29,705,810,184	\$4,986	1,331	\$6,636,366	\$4,986	5,956,513	\$29,699,173,818
Significant Permit Revisions	\$312	11,433	\$3,567,096	\$312	11,433	\$3,567,096	\$312	0	\$0
Permit Renewals	\$780	3,267	\$2,548,260	\$780	3,267	\$2,548,260	\$780	0	\$0
Total Permits Affected		6,170,297			17,889			6,152,408	
PSD Permits									
New Industrial	\$84,530	3,664	\$309,717,920	\$84,530	365	\$30,853,450	\$84,530	3,299	\$278,864,470
New Commercial/Residential	\$16,887	37,233	\$628,753,671	\$16,887	36	\$607,932	\$16,887	37,197	\$628,145,739
Total Permits Affected		40,897			401			40,496	
Total Source Costs			\$39,816,248,681			\$130,331,404			\$39,685,917,277

Table 3-6. Estimated ICR-based Costs Avoided for Sources at 50,000 tpy Threshold									
	All Title V 100tpy and PSD 250 tpy			50,000 tpy or Greater			Avoided Burden		
Activity	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)	Cost per Permit (2007\$)	Number of Permits	Total Cost (2007\$)
Title V Permits									
New Industrial	\$46,350	197,753	\$9,165,851,550	\$46,350	74	\$3,429,900	\$46,350	197,679	\$9,162,421,650
New Commercial/Residential	\$4,986	5,957,844	\$29,705,810,184	\$4,986	623	\$3,106,278	\$4,986	5,957,221	\$29,702,703,906
Significant Permit Revisions	\$312	11,433	\$3,567,096	\$312	11,433	\$3,567,096	\$312	0	\$0
Permit Renewals	\$780	3,267	\$2,548,260	\$780	3,267	\$2,548,260	\$780	0	\$0
Total Permits Affected		6,170,297			15,397			6,154,900	
PSD Permits									
New Industrial	\$84,530	3,664	\$309,717,920	\$84,530	207	\$17,497,710	\$84,530	3,457	\$292,220,210
New Commercial/Residential	\$16,887	37,233	\$628,753,671	\$16,887	15	\$253,305	\$16,887	37,218	\$628,500,366
Total Permits Affected		40,897			222			40,675	
Total Source Costs			\$39,816,248,681			\$30,402,549			\$39,785,846,132