New Source Review (NSR) Improvements

Supplemental Analysis of the Environmental Impact of the 2002 Final NSR Improvement Rules

United States Environmental Protection Agency
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Analysis of the Environmental Impact of the
2002 New Source Review (NSR) Improvement Final Rules

I. OVERVIEW

For more than 10 years now, the Environmental Protection Agency (EPA) has been engaged in an effort to improve the New Source Review (NSR) program in response to widespread concerns from stakeholders who are concerned that it is too complex and burdensome, it introduces uncertainty in planning, it inhibits industry's ability to quickly make needed changes, and it is not working as effectively as it could be to protect air quality. In 1996, after an extensive stakeholder process, EPA proposed a series of reforms[1] targeted at addressing stakeholder concerns and improving the program. As announced on June 13, 2002, the EPA now intends to finalize five key elements of the 1996 proposal: (1) Plantwide Applicability Limits (PALs), (2) the Clean Unit Test, (3) the Pollution Control Project Exclusion, (4) the revised baseline for determining pre-change emissions, and (5) the actual-to-projected-actual test. These reforms are aimed at providing much needed flexibility and regulatory certainty, and at removing barriers and creating incentives for sources to improve environmental performance through emissions reductions, pollution prevention, and improved energy efficiency. This document assumes that the reader already has some familiarity with the NSR program and with the terminology used in these five reforms, which are introduced in 1996 proposal and described fully in the final NSR Improvement rule.[2]

This document consists of several stand-alone analyses that were conducted by EPA or its contractors to provide supplemental information on the potential environmental impacts of the five provisions expected to be finalized in the upcoming NSR Improvement rules. The stand-alone analyses vary in scope. In the main body of the report, we present the results of each of these analyses in summary form, along with overall conclusions that we have reached from these analyses. Following that, the Appendices provide each of the analyses in its entirety, as well as other supplemental information.

This document is not intended to be a formal Regulatory Impact Analysis (RIA) or Economic Analysis as those terms are used in Agency rulemaking. The NSR Improvement rule does not require a formal RIA under Executive Order 12866 because the rule does not have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public

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[1]See 61 FR 38250.

[2]The proposal and supporting information are available in the docket for the NSR Improvement rule, docket number A-90-37, at the U.S. EPA Office of Air and Radiation Docket and Information Center.

health or safety, or State, local, or tribal governments or communities.

This analysis examines whether changes in health and environmental benefits are likely to occur as a result of NSR Improvement, but does not attempt to assign monetary values to any such changes. This analysis also does not assign monetary values to the other types of benefits that we expect to occur as a result of NSR improvement, such as the reduction in administrative costs from the streamlining of the permit process and the decreased opportunity cost from delayed changes. Quantifying these non-environmental benefits is outside the scope of this analysis.

In summary, this analysis finds that, collectively, the five NSR Improvements that the Agency is finalizing will be environmentally beneficial compared to the current program, and will improve air quality by reducing emissions from industrial facilities. The improvements in air quality will result in health and welfare benefits from reduced concentrations of pollutants regulated by the NSR program, primarily criteria pollutants. These benefits are relatively small compared to those of other air regulatory programs, but will result in a net environmental benefit compared to the current rule. For example, EPA's analysis of PALs finds that there are likely to be reductions in emissions of Volatile Organic Compounds (VOC) in the range of 3,400 to 17,000 tons per year from just three industrial categories. The agency believes that, overall, the use of PALs will actually reduce emissions by a greater amount, once additional categories and pollutants are considered. The analysis also finds that the Clean Unit Test and the exclusion for Pollution Control Projects will result in emissions reductions compared to the current program. Similarly, the analysis finds that the actual-to-projected-actual test is likely to be environmentally beneficial, but only to a small extent. The final reform, the change in the emissions baseline, will affect a very small number of facilities. Although it may allow for a small number of sources to avoid permitting because of the availability of a higher baseline, a small number of sources will also now be subject to a more stringent baseline. Thus, the analysis concludes that the overall consequences of the baseline change will be negligible.

II. INTRODUCTION

The purpose of this document is to provide supplemental information on the potential environmental effects of the NSR Improvement rules that EPA is finalizing. This information is intended to provide additional information to the public, in addition to record we are relying on as a basis for developing these rules. This information is not intended to serve as the basis for the final rules. Indeed, the EPA has a long and detailed record supporting the need for NSR improvement, and, consistent with standard rulemaking processes, we are fully explaining the legal and policy basis for our actions in that record. It is important to understand that the final rules are fully justified as a legal and policy matter, and the soundness of EPA's qualitative legal and policy basis for the rule does not depend on its ability to specifically quantify the environmental impact of the rule. However, the EPA believes it is appropriate at this time to present additional quantitative information regarding the NSR Improvement rulemaking.

It is important to note at the outset that NSR is one of many programs created by the

Clean Air Act to control or reduce emissions of air pollutants – particularly criteria pollutants – that are emitted from a wide variety of sources and have an adverse impact on human health and the environment. Other key programs include: the title IV Acid Rain Program, Maximum Achievable Control Technology (MACT) and other air toxics standards for control of Hazardous Air Pollutants (HAPs), New Source Performance Standards, the 22-state NO_x "SIP call," the Regional Haze program, numerous mobile source programs, and the basic state and local air control programs to attain and maintain the National Ambient Air Quality Standards (NAAQS). Together, these programs have achieved, and will continue to achieve, tens of millions of tons per year of reductions which are completely unaffected by the NSR Improvements rule.

While the variety of programs just discussed (as well as any other programs that may be adopted) will continue to play the dominant role in reducing emissions of air pollution, the NSR program will continue to serve its intended role of assuring that new and significantly modified sources, when they increase their emissions, are well-controlled and are permitted consistent with these overall air quality management programs. NSR is a broad program that covers new and modified sources across a wide range of source categories, and only a small portion of the sources covered by NSR is affected by the NSR improvement rule. NSR Improvement is a targeted set of rule changes that focus on issues related to modifications to existing emissions units. As discussed below, EPA estimates that more than 80 percent of the benefits of the program come from new sources and new units at existing sources, and are not affected by the NSR Improvement rule. Further, NSR Improvement does not significantly alter NSR for electric utility steam generating units, which are the largest category of NO_x, SO_2, and fine particle emissions. Regarding the program as a whole, EPA has, in the past, provided estimates of the benefits of the Prevention of Significant Deterioration (PSD) program,[3] but these are not good indicators of the impact of the NSR Improvements rule. For example, in a previous (*i.e.*, unrelated to the NSR Improvement Rule) look at the benefits of PSD, EPA estimated, based on permitting data from 1997 to 1999, that the overall PSD program avoided about 1.2 million tons per year for all source categories during that time period.[4] These estimates were also used to broadly estimate the benefits that occur when PSD imposes emissions limits on sources that construct or modify.[5] Based on its calculation of avoided emissions, EPA calculated mortality-related benefits from utility reductions of SO_2 and NO_x to be on the order of $3.6 billion. However, these estimates are intended to characterize the PSD program as a whole. As just noted, NSR Improvement applies almost exclusively to modifications at existing units, which account for less than one-fifth of these benefits. Further, the above estimate likely overstates the PSD benefit for a typical year, due to the disproportionately high number of gas turbines being

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[3]The PSD program is the portion of the NSR program that applies in attainment areas.

[4]See October 17, 2001 Memorandum from Karen Blanchard, US EPA, entitled "Benefits of the Prevention of Significant Deterioration Program"

[5]See June 20, 2001 Memorandum from Bryan Hubbell, US EPA, entitled "Benefits Associated with Electricity Generating Emissions Reductions Realized Under the NSR Program."

permitted during the three-year period upon which these numbers were based.[6]

Having set forth the overall context of this analysis, there are fundamental limitations on the ability to do a full quantitative analysis of the environmental benefits of the NSR Improvements now being finalized. In many EPA air rules, it is possible to do a comprehensive quantitative analysis of the health and environmental benefits of the regulation. These types of analyses rely upon the ability to estimate the effects that the regulation is expected to have on emissions over time. If the locations of the projected emissions changes are reasonably well-known, models can be used to estimate air quality impacts, and this information can be used to estimate resulting health and environmental benefits. Thus, where one can reasonably quantify the projected emissions impacts of a particular rule, it is possible to estimate that rule's impact on public health. However, for reasons explained below, the EPA cannot quantify with specificity the emissions changes for a given pollutant or pollutants, if any, that result from the NSR rule changes now being adopted, nor can we reliably determine the anticipated locations of any emissions changes. The following list illustrates the reasons why a more detailed provision-by-provision health analysis of the NSR Improvement rule changes is not possible:

- *Voluntary nature of improvements.* The majority of the NSR improvements being finalized (*e.g*., PALs, Clean Unit Test, pollution control project exclusion) are being made available as options that sources may exercise at their discretion. Because a source's decision whether and when to exercise a voluntary option is a highly case-specific decision that depends on a number of factors, and is also made in the context of other regulatory programs, the EPA is unable to model overall industry behavior to quantify how often and when the various options will be used on a nationwide basis. Although these options will clearly result in environmental benefits, they are difficult to quantify for this reason.

- *New vs. Modified sources.* EPA's reported estimates of the magnitude of NSR benefits (the 1997-99 PSD estimates) are calculated based on permitting data for all types of sources – new "greenfield" facilities, new units at existing facilities, and modifications to existing units. However, the NSR improvements apply almost entirely to modifications at existing units. As noted above, less than one-fifth of the 1997-99 PSD benefits were from projects that involved modifications to existing units. However, the data available do not allow identification of modified units with sufficient specificity to develop any more detailed estimate of the possible benefits of the NSR improvement rule as it relates to these modified units.

- *Difficult to link permits to environmental results.* The NSR improvement rule changes relate primarily to the provisions governing whether a source must obtain an NSR permit. Although fewer sources will undergo the full NSR permitting process as a result of these

[6] In addition, this estimate may be diminished for future time periods if the otherwise applicable limits absent NSR become more stringent.

rule changes, many of these sources will still be subject to alternate NSR provisions being included in the rule (*e.g.*, the requirement to cap emissions; the requirement to comply with clean unit emissions levels, the requirement to demonstrate a project is environmentally beneficial, and so on). There is not a straightforward relationship between the changes in number of permits and the real changes in emissions resulting from the NSR improvements. The number of NSR permits is a poor indicator for the program's environmental benefit for several reasons:

- The emissions benefits that result from an NSR permit process vary widely. They may be quite large in cases such as a new greenfield source, but can be negligible (or zero) in such cases as a modification to an already well-controlled unit.

- The avoidance of a permitting process does not necessarily mean that emissions increase. This is particularly true for some of the improvements which require pollution control measures as a prerequisite to reduced NSR permitting burden (*e.g.*, PAL's, Clean Unit Test, PCP exclusion). As discussed in more detail later, the current NSR process can act as a barrier to beneficial projects. Thus, reducing the procedural barriers to beneficial projects will likely get a better environmental result than requiring NSR permitting.

- The type of benefit, if any, that results from a permit process depends on the type of source, the pollutants it will emit, and the air quality in the area where it locates. We cannot resolve these differences as they may relate to the improvements now being finalized, because it is not possible to model source behavior with sufficient specificity. This not only affects the ability to generate emissions estimates, but also severely hinders any ability to relate this to health benefits.

- The NSR program can lead to changes in source behavior that have environmental effects even for sources that do not get an NSR permit. Many of these effects may be such that elimination of a permit requirement actually yields an environmental benefit. For example, a foregone pollution prevention project would not be revealed in permitting statistics, but does have an environmental consequence, and removing the barrier to the project would have a benefit. Similarly, the rule removes barriers and creates incentives for more energy efficient or lower-emitting processes, but does so without requiring a full NSR permit process. Permitting data tell us little about these effects, and it is very difficult to model source behavior to predict these effects some other way.

- The NSR program allows for emissions increases to occur, so long as they are well controlled. From an overall air quality standpoint, the facilities that go through NSR do not necessarily get emissions reductions needed to attain and maintain air quality standards, and may, in fact, increase emissions. Absent other air quality management programs, emissions avoided by NSR may simply appear elsewhere in the same airshed. Thus, a higher level of NSR permitting in an area does not necessarily indicate cleaner air.

- *Detailed records not usually kept.* The improvements relate mainly to the NSR applicability process, which is an element of the NSR program for which there is only limited quantitative information available. While sources may do detailed applicability calculations to determine whether to apply for a permit, EPA does not have records of these calculations because (1) when a source determines not to apply for an NSR permit, EPA is usually not notified, and (2) when a source does apply for an NSR permit, it is not required to prove to EPA or the State permitting agency that it is subject.

Because of these and other difficulties, it is very difficult to model the likely changes in emissions or air quality that will occur as a result of NSR Improvement, and thus, to carry forward a health analysis of these changes. However, as EPA has stated on numerous occasions, we believe that the NSR Improvement rules are likely to result in environmental benefits. This conclusion is based on a thorough review of the rulemaking record, and is based on our past experience with how sources respond to various NSR provisions, our ability to predict how they might respond in the future to specific changes in these provisions, and our assessment of the environmental changes likely to result. This assessment is qualitative, not quantitative. Nonetheless, the EPA understands that, where available, quantitative information can provide a useful supplement to these conclusions. For that reason, we are supplying the information contained in this report.

The remainder of this report is devoted to summarizing additional information on each of the five NSR improvements being finalized: (1) Plantwide Applicability Limits (PALs), (2) the Clean Unit Test, (3) the Pollution Control Project Exclusion, (4) the 2-in-10 baseline, and (5) the actual-to-projected-actual test. The analyses upon which these summaries are based are provided in the Appendices.

III. SUMMARY OF FINDINGS

A. Plantwide Applicability Limits

The EPA expects that the adoption of PAL provisions will result in a net environmental benefit. Our experience to date is that the emissions caps found in PAL-type permits result in real emissions reductions, as well as other benefits. As part of an overall agency effort to promote more flexible air permits, the EPA has been working with sources, States, the public, and other affected parties to pioneer a number of flexible permits nationwide. We recently completed an evaluation of six of these flexible permits that have been in effect long enough for us to be able to examine their performance. This evaluation, entitled "Evaluation of the Implementation Experience with Innovative Air Permits" is included as Appendix A to this report. It provides an overall introduction to flexible permitting, and reports on the magnitude of emissions reductions that have occurred under the permits that were evaluated.

Based primarily on the information available in this report, the EPA has made a rough estimate of the level of emissions reductions that are likely to occur if the EPA adopts PAL provisions in the NSR improvement rules. The basis for the estimate of emissions reductions is provided in Appendix B to this report. Although it is impossible to predict how many and which sources will take PALs, and what actual reductions those sources will achieve for what pollutants, we believe that, on a nationwide basis, PALs are certain to lead to tens of thousands of tons of reductions of VOC from source categories where frequent operational changes are made, where these changes are time-sensitive, and where there are opportunities for economical air pollution control measures. These reductions occur because of the incentives that the PAL creates to control existing and new units in order to provide room under the cap to make necessary operational changes over the life of the PAL. It is important to note that the incentive for sources to take PALs stems from the more flexible and certain approach to NSR applicability that PALs offer, which offers benefits for all sources, even those who may not otherwise trigger major NSR. We expect that many sources might seek to obtain PALs because of the regulatory certainty they offer, even though they expect to have very few (or no) changes over the life of the PAL that would trigger major NSR absent the PAL.

The PAL analysis in Appendix B examines three source categories where PALs are likely to see widespread use, and provides a range of nationwide VOC reductions for these categories based on their actual emissions and on the experience in the flexible permits to date. The categories evaluated were pharmaceutical manufacturing, semiconductor manufacturing, and automobile manufacturing. The analysis found that if half the sources in these categories took PALs (representing approximately 50 PAL sources), the reductions would likely range from approximately 3,400 to 11,300 tons per year, and if three-fourths of the sources took PALs the reductions would likely range from approximately 5,100 to 17,000 tons per year.

Another important benefit from the adoption of PALs is the emissions reduction benefit that would occur due to the elimination of multiple small (*i.e.* "insignificant") increases allowed under the current regulations. The NSR program is triggered for modifications only if the change results in a significant net emissions increase, with significance levels specified in the rules. Emissions increases that are not significant are not covered by NSR.[7] Significance levels depend on the pollutant. For example, levels for NO_x, VOC, and SO_2 are 40 tons per year[8], and the significance level for CO is 100 tons per year. For reasons described above, EPA cannot model what the emissions increases from such changes would be from the numerous small changes that do not trigger major NSR. However, our experience shows that insignificant emissions increases are common at large facilities. Under the PAL approach, these increases would not be allowed because the plantwide emissions are capped regardless of the size of the changes underneath the cap. Thus, we expect the PAL provisions to result in benefits due to the

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[7] They may still be covered by state "minor NSR" programs, which are unaffected by the NSR Improvement rule.

[8] Significance levels are lower in certain nonattainment areas.

elimination of these increases. The benefits depend on the number of sources who take PALs, and the number of small increases at such sources that the cap prevents, neither of which we can reliably estimate at this time. However, this additional benefit is potentially large.

It should be further noted that the above estimate of the PAL emissions reductions benefits for the three categories studied understates the national benefit of PALs because it does not consider the dozens of other types of sources where PALs may also be used. Furthermore, the analysis is focused on VOC, which, although likely to be the most common pollutant for which PALs are used, is not the only pollutant for which PALs will be adopted. We expect that a smaller number of PALs will be adopted for other pollutants, and that some of these could individually yield large emission reduction benefits.

B. The Clean Unit Test

The EPA expects that the Clean Unit Test will result in at least a small positive environmental benefit. The primary environmental benefit from the Clean Unit Test is that some subset of sources will install or enhance controls beyond what is otherwise required in order to qualify for the Clean Unit designation. They would do so because, in exchange, the unit would benefit from increased operational flexibility, so long as its emissions do not exceed the permit limits that represent clean unit operation. The purpose of this portion of the analysis is to characterize the environmental benefits that would result from such controls. However, it is important to note that a significant benefit of the Clean Unit Test is the administrative savings achieved by avoiding the NSR permit process when that process would result in trivial or no environmental benefit. Because the present analysis is focused on environmental impacts, it does not quantify benefits of the Clean Unit Test such as the administrative savings and the reduction in opportunity cost.

It is extremely difficult at this time to quantify the emissions reductions benefits for sources controlling early and/or more extensively in order to qualify for the Clean Unit test. We expect that the types of sources that would do so are similar, but not identical, to the sources that would take PALs – sources where the economic need for quick operational changes justifies the added expense of implementing early or more extensive investment in pollution reduction technologies. For this reason, we anticipate that the relative level of emissions reductions from such sources is likely to be comparable to those seen in the innovative permit pilots. However, while some of these reductions may be associated with emissions cap-type permits like those discussed above, others may be implemented on an individual unit basis. Quantifying the national impact of such reductions is extremely difficult because we presently do not have the ability to reliably model the degree to which various industrial sectors might use the Clean Unit Test on a unit-by-unit basis. Quantification is further complicated because some Clean Unit candidates may opt for PALs instead, and the analysis would need to factor in possible double-counting.

Although we cannot quantify the benefits of the Clean Unit Test on a national basis, as noted above, we expect that some level of emissions reductions will occur because of sources installing added controls, or enhancing existing controls, to qualify for the designation. A good example of this is NO_x emissions from the electric generation sector, where a subset of utilities will install, or have installed, seasonal NO_x controls. For the relatively modest added cost of operating and maintaining these controls year-round, rather than seasonally, a utility with NO_x controls could presumably qualify for the clean unit designation, and the flexibility offered under Clean Unit Test may offer incentive for it to do so. Because this choice would be a highly case-specific one, we cannot model whether a particular source in this situation would elect to seek Clean Unit status. However, if it did, EPA expects that the NO_x reduction benefits would be potentially significant.[9] We further expect that similar possibilities will be present in other industries, though the magnitude will vary depending on the flexibility needs and opportunities for early/more extensive controls within the industry category.

A more specific example of the effects of the Clean Unit Test is an example based on data from one of EPA's flexible permit pilots. The example has been adapted to illustrate the Clean Unit Test (obviously, direct examples of sources implementing the Clean Unit Test provisions are not yet available). In this example, a tape coating facility installed VOC controls that went beyond current control requirements by installing a large thermal oxidizer and venting several coating lines and drying ovens to it. It did this under a flexible permit because it expected to make a series of innovations and related operational changes. Had the Clean Unit option been available (and the company had chosen to pursue it, which is reasonable to assume based on its use of the flexible permit option), the flexibility needed to make these innovations could have been secured under the Clean Unit Approach. Its potential to emit at the time was 65,000 tons/year of VOC, and it had recently emitted about 10,600 tons/year. Assuming it accepts a Clean Unit permit limit, a 98 percent control level would likely be required (representative of BACT), which would establish a limit of 1,300 tons/year. Although the future changes may increase or decrease actual emissions, the Clean Unit Test would restrict their emissions to 1,300 tons per year (tpy) or else the Clean Unit status would be lost. Thus initially, the approach would achieve 9,300 tpy reduction in actual emissions, and the source would gain the flexibility to make its desired changes quickly.[10]

As seen in the examples above, particular sources can achieve emissions reduction benefits by controlling early and/or more extensively. These benefits are compared to major NSR, where the source may be required to install BACT eventually, but, in the interim, would forego environmental benefits and could face significant burden in reviewing each subsequent change to the clean unit. Such additional review would likely have resulted in no environmental

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[9]In this case, the benefits attributable to the Clean Unit test would be reduced if year-round operation of NO_x controls became mandatory. However, the Clean Unit provisions could still provide an incentive to reduce emissions earlier than required.

[10]An added benefit is that future *minor* increases at the unit, which would be allowed under the major NSR applicability, would also now be controlled a the 98% level.

benefit each subsequent time.[11] Thus, in this case, the Clean Unit approach would create an incentive to control more emissions sooner than the current rule, and it would ultimately result in significant administrative savings in the future.

Notwithstanding the benefits from sources who install or enhance pollution controls to get the Clean Unit Designation, the EPA expects that the most frequent applicants for the Clean Unit Test will be those who have already installed, or will otherwise be installing, state-of-the-art controls, and who are now seeking Clean Unit Designation in order to avoid the administrative burden of potential duplicative review for changes at the already well-controlled unit. In this case the environmental benefits of the air pollution control have already been realized, and are not counted again in this analysis. However, the EPA notes that nothing in the Clean Unit Test would allow backsliding of emissions limitations on these already well-controlled units.

A second piece of the environmental impact of the Clean Unit Test is the question of whether environmental benefits from the current rule are lost due to the NSR avoided during the10-year duration of the Clean Unit designation. In other words, are existing units with a Clean Unit designation able to keep operating with inferior controls when major NSR would result in the installation of superior controls? To answer this question, the EPA initiated a review looking at the evolution of BACT controls over time. In order to qualify for the Clean Unit Test, a facility must have installed controls comparable to BACT. Therefore it is helpful to look at the evolution of BACT controls to see how likely it is that a BACT decision for a well-controlled unit at the end of a 10-year clean unit period would result in controls that are significantly more effective than those resulting from a BACT decision at the beginning of the 10-year period. Under the current rule, the controls would have to be significantly more effective in order to justify the cost and other impacts of dismantling of the controls in place and the retrofit of the new control system. We evaluated 10-year periods because the 10-year period is provided for in the final NSR Improvement rule. To conduct this review, the EPA relied upon the best available historical database of BACT determinations, known as the RACT/BACT/LAER Clearinghouse (RBLC). We initiated a study looking at the evolution of control devices and control efficiencies for the higher-emitting source categories (we excluded electric utilities from this particular study, because we are presenting a more detailed discussion for utilities below), selected based on the availability of determinations contained in the RBLC from 1986 to the present.[12] The study report is found in Appendix C of this document.

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[11]This is true so long as there is not dramatic evolution in BACT-level controls over the time frame of the Clean Unit Designation (10 years), a point we address later in this section.

[12]The source categories were selected to cover those which had the greatest number of determinations in the database, and, where available, those which comprised the higher-emitting source categories. The 11 source categories selected constitute about 53 percent of all the determinations in the database.

In general, the study found that, from 1988 to 2002: (1) for a given criteria pollutant, no obvious trends were evident in the level of control based on individual control devices; (2) for a given pollutant, no trends were evident in the level of control considering all control devices together; (3) the types of control devices used for a particular pollutant across industry categories remained consistent; and (4) the types of control devices used within a given source category remained consistent for each pollutant. Thus, on an overall basis, the EPA did not find any data to suggest that, over the 10-year time frame, improvements in control technology are occurring that are of sufficient magnitude to lead to BACT determinations requiring replacement of control systems on existing clean units. The EPA observes that modest improvements in control technology have occurred, and control costs have decreased, which has resulted (and will continue to result) in gradual improvement in controls for new units and new greenfield sources. However, this analysis is focused on existing units, and we find nothing in this analysis that suggests that the control requirements for existing clean units under NSR Improvement would be less than under current NSR rules.

For coal-fired utilities, the EPA has made a detailed review of the evolution of control technologies for SO_2, NO_x, and particulate matter emissions since the 1970s. This review is described in a report which is presented as Appendix D to this report. The review found that the types of control devices were relatively stable for coal-fired utilities over 10-year time horizons. Despite steady improvements in the effectiveness and affordability of these controls for new sources, there is no reason to believe, based on this review, that any such improvements during the 10-year period would, under the current rule, justify the significant cost of removing the controls from an already well-controlled existing unit, and retrofitting a newer system that would take advantage of these improvements. Thus, for utilities, the EPA also finds nothing to suggest that the control requirements for existing clean units under NSR Improvement would be less than under current NSR rules.

Therefore, our review shows that, for clean units, over 10 year time-frames, older technology is likely to remain as BACT under current as well as new rules. Furthermore, even if this replacement of controls were required in some cases, the benefits in such cases would be relatively small, and, since these instances would be rare, the change in overall environmental benefit would be negligible. The result is that the Clean Unit Test is essentially as effective as the current rule at promoting the installation of state-of-the-art controls. Coupled with the benefits described earlier, we have determined that the Clean Unit Test is likely to result in a small environmental benefit.

C. The Pollution Control Project Exclusion

In certain cases, the NSR regulations can serve as a disincentive for sources seeking to implement environmentally beneficial projects because the costs and delays associated with NSR can render otherwise environmentally beneficial projects uneconomical. This occurs when an otherwise environmentally beneficial project triggers NSR because it increases the emissions of some pollutant other than the ones being controlled (sometimes called a “collateral increase.”) A simple example is a thermal incinerator which dramatically reduces VOC and HAP, but can increase NO_x because of the combustion process involved. The pollution control project (PCP) exclusion removes this disincentive for environmentally beneficial projects, a step which we expect will result in an overall environmental benefit as beneficial projects that would not otherwise go forward are now undertaken. The EPA is confident that the environment will benefit from the PCP exclusion because the rule requires that a permitting authority determine that projects be environmentally beneficial, or that projects be selected from a list of projects that are presumptively environmentally beneficial, before they can qualify as a PCP. Furthermore, it is important to note that, like the current PCP exclusion, the final rule includes provisions to assure that any project must be evaluated to assure that collateral increases are minimized, that no National Ambient Air Quality Standard (NAAQS) or air quality increment will be violated and no adverse impacts will occur in a Class I area. In addition, in a nonattainment area, the increases of the nonattainment pollutant must still be offset, even as the overall project is environmentally beneficial.

The PCP exclusion has been implemented under the current rule since 1994.[13] While EPA believes there are certainly benefits to removing barriers to PCPs, the policies in effect under the current rules have already achieved some of these benefits in a limited fashion. Thus the true measure of the benefits of the rule change relates to whether the NSR Improvement Rule will promote greater use of PCPs. Measured against the current rule, under which several environmentally beneficial projects per year have qualified for the exclusion, we expect that the NSR Improvement rule will promote an increase in the number of projects that qualify, and that additional environmental benefit will result from those projects. This is because the final rule contains a number of elements which clarify and streamline the approval of pollution control projects, and which will add more certainty to the process as compared to the current policy. The greater certainty and reduced delay will likely result in more PCP applicants. Furthermore, the PCP exclusion in the final rule broadens the definition of what types of environmentally beneficial projects may be eligible for the exclusion. As a result, we predict an increase in the number of PCPs under NSR improvement.

Regarding the impact of these changes, we presently estimate that the environmental benefits from pollution control projects can range from about the same as the collateral emissions increase, to orders of magnitude greater than the collateral increase. A more detailed explanation of how EPA arrived at this estimate is contained in Appendix E to this report. Currently, we estimate that the overall reductions from the PCP exclusion are small – probably on the order of a few thousand tons each year – due to the small number of projects of which we are aware. As such, an increase in the number of PCPs will enhance these benefits to the extent that more PCPs will be undertaken. However these overall reductions will likely vary widely from year to year and across pollutants. Furthermore, this discussion does not take into account

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[13]Furthermore, a 1992 NSR rule for electric utility steam generating units promulgated a pollution control project exclusion for that source category. This exclusion remains in effect, but is being harmonized with the overall PCP exclusion provisions. Thus, we expect no discernible impact from the rule changes for this source category.

the possibility that States are approving PCPs for which EPA does not have data. Such a possibility means that the order of magnitude estimate here may be an overestimate or an underestimate of the benefit, but does not change the overall point that the NSR Improvement provisions slightly enhance the environmental benefits that occur under the previous PCP exclusion.

Based on this estimate, we expect to see a modest increase in the total number of pollution control projects, and their associated environmental benefits, as a result of NSR Improvement. However, because of the voluntary and case-specific nature of these projects, we cannot at this time model how many or what types of additional pollution control projects will occur. Thus, while there are environmental benefits that will occur along the lines of those described in the preceding paragraph, we cannot reliably estimate their overall magnitude. To provide some context, the EPA notes that the PCP exclusion is not available to new sources, and further, that the exclusion, as noted above, is already in place for electric utility steam generating units. Nonetheless, the EPA has determined that removing the PCP disincentives at existing non-utility sources will result in a small net environmental benefit, and the safeguards described above serve to reinforce this conclusion.

D. Actual Emissions Baseline

The EPA believes that the environmental impact from the change in baseline EPA is now finalizing will not result in any significant change in benefits derived from the NSR program. Our analysis supporting this conclusion is contained in Appendix F. In general, this analysis finds that, while it is very difficult to model source behavior sufficiently to predict whether emissions benefits will be lost or gained as a result of NSR Improvement, in either case the magnitude of the change is likely to be very small. As described in Appendix F, the rule change will not alter the baseline at all for most sources, including (1) new sources, (2) modifications in the largest-emitting category, coal fired power plants, (3) modifications at any source where emissions have been highest in recent years, and (4) modifications at any source where emissions have been relatively stable. Together these categories comprise an estimated 90 percent of emissions benefits from the NSR program.

Furthermore, for the remaining case, where recent emissions are low compared to the past, a source cannot qualify for a significantly higher baseline emissions level if the present emissions are lower as a result of enforceable controls or other enforceable limitations that have gone into effect since that time – which is true an estimated 70 percent of the time. Indeed, such sources could face more stringent baselines under the current rule if controls are applied toward the end of the baseline period. This leaves only the case where emissions are lower as a result of decreased utilization due to decreased market demand, some kind of outage, or other circumstance. Even in this case, it is not clear that a different baseline would always result, because the source is eligible, under current rules, to request a more representative baseline than the previous two years. It is reasonable to assume that sources facing recent drops in utilization would be able to make credible cases to their permitting authorities that the recent levels were not representative of normal operation. However, we cannot draw specific conclusions about how many sources would or would not receive alternate baselines, nor, it follows, can we estimate what emissions consequences, if any would result. However, because the number of sources receiving different baselines likely represents a very small fraction of the overall NSR permit universe, excludes new sources and coal fired power plants, and because the baseline may shift in either direction, we conclude that any overall consequences would be negligible.

E. Actual-to-Projected-Actual Test

Appendix G describes the environmental impacts of switching to an actual-to-projected-actual test for sources other than electric utility steam generating units. On the one hand, as the analysis discusses, the current actual-to-potential methodology discourages certain environmentally beneficial changes and actually provides an incentive to keep actual emissions high. As described in the Appendix, through removing incentives to keep pollution high, and through removing barriers to emissions-reducing changes, EPA has determined that there will be environmental benefits that result from switching to the actual-to-projected-actual test, but it is very difficult to model the behavior of individual sources in sufficient detail to quantify these benefits nationally.

On the other hand, there are could be cases where, as described in Appendix G, hypothetical emissions increases could trigger NSR under the actual-to-potential test but not under the projected actual test. The EPA has determined that under the current rule, these changes virtually always take permit limits to avoid NSR. In such cases, the rule is environmentally neutral. While the actual-to-projected-actual test would reduce the number of sources who would need to take permit limits, we find that the environmental benefit of these permit limits is effectively preserved because any source projecting no significant actual increase must stay within that projection or face NSR.

For these reasons, we believe that the environmental impacts of the switch to the actual-to-projected actual test are likely to be environmentally beneficial. However, as with the change to the baseline, we believe the vast majority of sources, including new sources, new units, electric utility steam generating units, and units that actually increase emissions as a result of a change, will be unaffected by this change. Thus, the overall impacts of the NSR changes are likely to be environmentally beneficial, but only to a small extent.

IV. CONCLUSION

In conclusion, the EPA has determined that the overall effect of the NSR Improvement rule will be a net environmental benefit. This report illustrates the serious limitations on our ability to quantify this impact. Nonetheless, the analysis shows that, collectively, the five NSR Improvements that the Agency is finalizing will be environmentally beneficial compared to the current program, and will improve air quality by reducing emissions from industrial facilities. These reductions are relatively small compared to other regulatory programs. For PALs, EPA finds that there are likely to be emissions reductions of tens of thousands of tons per year from just three industrial categories, and that overall reductions will likely be even more than this amount. For the Clean Unit Test and the exclusion for Pollution Control Projects, EPA finds that emissions reductions will also result compared to the current program. The analysis finds that the actual-to-projected-actual test is also likely to be environmentally beneficial, but only to a small extent. Finally the analysis finds that the change in emissions baseline will affect a very small number of facilities, and the overall consequences of the baseline change will be negligible.

Thus, of the five changes discussed, varying levels of emissions reduction benefits are likely to result from four of them, and the other (10-year baseline) likely has no significant effect one way or the other. Thus, overall, we expect net emissions reduction benefits to result from NSR Improvement. As the attached analyses show, benefits come primarily from reductions in criteria pollutants and their precursors, but the removal of barriers to environmentally beneficial projects can also result in reductions of HAPs, greenhouse gases, ozone depleting substances, etc. Although we expect the benefits from this rule to be relatively small, there are nonetheless notable benefits to reducing criteria pollutant concentrations, Such benefits include (but are not limited to) reductions in incidences of premature mortality, chronic asthma, asthma attacks, chronic and acute bronchitis, other chronic respiratory diseases and damage, lung inflammation, respiratory cell damage, respiratory infection, infant mortality and low birth weight, cancer, and various cardiovascular effects. Benefits from reducing these effects can include fewer lost work days, fewer emergency room visits for respiratory and cardiovascular effects, and fewer hospital admissions for respiratory and cardiac diseases. Potential benefits beyond human health benefits include reductions in damage to plants and forests, improved yields for crops and forest products, improved ecosystem function, improved visibility, less corrosion and soiling of buildings and monuments, less eutrophication, and less acidic deposition and acidification of water bodies.

As a result, we expect the overall health impact from this rule to be a net benefit, although, again, there are serious limitations on our ability to quantify this benefit (*i.e.*, to predict how many fewer asthma cases will result from the rule). Furthermore, a variety of economic benefits – not discussed in this document – are also expected to result from these long-awaited reforms. While we believe that these economic benefits are a critical reason to complete the NSR improvement effort, it is clear from this analysis that some degree of health and environmental benefit can be expected from the final rule as well.

APPENDIX A

FLEXIBLE PERMIT PILOT EVALUATION REPORT

Evaluation of Implementation Experiences with Innovative Air Permits

Results of the U.S. EPA Flexible Permit Implementation Review

SUMMARY REPORT

Report prepared by:
EPA Office of Air Quality Planning and Standards (OAQPS)
EPA Office of Policy, Economics and Innovation (OPEI)

In consultation with:
EPA Office of Enforcement and Compliance Assurance (OECA)
EPA Office of General Counsel (OGC)
EPA Office of Policy and Review (OPAR)

With support from:
Ross & Associates Environmental Consulting, Ltd.
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and
Midwest Research Institute

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Executive Summary

Background

In recent years, the U.S. Environmental Protection Agency (EPA) and some State and local permitting authorities recognized a change in the manufacturing landscape. This change arose in today's increasingly competitive global markets, requiring companies to respond rapidly to market signals and demand, while delivering products faster, at lower cost, and of equal or better quality than their competitors. As their market response and product development time frames shrank, companies in several industries perceived the potential administrative "friction" – costs, time, delay, uncertainty, and risk – resulting from operating under conventional air permitting approaches to increase. This raised an important question: how to provide these U.S. companies with the "flexibility" to compete effectively in global markets without decreasing environmental protection? At the same time, the EPA and others sought ways to align the regulatory framework to encourage emissions reduction and pollution prevention.

To address these challenges, the EPA and several State and local permitting authorities worked with selected companies over the past few years in the context of individual permit pilots to develop innovative approaches to air permitting. The EPA and the States launched these efforts to increase sources' operational flexibility while ensuring environmental protection and facilitating pollution prevention. Permitting authorities involved in these pilot initiatives designed permits within the existing regulatory framework to address all applicable air requirements. As interest in innovative approaches to air permitting increased, the EPA evaluated the implementation experience with "flexible" permitting techniques developed under pilot permitting efforts, such as the EPA's Pollution Prevention in Permitting Program (P4) and various State innovation initiatives. The EPA believes that careful evaluation of the implementation experience with such flexible permits can improve the effectiveness and efficiency of future efforts and help to inform evolving air policymaking activities in these areas. The EPA launched the Flexible Permit Implementation Review to meet these objectives.

What Is Flexible Air Permitting?

The term "flexible permit" is used in this report to describe air permits with conditions designed to reduce the administrative "friction" – costs, time, delay, uncertainty, and risk – experienced by sources and permitting authorities when implementing a permit or making certain changes under the permit. This is typically accomplished by allowing a source to make certain types of changes (e.g., modifications to a source's method of operation, equipment, raw materials, emission factors, or monitoring parameters) without requiring additional case-by-case permitting, provided the source meets certain criteria outlined in its operating or construction permit. Such criteria might include the maintenance of plant-wide emissions levels below enforceable caps. Over the past decade, the EPA and State and local permitting authorities have also piloted specific permitting techniques and tools to accomplish advance-approval for certain types of changes that might take place over the course of a permit term. While chosen solutions will depend on individual state permitting rules and requirements, such techniques typically include descriptions of advance-approved changes or categories of changes in the permit, procedures for testing pollution control device performance and updating emission factors or parameter values without requiring the permit to be amended or re-opened, elimination of redundant requirements by applying the most stringent applicable requirement, and provisions to explicitly encourage pollution prevention.

Flexible Permit Implementation Review Findings

The EPA launched the Flexible Permit Implementation Reviews to examine the implementation experience with innovative air permitting techniques. Under this initiative, the EPA assembled a Review Team, representing multiple EPA offices supplemented by contractor support, to conduct in-depth reviews of six pilot permits with innovative flexibility provisions and sufficient operating history. These pilot permits were developed for the following companies: 3M, DaimlerChrysler, Imation, Intel, Lasco Bathware, and Saturn. The reviews included detailed analyses of source and permitting authority experiences developing and implementing flexible air permits, based on review of information in the public record, discussions with source and permitting authority personnel, site visits to the source and permitting authorities, and verification of recordkeeping and emissions calculation requirements.

The EPA's review and analyses support the following findings for the six flexible permits covered in this review.

Finding 1: The flexible permits contain adequate measures to assure compliance with all applicable requirements.

Permitting authorities and the EPA found that the flexible permits contained monitoring, recordkeeping, and reporting mechanisms sufficient to assure that identified regulatory requirements are met and that appropriate measures are in place. The EPA Review Team did find, however, that certain topics related to renewal of flexible permits warrant further discussion and clarification. These topics include determining acceptable approaches for adjusting plant-wide emissions caps at permit renewal, and determining acceptable approaches to transition back to conventional permitting approaches if flexible permits are allowed to expire.

Finding 2: The flexible permits were considered to be enforceable by permitting authorities and EPA.

A key objective was to verify that the flexible permit provisions are enforceable by permitting authorities and the EPA. The six permitting authorities involved in the pilots all reported the ability to detect non-compliance with flexible permit conditions and to enforce the permit requirements, and expressed certainty that permit requirements could be enforced, had the need arisen. For all permits, the EPA was able to replicate the emissions calculations for selected time periods to demonstrate compliance. Permitting authorities reported that conducting inspections of sources with flexible permits is comparable to conducting inspections of sources with conventional permits.

Finding 3: The flexible permits facilitated and encouraged emissions reductions and pollution prevention.

The flexible permits contain mechanisms designed to facilitate and encourage emissions reductions and pollution prevention (P2). Five of the sources with flexible permits lowered actual plant-wide emissions during their permit terms, and the sixth source lowered its emissions per unit of production during the permit term. For example, using pollution prevention (P2), Intel lowered actual emissions of volatile organic compounds (VOCs) from 190 tons/year to 56 tons/year while increasing production. After a substantial voluntary reduction of VOC emissions from 10,000 tons/year, 3M further lowered its actual VOC emissions from 4,300 tons/year to below 1,000 tons/year. This reduction resulted primarily from increased pollution control device performance, greater use of voluntary controls, P2, and reduced production. DaimlerChrysler lowered its actual VOC emissions from 1,400 tons/year to less than 800 tons/year, primarily through P2 associated with vehicle coatings and plant solvent usage.

The plant-wide emissions caps focused organizational attention on reducing plant-wide emissions. In many cases, the advance approved change provisions reduced the administrative "friction" associated with P2 changes, making such changes more attractive for sources to undertake. The flexible permits increased internal awareness and focus on pollution prevention at the sources through explicit P2 program, reporting, and/or performance requirements.

Finding 4: Companies with the flexible permits believe that air permitting is on their critical response path.

Each of the sources with flexible permits reported that conventional permitting approaches can constrain their ability to compete effectively. The combination of increasingly globalized competition and a shift to new modes of production substantially increased the pressure to operate highly flexible, nimble, and responsive research, development, and production operations. For example, competitive pressures and computer design advances in the automotive sector have compressed the new vehicle development process from five years to less than 18 months, requiring increasingly flexible production systems and time sensitive equipment changes. For products in the semiconductor and specialty tape industries, competitive pressures frequently cause certain products to become obsolete within six to nine months, as customers' specifications change and technology evolves. Advance production concepts, such as lean manufacturing, designed to help firms compete effectively, require rapid, and often iterative, operational and equipment changes for continuous improvement of resource productivity, operational efficiency, and product quality. For these reasons, companies report that conventional case-by-case permitting actions can be problematic due to the potential delay and uncertainty of final permit actions. Companies with flexible permits identified similar needs at other facilities and are interested in pursuing flexible permits for those facilities.

Finding 5: Companies with the flexible permits utilized their flexibility provisions.

Flexibility provision utilization during the permit terms exhibited rates and types of changes consistent with the needs expressed by the companies during permit development. The actual number of changes made using advance approval and other flexibility provisions varied by source, with Intel implementing the most changes (e.g., approximately 150 to 200 equipment and operational changes per year). Other companies implemented fewer changes (e.g., more in the range of 20 or fewer changes per year), but emphasized that the relative value of making certain critical changes can be more important than the number of changes made. Some companies did not utilize all of the flexible permit provisions, but generally anticipated using the flexibility provisions in the future. The flexible permits accommodated a substantial number of advance approved changes while providing sufficient clarity in describing the advance approved changes to ensure enforceability. Additionally, flexible permits facilitated an increase in the rate and a shift in the type of changes made, when compared to what might have occurred under a conventional permit.

Finding 6: The flexible permits enhanced information sharing between the companies and permitting authorities.

The flexible permits enhanced the permitting authorities' overall understanding of company activities and emissions as compared to conventional permitting approaches. The flexible permit development process provided the permitting authorities with a clearer understanding of the maximum emissions levels anticipated during the permit terms. During permit development, companies provided more information regarding the type of changes anticipated during the permit term. This provided a more comprehensive, up-front picture of anticipated operational activities and associated environmental performance than a conventional permitting process.

During permit implementation, information about a company's specific changes under the advance approval provisions was generally comparable to information provided under a conventional permitting process. The flexible permits also required information about total source emissions and pollution prevention that is not typically required under conventional permitting.

Finding 7: The flexible permits generally provided to the public equivalent or greater information than

conventional permits.

The flexible permits shifted the timing, type, and format of information made available to the public about emissions performance, operational and equipment changes, and P2 activities. The specific format, timing, and availability of certain types of information required by the flexible permits varied, particularly for advance approved changes. In all cases, the flexible permits provided more information up-front about operational changes (or categories of changes) that the sources anticipated making during the permit terms. This provided the public with an opportunity to understand and comment on the companies' anticipated changes. During permit implementation, four of the flexible permits provided equivalent or greater information for specific changes made under the advance approval provisions, although in a different format and timing than typically available under conventional permitting. In two cases, the pilot permits resulted in less information about certain changes implemented under the advance approval provisions. In the areas of total plant-wide emissions information and/or P2 information, all of the pilot permits increased the availability of information to the public for the companies' emissions and activities. For all six permits, the permitting authorities indicated that, on balance, the flexible permits improved the availability of information to the public, ensuring the flow of significant and meaningful information regarding the current status and future direction of operations and emissions.

Finding 8: The flexible permits produced or are anticipated to produce net financial benefits to companies and permitting authorities.

Companies and permitting authorities reported that the flexible permits resulted in net financial benefits or are anticipated to do so in the future. Companies and permitting authorities indicated that initial permit development costs exceeded those required to develop conventional permits because of the innovative nature of the permits and additional resources associated with developing site-specific flexible permit provisions. In each case, however, companies and permitting authorities reported that the flexibility provisions decreased, or are expected to decrease, the administrative costs of operating under the permit to more than offset the initially higher permit development costs. Companies reported that the potential opportunity costs of project delays from air permitting can be high, ranging as high as several million dollars in just a few days. In so far as flexible permits can minimize project delays, the economic benefits to companies can be correspondingly large. Permitting authorities typically reported that the additional permit development costs for flexible permits were offset by resource savings within the first three years of permit implementation.

Finding 9: Permitting authorities are generally supportive of flexible permits as an option.

The six permitting authorities involved in the flexible permits indicated that they are pleased with the environmental and administrative benefits of the permits. They believe flexible permitting techniques are useful tools to address some sources' operational flexibility needs, to foster environmental improvements through emissions reductions, and to reduce required permitting resources and backlogs for permitting. This increased permit efficiency allows the public agencies to focus resources on higher environmental management priorities. Permitting authorities expressed interest in renewing the flexible permits and expanding the use of flexible permits within their jurisdictions and believed that finalization of EPA policy and/or guidance for flexible permits should increase national interest and efficiency in expanding their use. Additionally, permitting authorities stated that various forms of EPA outreach, training, and assistance would be useful to assist permitting authorities to develop effective flexible permits.

Finding 10: Permitting authorities indicated that flexible permit provisions should be matched with a company's need for flexibility and technical capacity to implement effectively its flexible permit requirements.

Permitting authorities believe that flexible permits meet applicable requirements and are fully enforceable. However, such permits may not be appropriate for all sources. Permitting authorities believe that two critical factors should be considered when determining the appropriateness of flexible permitting for a particular company. First, the company should be able to demonstrate that it has a sufficient need for the flexibility to justify the additional up-front permitting authority time and resources required to develop flexible permit provisions for the company. Second, the company should exhibit the technical capacity to operate effectively under a flexible permit. Factors such as a source's compliance history, commitment to pollution prevention, and ability to track and manage operational changes and emissions should be considered by permitting authorities when determining the appropriateness of a flexible permit for a company.

I. Introduction

A. Project Scope and Purpose

Over the last several years, the U.S. Environmental Protection Agency (EPA) and several State and local permitting authorities worked with several companies to develop innovative approaches to air permitting. The EPA and States launched these pilots to increase operational flexibility while ensuring environmental protection. Permit developers sought to encourage and facilitate emissions reductions and pollution prevention with the flexible permits. The permits were also designed to reduce the administrative "friction" – costs, time, delay, uncertainty and risk – associated with making certain types of operational and equipment changes. Additionally, permitting authorities desired to reduce the resources needed for case-by-case applicability determinations and for the approval process of subject minor and major New Source Review (NSR) permit applications and other permitting amendments. Permitting authorities designed these "flexible permits" within the existing regulatory framework (i.e., approaches were not precluded under any relevant Federal or State regulation) to address all applicable air requirements.[1]

As interest in flexible air permitting increased, the EPA saw the need to evaluate the implementation experience with flexible permits developed under pilot efforts such as EPA's Pollution Prevention in Permitting Program (P4) and State innovation activities. Particular interest has focused on flexible permitting techniques such as plant-wide emissions limits (e.g., plant-wide applicability limits, or PALs; potential-to-emit caps).

In response to this need, the EPA launched the Flexible Permit Implementation Review to conduct in-depth reviews of six flexible permits developed since 1993. The EPA's Office of Air Quality Planning and Standards (OAQPS) initiated this effort, in partnership with EPA's Office of Policy, Economics, and Innovation (OPEI). The EPA Office of Policy Analysis and Review (OPAR), the Office of General Counsel (OGC), and the Office of Enforcement and Compliance Assurance (OECA) provided support for this effort.

The purpose of the Flexible Permit Implementation Review is to help the EPA:

- Determine whether the flexible permits work as envisioned, providing the desired operational performance improvements and environmental protection.
- Obtain more detailed and better organized information regarding these efforts.
- Improve communication of the details and results of these efforts.
- Understand how such flexible permitting approaches might be improved.
- Assess the level of environmental benefit achieved under flexible permits.
- Learn how similar flexible permit development processes can be streamlined in the future.
- Provide input, as appropriate, into the final development of corresponding EPA policy.

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[1]The term "flexible permits" has been primarily used to describe permits with conditions that enable permitted sources to make certain changes (e.g., modifications to operations, equipment, raw material, emission factors, monitoring parameters) without requiring further case-by-case review and approval or permit modifications from the permitting authority. The term also encompasses those approved permit conditions which are sufficient to enable a more expedited permit revision process, but not to accomplish a full advance-approval. This report and its appendices use the terms "flexible permits," "flexible permit conditions," and "flexibility provisions" to denote permits and permit conditions that include such provisions related to advance approval. See Section D for a discussion of flexibility provisions examined by the EPA's Flexible Permit Implementation Review.

B. Structure of this Report

This report presents the EPA's findings from the Flexible Permit Implementation Review. The Executive Summary briefly addresses the review's purpose, scope, approach, and findings. The Introduction includes a more detailed account of the project purpose and scope (Section A), the structure of this report (Section B), and the review approach and process (Section C). Section D introduces the primary types of flexibility provisions that are included in the six flexible permits reviewed in this evaluation. Section E summarizes the flexibility provisions contained in the six flexible permits, and briefly discusses the sources' operations, emissions, emissions sources, and emissions control equipment. The Findings Section presents the EPA's ten major findings from this flexible permit evaluation. Each finding is explored in detail, drawing on examples from the six Permit Review Reports.

C. Review Approach and Process

The EPA's Flexible Permit Implementation Review involved detailed analysis of company and permitting authority experiences implementing six flexible air permits. To structure the six permit reviews, OAQPS developed a "Flexible Permit Review Framework" that includes specific evaluation questions grouped into eight areas of inquiry. The Flexible Permit Review Framework was developed by OAQPS in consultation with other EPA offices, including OPAR, OECA, OGC, and OPEI.

C.1 Flexible Permit Review Framework

The areas of inquiry in the Flexible Permit Review Framework are listed below. Each of the six Permit Review Reports accompanying this report are structured based on this review framework, and they include the specific questions and areas of inquiry that were addressed by the reviews.

- **Background**: This section examines background information on the permitting authority's structure, capacities, and processes; the pilot source's operations and characteristics; and the company's need for flexibility.

- **Flexible Permit Design Features**: This section examines the specific flexibility provisions contained in the permit and the terms which assure compliance with them, including monitoring, recordkeeping, and reporting requirements.

- **Public Participation and Public Perception**: This section assesses the public's participation in the development of the flexible permit through examination of the public involvement process and the record of public comments. It examines the flows of information during development and implementation of the pilot permit, and compares these to what might have been experienced under conventional permitting.

- **Implementation of Flexible Permit Provisions**: This section examines when and how flexible permit provisions were actually utilized by the source during permit implementation. It explores how the flexible permit implementation might compare to the experience under a conventional permit. This section also assesses the quality and quantity of information generated under the flexible permit and discusses any problems that were encountered.

- **Design Adequacy of the Flexible Provisions**: This section assesses whether the flexible permit design features, such as advance-approved change provisions, were adequate to assure compliance with all applicable requirements.

- **Practical Enforceability of the Flexibility Provisions**: This section assesses the ability of the source and permitting authority to determine compliance with the permit conditions and applicable requirements. It also examines the ease of inspection associated with the flexible permit.

- **Permit Costs, Environmental Benefits, and Value Added**: This section assesses the relative costs and benefits of the flexible permit to the source and permitting authority, as compared to a conventional permit. In particular, this section examines whether the permit actually provided desired flexibility to the source as well as equivalent or better environmental protection.

- **Other Issues**: This section addresses ways in which flexible permits can be improved and how the EPA can support such improvements in the future.

C.2 EPA Review Team

The EPA assembled a core Permit Review Team consisting of representatives from various EPA offices, including OAQPS, OPEI, and OECA. Ross & Associates Environmental Consulting, Ltd., under subcontract to the EPA through Industrial Economics, Inc., provided overall team coordination services and compiled review results. In addition, representatives from Midwest Research Institute, under contract to the EPA, participated in the reviews to support the EPA's evaluation of the emissions monitoring, recordkeeping, and reporting requirements and practices. At least six representatives from this group participated in each of the six individual permit reviews and associated site visits. In some cases, the EPA Review Team was supplemented by representatives from the EPA Regional Office in which the pilot permit was developed.

C.3 Permit Review Process

The Flexible Permit Review Framework was completed for each of the six flexible permits. This was accomplished through extensive off-site research, on-site visits to the source and the permitting authority, and a review process for finalizing responses to the Flexible Permit Review Framework. Prior to each site visit, preliminary responses to many of the review questions were drafted by the EPA and its contractors based on information collected through pre-site visit conference calls with each company and permitting authority. Background research also included review of the flexible permits and other publicly available records, including permit applications, public comments received during permit review or implementation, inspection reports, monitoring data summaries, compliance certifications, notices, and other records.

The on-site reviews consisted of visits to the source and the permitting authority. The EPA Review Team's one to one-and-a-half day visits were designed to collect and verify evidence and data to complete the Flexible Permit Implementation Review Reports. The EPA on-site reviews were *not* conducted as compliance audits of the sources. Rather, they assessed the company and permitting authority's experience with developing and implementing the flexible permits, so as to help improve similar permits in the future. The site visits included discussions with company and permitting authority personnel and a walk-through of the plant, as well as a detailed examination of on-site records, including monitoring data. Representatives from the permitting authority participated in the source site visits and discussions. The plant site visits were typically followed by a half-day visit of the EPA Review Team to the permitting authority offices to discuss specific aspects of the review framework relevant to the permitting authority. Company personnel did not participate in meetings and discussions at the permitting authorities.

Following each site visit, extensive steps were taken to ensure the accuracy of information catalogued in the Flexible Permit Review Frameworks. EPA contractors prepared initial drafts of the Permit Review Reports. EPA contractors conducted follow-up discussions, as necessary, with the sources and the permitting authorities to complete these draft Permit Review Reports. The EPA Review Team provided preliminary review and comment on the draft Permit Review Reports. The revised Permit Review Reports were then forwarded to the relevant company and permitting authority contacts for review and comment. Companies and permitting authorities were asked to verify the accuracy and completeness of the responses contained in the Permit Review Reports. Based on these comments, the EPA contractors worked with OAQPS and OPEI staff to finalize the six Permit Review Reports. This Summary Report was prepared by OAQPS and OPEI, with support from contractors, and was reviewed and commented on by other members of the EPA Review Team.

C.4 Flexible Permit Selection
EPA selected six pilot permits for review based on the following criteria.

- Extent of permit implementation and/or duration since permit issuance.
- Likelihood of source and permitting authority voluntary participation in the review.
- Number and type of flexibility provisions in permit.
- Unique features of flexible permit.
- Diversity of emissions and applicable requirements.
- Number of inspections completed.
- Relevance of permit to inform ongoing EPA efforts to develop policy.

Table 1.1 lists the six flexible permits selected for inclusion in the Flexible Permit Implementation Review (see end of report).

D. What Are Flexible Permit Provisions?

The term "flexible permit" is frequently used to describe pilot permits with conditions that reduce the administrative "friction" – costs, time, delay, uncertainty, and risk – experienced by companies and permitting authorities when making certain changes under the permit. Such changes could include modifications to a source's method of operation, equipment, raw materials, emission factors, or monitoring parameters. The six flexible permits examined in this review contain flexibility provisions which advance approve such changes or categories of changes. While flexible permit solutions will depend on individual state permitting rules and requirements, a variety of flexible permit provisions have been developed by the EPA and State and local permitting authorities to accomplish advance approval for a category of changes. Several types of flexible permit provisions utilized in permits reviewed in this report are summarized below.

D.1 Description of Advance-Approved Changes
The six flexible permits include descriptions that enable the advance-approval of specific changes and/or categories of changes. Advance approved change descriptions typically allow companies to make a fairly broad spectrum of modifications, eliminating the need for additional case-by-case review and approval by the permitting authority at the time the plant makes the change. Changes that trigger new applicable requirements (i.e., requirements unaddressed by the advance approval provisions) or require modifications to monitoring, recordkeeping, and reporting requirements are not advance approved. To implement advance approved changes, sources must maintain plant-wide emissions below applicable limits. In addition, they typically must submit notice to the permitting authority and maintain on-site logs providing documentation of the changes implemented under the advance approval provisions (e.g., the addition of a new emissions unit).

Some of the flexible permits contain provisions that only partially advance approve particular types of changes, providing a streamlined review and approval process. Permitting authorities believe this to be useful as an interim approach for certain types of changes and review requirements. For example, a flexible permit might advance approve a set of changes to which a source must apply best available control technology (BACT). The permit, however, could preserve the conventional process for public comment on the company's proposed BACT approach, as well as the permitting authority's opportunity to reject or comment on the proposed BACT approach at the time of the change.

D.2 Plant-wide Emissions Limits

All six flexible permits contain one or more plant-wide caps on emissions of Volatile Organic Compounds (VOC) and/or criteria air pollutants. These emissions caps typically included annual/12-month rolling limits (e.g., tons/year) and short-term limits (e.g., pounds/hour) that cover emissions from all emissions sources at a plant, including any that may be "grandfathered" under the Clean Air Act.

Emissions caps can function in different ways. First, caps can serve as a basis for ensuring new applicable requirements are not triggered. In other words, caps can be set in such a way that (as long as there is no violation of the limit) new applicable requirements will not be triggered. Potential-to-emit (PTE) caps typically establish "synthetic" minor source status for applicability purposes under one or more regulations by setting a limit on plant-wide emissions below the emissions threshold that would trigger major source status. In addition, for major sources, Plant-wide Applicability Limit (PAL) baselines are typically set at an average of the actual plant emissions for the previous two years (or another more representative period) plus 39 tons/year, an increment just under the Significant Emissions Rate (SER) for VOC emissions of 40 tons/year that would trigger major New Source Review.[2] In another variation, Oregon rules establish an annual and short-term Plant-Site Emissions Limit (PSEL) for sources in the State, based on each source's actual emissions in 1978, that is contained in the State Implementation Plan (SIP). The PSEL also functions to define the aggregate emissions level below which major NSR would not apply to changes made at the site. Short-term emissions caps, where required, also act to assure that the advance approved changes in combination with existing emissions do not adversely impact the National Ambient Air Quality Standards (NAAQS) (in attainment areas). Finally, emissions caps serve to bound the magnitude of advance approved changes so as to define them in a reasonably anticipated alternative operating scenario for title V permitting purposes. Often, when more than one cap was involved, these caps can be streamlined into one plant-wide emissions limit (i.e., combined into the most stringent form) so as to serve multiple functions at the same time.

D.3 Replicable Testing Procedures

Several of the flexible permits contain replicable testing procedures that enable sources to update the monitored parameter levels of concern (e.g., pollution control device efficiencies, emission factors), based on approved testing results, without requiring a permit modification. Permit provisions describe the replicable procedure to be used when testing and updating parameters, and the actual parameter values are documented in required correspondence between the permitting authority and company, which are maintained at the source and in the permitting authority's files along with the permit.

D.4 Applicable Requirement Streamlining

Pursuant to EPA guidance presented in White Paper Number Two, several of the flexible permits streamlined applicable requirements to reduce permit complexity. In these instances, overlapping and redundant requirements were subsumed under the most stringent requirement(s). This technique was particularly effective when it was used as part of a "clean building" approach. A "clean building" is a separate structure or collection point within a plant site containing emissions units that are (or will be in the case of new units) routed to one or more dedicated, state-of-the-art air pollution control devices. To advance approve modifications or new unit additions in a "clean building" with respect to all technology-based requirements, the control device must assure compliance for all the advance approved changes (as well as for all unchanged existing operations in the same building) with the most stringent requirement that could apply to any of the activities being advance approved to occur within the "clean building."

D.5 Pollution Prevention Provisions

Several of the flexible permits contained explicit pollution prevention (P2) conditions designed to focus greater plant attention on P2 and to take full advantage of the P2 that often takes place when flexible permit

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[2] This assumes the sources is in an attainment area. SERs also differ depending on the pollutant in question.

provisions are established. These conditions ranged from P2 program development and reporting requirements to enforceable P2 performance targets.

E. Pilot Permit and Source Characteristics

While the flexible permits contain provisions to accomplish advance approval that are generally similar, each permit has a unique combination of conditions that are tailored to the company's flexibility needs, operations, and State-specific requirements. This section introduces the six flexible permits evaluated by the EPA's Flexible Permit Implementation Review. Table 1.2 highlights the key flexibility provisions in each permit (see end of report). The company operations, emissions sources, and emissions control equipment are summarized below. Detailed descriptions of source characteristics, flexible permit provisions, monitoring requirements, and other background information are available in the six Permit Review Reports.

3M Company - St. Paul, Minnesota
3M's St. Paul tape plant manufactures more than 550 specialty tape products, including automotive and medical tapes, graphics tape, offset printing tape, and foam and double-sided tapes. To produce tape products, adhesives are mixed at the plant and then applied to a tape backing, or "web", on one of 18 coaters. The coated web is fed through ovens to volatilize excess solvent from the adhesives, and is then wound into rolls and cut for packaging and shipment. VOC emissions result from volatilized solvents coming off the adhesive mixing areas and evaporation ovens and are controlled through a highly efficient regenerative thermal oxidizer (RTO). The flexible permit, issued in 1993, was needed to provide for an extensive program of renovations to maintain the long-term viability of this plant in 3M's network of plants.

DaimlerChrysler Corporation - Newark, Delaware
DaimlerChrysler's Newark Assembly Plant (NAP) began producing the Dodge Durango, a sports utility vehicle, in 1997. While vehicle production levels tend to be cyclical due to model changeovers and economic demand cycles, vehicle production in July 2001 was about 600 vehicles per day (200,000 vehicles/year). The NAP's initial flexible permit, issued in 1995, enabled the source to retool for Durango production and to construct a new vehicle coatings building adjacent to the assembly buildings. Most VOC emissions result from the various steps in the vehicle coating process (e.g., electro-coat dip tanks, paint booths, curing ovens), and are controlled through pollution prevention (P2) efforts and, to a lesser extent, by a regenerative thermal oxidizer. The NAP emits criteria pollutants (PM_{10}, SO_2, NO_x, and CO) from operation of the thermal oxidizer, five boilers, paint curing ovens, and other combustion sources.

Imation Corporation - Weatherford, Oklahoma
Imation's Weatherford plant consists of two separate buildings. The North Building houses Printing and Publishing Division operations and manufactures products for the graphics arts and printing industries. Digital and conventional proofing systems are produced by coating thin films with colored, solvent-borne solids. The South Building contains Data Storage Division operations and produces data storage products such as computer diskettes. VOC emissions result from the solvent-borne coatings as they are mixed, applied to the film, and heated in curing ovens. Production areas are maintained with negative pressure and VOC emissions from the coaters and ovens are routed to voluntarily installed pollution control devices, including a regenerative thermal oxidizer, a catalytic oxidizer, and a carbon absorber. The pollution control equipment, two on-site boilers, and other miscellaneous combustion sources emit criteria pollutants. The design of the permit was critically needed for Imation to test new raw materials and processes in a timely manner.

Intel Corporation - Aloha, Oregon
Intel's Aloha, Oregon semiconductor fabrication plant produces semiconductor chips for use in computers and other electronic devices. An iterative sequence of steps, including application of photoresist, UV light exposure, developing, etching, rinsing with deionized water, doping, and rinsing with acid and solvent is

employed to transform silicon wafers into semiconductors. Plant air emissions consist of VOCs and organic and inorganic hazardous air pollutants (HAPs) from production processes and cleaning activities, as well as criteria pollutants from on-site boilers. The flexible permit was designed to rely primarily on a campaign of P2 to advance approve a myriad of small equipment changes and process modifications.

Lasco Bathware - Yelm, Washington

Lasco's Yelm source produces fiberglass reinforced plastic (FRP) bathtubs, shower stalls, and whirlpools. The source operates a gelcoat line and an acrylic line. Coats of plastic and fiber-reinforced resins are sprayed in successive layers into molds (gelcoat line) or on preformed acrylic plastic sheets (acrylic line). Styrene emissions result from the spray booth operations. Lasco, through P2, limited its emissions per unit of production so as to allow greater overall production under its emissions cap. During the flexible permit term, Lasco also installed a regenerative thermal oxidizer to control these VOC emissions from various steps in the gelcoat line.

Saturn Corporation - Spring Hill, Tennessee

Saturn operates an integrated automotive production plant that produces a range of Saturn-brand vehicles. Production, which peaked in 1996 at 314,035 vehicles, has declined in recent years due to weakness in the subcompact car market segment. The flexible PSD permit, issued in June 2000, has enabled Saturn to retool to produce a new, fuel-efficient sport utility vehicle, the Saturn VUE™. VOC emissions result from the vehicle paint lines and the lost-foam aluminum foundry operations. VOC emissions are controlled by eleven recuperative thermal oxidizers, two regenerative thermal oxidizers, and a hybrid carbon adsorption/thermal oxidation system. Criteria pollutants arise from operation of the pollution control equipment, ovens, boilers, and other miscellaneous natural gas combustion sources. The Saturn PAL PSD permit is a hybrid permit consisting of a PSD permit for a major expansion with permitted emissions based on projected future actual emissions in combination with a PSD permit for existing emissions units with allowable emissions based on current actual emissions at the existing emissions units.

II. Findings

Drawing on information collected through the Flexible Permit Implementation Review, the EPA identified the following findings. Where appropriate, specific examples are drawn from the six individual permit implementation experiences. Readers should refer to the six Permit Review Reports for the full details of the individual permit reviews.

Finding 1: The flexible permits contain adequate measures to assure compliance with all applicable requirements.

Evaluation of the design adequacy of the flexible permits requires consideration of the objectives of the permit developers. Permitting authorities generally had two primary objectives in mind. The first was to ensure that all applicable air requirements were met. This design objective meant that the flexible permits were developed to function within the current regulatory framework without new rulemakings. The permit design teams believed that it was imperative to address all substantive requirements (e.g., technology, emissions performance, or work practice requirements) and procedural requirements (e.g., public notification, review, and comment processes; and reporting and information availability requirements). If any applicable requirement were omitted, this could necessitate obtaining construction approval and/or revising the operating permit solely to address the missing applicable requirement. This would erode most, if not all, of the potential benefits from advance approval of the other applicable requirements. The design challenge was to do so through techniques and altered administrative practices that would improve company and permitting authority operational performance and promote P2. The second design objective focused on improving the performance, or outcomes, achieved under the permit when compared with performance that would likely be experienced under a conventional permit. Specific aspects of this performance improvement goal are addressed later in this report.

All of the permitting authorities stated that the flexible permits were fully supported by current Federal and State rules. They believed that no rulemaking was required to support any of the flexible permitting efforts. While many of the flexibility techniques are not explicitly described or addressed in existing rules, the permitting authorities determined that current rules accommodated the flexible permits, since no existing regulation expressly precluded them and because the approaches did not bypass established substantive and procedural regulatory requirements.

In several cases, rule interpretations were important to enable certain flexibility provisions.

- Oregon DEQ and OAPCA representatives both reported that their ability to interpret "emissions unit" as an entire production line or building, as opposed to a specific piece of equipment or process step, was instrumental to enabling the advance approval provisions.
- DNREC determined that it had the ability to allow advance approvals in a manner consistent with construction time limit requirements.

The EPA found no evidence indicating that any air-related requirements applicable to the sources and their advance approved changes were missed during permit development. The EPA also found that the flexible permits adequately identified all requirements applicable to the advance approved changes.

The flexible permits contained adequate monitoring, recordkeeping, and reporting mechanisms to ensure

that regulatory requirements are met and that appropriate measures are in place.

Permitting authorities and the EPA found that the flexible permits included monitoring, recordkeeping, and reporting (MRR) approaches that are appropriate given source operations. They also found that MRR approaches used in the flexible permits are sufficient to determine ongoing compliance with the permit conditions and applicable requirements. Table 2.1 summarizes the MRR requirements contained in the flexible permits (see end of report). Please refer to the Permit Review Reports for a more detailed discussion on the design adequacy of MRR approaches used in the six flexible permits. In several cases, the permitting authorities required enhanced MRR requirements to ensure that plant demonstration of compliance with established emissions caps was performed on a more frequent basis. These measures were partly designed to enable sources and permitting authorities to quickly identify problems or trends that could result in potential emissions cap exceedances, reducing the risk and potential severity of permit violations.

- 3M's St. Paul tape plant was required to calculate daily and rolling annual emissions totals within 41 hours of the end of each day, comparing these totals with the established VOC emissions caps.
- DaimlerChrysler was required to submit monthly reports to DNREC documenting plant-wide VOC and NO_x emissions in tons per year for the previous 12 months, as well as plant-wide daily emissions totals for the month.

In all cases, plant-wide emissions totals and calculations that demonstrated the companies' compliance with applicable emissions caps were required to be maintained on-site and were available to agency inspectors upon request. The EPA did, however, identify areas in which several of the flexible permits could be improved to ensure that specific monitoring techniques are consistent with current EPA guidance. The EPA did not find that any of these areas for improvement affected the companies' abilities to monitor actual emissions, or to ensure compliance with the emissions caps or advance approved change provisions. However, the EPA Review Team recommends that these improvements be considered in subsequent versions of the permits. Several of these recommendations are summarized below.

- Although the monitoring requirements for the VOC scrubber for Intel's Fab 4 at the Aloha plant used an appropriate methodology (i.e., operating parameter monitoring), the elements of the monitoring approach, were they relevant to the companies' ability to assure compliance, could be improved by including an operation and maintenance requirement that relates water flow rate with the flow corresponding to the optimum VOC removal efficiency, as verified through source testing.
- The EPA found that Saturn is conducting appropriate monitoring for the emissions caps, and has submitted a complete monitoring protocol to TDEC, in accordance with permit condition C.2. The EPA recommends the addition of several specific monitoring procedures and performance indicator ranges in the final Title V permit. These recommended measures are associated with monitoring of the carbon bed adsorber control equipment.
- For the Imation permit, the EPA found that continuous measurement of the air flow rate from coaters 12W and 15W and going to the catalytic oxidizer is appropriate parametric monitoring for monitoring capture efficiency. However, the permit did not identify any indicator range for this parameter (i.e., an operating range outside of which a deviation would require corrective action and reporting was not identified). Current monitoring guidance would recommend establishing such an indicator range. The periodic monitoring of capture efficiency and control device performance using inlet and outlet THC measurements was identified as an appropriate technique.

Implementation of flexible permit monitoring, recordkeeping, and reporting provisions was consistent with that envisioned and intended during permit design.

Permitting authorities reported that the sources' implementation of monitoring, recordkeeping, and reporting (MRR) requirements was consistent with that intended during permit development. They also found that the scope, timing, and availability of MRR information was sufficient for the permitting authorities to monitor companies' compliance with permit conditions and applicable requirements. In two cases, adjustments were made to clarify or alter MRR requirements during permit implementation.

- During a 1995 inspection, MPCA identified potential deficiencies in the recordkeeping approach for temperature monitoring of the thermal oxidizer emissions control device at 3M's St. Paul Tape Plant. 3M was able to demonstrate that no violations of the control device temperature level or the VOC emissions cap had occurred. 3M and MPCA clarified and agreed on an acceptable approach for recording future control device temperature readings.
- In 1996, MPCA eliminated the requirement for a ten-day advance written notice from 3M of changes implemented under permit condition 2.3.4. MPCA reported that the agency believed that the post-commencement notice for changes (submitted within two weeks of an actual change) was sufficient to provide the agency and the public with a documented record of advance approved changes actually made at the source.

Certain topics related to the renewal of flexible permits warrant further thinking to clarify acceptable approaches.

While the flexible permits operated well during the initial permit terms, companies and permitting authorities identified two areas that could benefit from further thinking and clarification. The first involves clarifying acceptable approaches for updating PALs at permit renewal. Companies and permitting authorities indicated that revising PAL levels based on the average of actual emissions for the prior two years (or some similar approach) can create disincentives for emissions reductions and P2 if the correction is too extreme. At the same time, permitting authorities and companies acknowledged that some approach for revising PAL levels at permit renewal is important to address new considerations that may have arisen, such as new applicable requirements or changes in local air quality or attainment status.

The second area involves the clarification of acceptable approaches to transition back to conventional permitting approaches if flexible permits are allowed to expire and the company or permitting authority does not wish to renew the flexibility provisions. For example, in the case of the 3M St. Paul Tape Plant flexible permit, the advance approved change provisions expired at the end of the permit term, while the plant-wide VOC emissions cap has remained in place.[3] This has raised questions regarding what level of changes (if any) would be allowed before New Source Review (NSR) would be triggered.

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[3] At the time of the EPA site visit in June 2001, the 3M St. Paul Tape Plant was operating under its State air operating permit, although the advance-approval conditions in the permit expired in March 1998. The plant has submitted its Title V permit application and is awaiting its draft Title V permit.

Finding 2: The flexible permits were considered to be enforceable by permitting authorities and EPA.

A key objective of the EPA's Flexible Permit Implementation Review was to verify that company compliance with the flexible permits is enforceable in a practical manner by permitting authorities and the EPA. Permitting authorities expressed their belief that the flexible permit provisions are practicably enforceable, and the EPA agrees with these permitting authority assertions based on the findings from the reviews of the six flexible permits.

The flexible permits contain sufficient monitoring, recordkeeping, and reporting requirements to enable permitting authorities and the EPA to assure compliance.

Permitting authorities believe that the flexible permits are enforceable in a practical manner. They believe that they have the ability to detect source compliance with the flexibility provisions, as well as all applicable requirements, based on the monitoring, recordkeeping, and reporting requirements established in the permits. Permitting authorities further reported that their experiences during implementation of the permits confirmed that the flexible permits are enforceable in practice. See Finding 1 above for additional discussion of the adequacy of permit design related to monitoring, recordkeeping, and reporting requirements.

The EPA agrees with the permitting authorities' statements regarding the ability to determine company compliance with permit conditions and applicable requirements based on the findings from this review. The EPA found the monitoring, recordkeeping, and reporting information implemented by the companies for calculating emissions and determining control equipment parameter values to be sufficient to determine compliance. The EPA Review Team was able to reproduce the exact compliance values for each flexible permit using actual emissions and monitoring data (e.g., material usage data, VOC content data, control device parameter data) and established emissions calculations procedures. The EPA found that all data necessary to perform compliance verification calculations was available and well-organized at the sources.

Permitting authorities reported that conducting inspections of sources with flexible permits is comparable to conducting inspections of sources with conventional permits.

While the number of inspections conducted by permitting authorities varied, permitting authorities generally indicated that inspecting sources with flexible permits was straightforward and comparable to conducting inspections for sources with conventional permits.[4] A few permitting authorities stated that some up-front education was required of permitting authority inspectors to ensure their familiarity with the flexibility provisions in the permits. They indicated such orientation was necessary since the flexible permits contained some requirements not typically required in conventional permits, such as on-site logs of alternate operating scenarios and changes implemented under the advance approval provisions, as well as plant-wide emissions calculations.

In some cases, permitting authorities indicated that the flexible permits resulted in less difficult or time-consuming inspections. This was primarily attributed to the reduced need to verify compliance with

[4]The number of inspections conducted of sources with flexible permits by the time of the EPA's review varied primarily based on the length of time the source had been operating under the flexible permit. Permitting authorities typically reported that they conduct annual inspections of the sources, although in some cases (e.g., MPCA's inspection of 3M's St. Paul Tape Plant) the frequency of inspections was reduced as permitting authorities focused on higher priority activities (e.g., issuance of Title V permits).

numerous requirements for specific equipment or activities that are commonly included in conventional permits (e.g., limitations on production rates for process lines, equipment, or process level emissions). Instead, inspectors were able to direct attention to ensuring compliance with the plant-wide emissions limits.

Finding 3: The flexible permits facilitated and encouraged emissions reductions and pollution prevention.

The flexible permits were designed to bring sharper attention to the current level of actual plant-wide emissions and emissions per unit of production. While the permits generally did not require actual emissions reductions during the permit term, they contained provisions to facilitate and encourage emissions reductions and P2. The permit implementation experience, supported by statements from the sources and permitting authorities, indicates that the permits were effective in facilitating emissions reductions and P2. Of the five sources which had been operating under their flexible permits for three or more years, all five accomplished a significant lowering of actual plant-wide emissions and/or emissions per unit of production. Achieving such environmental benefits was attributed by the companies to several factors, as discussed below.

Companies accomplished a significant lowering of actual plant-wide emissions and/or emissions per unit of production during their flexible permit terms.

- 3M lowered its actual VOC emissions from 4,300 tons/year to 700 tons/year due to increased pollution control device capture of VOCs, greater use of voluntary controls, P2, and reduced production.
- DaimlerChrysler lowered its actual VOC emissions from 1,165 tons/year to 776 tons/year, primarily through P2 associated with vehicle coatings and plant solvent usage.
- Lasco tested its emission factor as part of developing its flexible permit, leading to a voluntary reduction in emissions of approximately 100 tons/year prior to obtaining the flexible permit. During the permit term, Lasco implemented P2 measures and installed a thermal oxidizer to increase production while remaining under the emissions cap. These efforts resulted in per unit emissions reductions of approximately 32 percent.
- Using P2 projects, Intel lowered its actual VOC emissions over three-fold, from 190 tons/year to 56 tons/year, to become a synthetic minor source while simultaneously increasing production.
- As Saturn had only operated under the flexible permit for 13 months (at the time EPA's review was conducted), it is difficult to determine trends in VOC emissions per unit of production. VOC emissions for the first year of the flexible permit implementation were about 580 tons/year, compared with 798 tons/year in the year prior to the issuance of the flexible permit (1999).
- Imation reported that it has achieved about an 11 percent reduction in the pounds of VOC emissions generated per unit of production in 2000 when compared with 1997 baseline levels.

Companies reported that the plant-wide emissions caps focused organizational attention on reducing plant-wide emissions.

Several of the flexible permits shifted the allowable level of plant-wide emissions downward.

- The flexible permit for 3M's St. Paul Tape Plant enforceably limited VOC emissions to less than half those previously emitted by this source. With respect to actual emissions, MPCA indicated that the State of Minnesota does not have a technology requirement (such as one for best available state-of-the-art technology) as part of their State minor New Source Review program. As a result, air pollution sources are in a position to maintain their historical emissions and to increase their emissions in 39-ton increments through minor changes on an ongoing basis. Under the flexible permit in 1993, 3M became subject to an annual VOC emissions cap of 4,283 tons. Prior to the flexible permit, 3M was "grandfathered" to emit up to 65,000 tons annually. In 1988, 3M had 10,600 tons of actual VOC emissions and then voluntarily installed controls, bringing emissions down to 4,300 tons/year in 1991.

- The establishment of VOC PALs for the Saturn plant was part of a PSD permit revision process to allow approximately a doubling of production capacity. Even with a substantial increase in production capacity, the new PSD permit (including incorporation of VOC PALs) sets maximum VOC emissions at a level of about 50 percent of the allowable VOC emissions under the original, superceded PSD permit for the plant.
- Imation's flexible Title V permit extended emissions limits to the 12W coating line that was previously "grandfathered" under the Clean Air Act. Without the voluntary emissions controls that Imation installed (prior to the flexible permit), the coating line had a potential to emit (PTE) of approximately 4,000 tons/year of VOC. The permit enforceably limited VOC emissions to one site-wide cap of 249 tons/year, creating "synthetic minor" status for purposes of PSD applicability. Imation could have requested two such caps since its operations at Weatherford involved two separate sources [i.e, different operations with different Standard Industrial Classification (SIC) codes].

While limits on allowable emissions do not necessarily affect actual emissions, several of the companies reported that the emissions caps had a "focusing effect," drawing company personnel's attention to managing activities so as to minimize plant-wide emissions. They added that conventional air permits typically contain a more diffuse set of emissions limitations on specific equipment or production lines that lack this focusing effect. With company attention focused on managing plant-wide emissions levels in relation to an emissions cap, several companies reported that this created structural incentives for the companies to pursue emissions reduction opportunities that increase the margin of compliance - the difference between the emissions cap and actual emissions. First, companies indicated that emissions reductions result in larger compliance margins that typically reduce the risk of non-compliance associated with emissions cap exceedances. Second, per unit emissions reductions can create room under the cap to accommodate future production increases.

- Lasco representatives indicated that the 249 tons/year PTE cap on VOC emissions created a strong P2 and emissions reduction incentive, particularly since the source's margin of compliance was not large (e.g., actual emissions were 244.5 in 1998) and since the cap created a real production constraint.
- DaimlerChrysler representatives reported that the flexible permit conditions are easier to communicate to operations personnel since the focus on a plant-wide emissions cap and P2 is more intuitive and provides more "clarity of focus" than specific equipment or production line requirements. As a result, it has been easier to engage operations personnel in exploring and implementing P2 projects under the flexible permit. By eliminating numerous requirements on individual emissions sources at the plant, the flexible permit has also complemented DaimlerChrysler's lean manufacturing initiatives designed to reduce complexity throughout the plant.

While emissions caps, in general, can encourage emissions reductions, certain permit designs can also create disincentives for reducing emissions. As mentioned above, several companies voiced a major concern that their over-control and/or use of P2 to create emissions "head room" under an emissions cap could be lost due to five year contemporaneous "ratcheting." A significant compliance margin between actual emissions and applicable emissions caps is desired by sources to buffer against risk of emissions cap exceedances and to accommodate production fluctuations linked to changing market demand for plant products. Companies indicated that a counter-productive "ratcheting" situation can arise if a PAL is totally adjusted downward at permit renewal to reflect recent actual emissions levels (e.g., average of prior two years actual annual emissions).

Advance approved change provisions reduced the administrative "friction" associated with P2 changes, making such changes more attractive for companies to undertake.

Advance approval provisions for selected operational, equipment, and raw material changes can significantly reduce the administrative "friction" of making changes, including delay and costs for undertaking modifications that have P2 benefits. Companies indicated that under conventional permits, administrative friction often arises from two activities. First, desired changes are typically evaluated by company environmental personnel to determine whether any regulatory requirements apply to or are triggered by the desired modification. Several companies reported that such applicability determinations are often not straightforward, and that they frequently require careful interpretation and necessitate seeking guidance or clarifications from the permitting authority. Second, changes triggering minor NSR are typically subjected to a notice of construction permitting process to seek approval from the permitting authority in advance of initiating the modification. Staff time needed to conduct applicability determinations and individual permit applications increases transaction costs for each modification. Additionally, the time frame between when the desired change is first identified and when it is reviewed and permitted can extend beyond the company's desired implementation time frame, resulting in a disincentive to change.

Companies reported that modifications designed to improve resource productivity, process efficiency, or reduce pollution are often implemented in an iterative manner, as source personnel initiate a modification, observe and measure results, and then make further refinements to optimize system performance. This could involve trying multiple raw materials to find one with optimal product quality and emissions performance characteristics. Several companies indicated that under such iterative change processes, increased transaction costs and time delays - or even perceived uncertainty about such costs and delays - can produce significant "barriers to entry," causing the plant to forego modifications with positive environmental outcomes that lack significant strategic, operational, or competitiveness advantages.

- For example, Intel representatives indicated that operations personnel are less willing to engage with environmental staff in exploring potential P2 opportunities if they perceive that there is a significant potential for delay or time intensive regulatory evaluations and communications. Due to the iterative nature of many P2 projects, operations personnel typically need to conduct a series of experiments on a manufacturing process to see if the changes produce the desired results. Intel indicated that many of these individual changes could be subject to individual construction permitting actions thus imposing a very jagged, stop-and-go aspect to the experimentation process. Intel indicated that, under such conditions, operations personnel might well view experimentation for purposes of pollution prevention as being too disruptive of the manufacturing process to proceed.

Even when emissions-reducing projects "pay" (e.g., exhibit a positive return on investment), increased transaction costs, time delays, and uncertainty can reduce the projects' ability to compete effectively for internal resources and organizational attention. The net result can be environmental benefits left on the table.

Companies reported that advance approval provisions can significantly improve the attractiveness of making modifications that result in reduced emissions by reducing their transaction costs and the potential for time delays. The examples below illustrate ways in which utilization of advance approved change provisions facilitated P2 activities at several of the sources with flexible permits.

- Between 1994 and 1998, Intel's Aloha plant made at least 18 P2-related equipment and material changes, utilizing the permit's advance approval provisions, that resulted in VOC emissions reductions of over 100 tons/year.

- DaimlerChrysler's NAP has undertaken numerous P2 activities utilizing the advance-approved change provisions in their flexible permit, including steps to reduce VOC and HAP emissions from vehicle coating processes. DaimlerChrysler representatives reported that, in the absence of a flexible permit, the source might have still pursued some of these P2 initiatives, but that they may well have been delayed to coincide with permit renewal time frames due to the cost and staff resources required to secure case-by-case permit approvals. They emphasized that the flexible permits significantly reduce the regulatory friction associated with making P2 changes, increasing incentives for P2.
- Lasco representatives stated that the flexibility provisions allowed the Yelm plant to test and undertake changes that reduced styrene emissions without having to wait for conventional case-by-case permit approval. The advance approved change provisions substantially increased the likelihood that Lasco would actually research and implement such changes, due to Lasco's corporate reluctance to undertake changes that would trigger NSR permitting actions. Lasco has implemented several changes utilizing the advance approval provisions that have reduced emissions, including installation of a new putty station and expansion of emissions control capacity.

Several flexible permits increased company awareness and focus on pollution prevention through explicit P2 program, reporting, and performance requirements.

Four of the flexible permits contained explicit conditions requiring the companies to implement formal P2 programs, report on P2 performance, and/or meet certain P2 performance targets. While these companies had histories of P2 accomplishment prior to issuance of the flexible permits, the companies generally reported that the explicit P2 permit conditions served to increase the visibility of P2 among plant personnel. When combined with the new focus on managing plant-wide emissions against a cap and the relative administrative ease for accomplishing such changes under the advance approval provisions, the P2 commitments and programs have empowered some company environmental personnel to expand P2 activities.

- Intel found that the flexible permit provided clear incentives to favor P2 over new emissions control technology for meeting the required source-specific, performance-based VOC Reasonably Available Control Technology (RACT) determination (permit condition 14). The explicit focus on P2 in the permit increased environmental personnel's leverage in their efforts to engage operations personnel in exploring and implementing P2 efforts.
- The P2 performance requirement included in the DaimlerChrysler NAP's flexible permit has prompted a clear organizational focus on reducing VOC emissions associated with vehicle coating operations. DaimlerChrysler is to begin utilizing a powder clearcoat by September 2003 if it is commercially available; if not, the company is to employ P2 measures that will reduce topcoat VOC emissions to below seven pounds of VOCs per gallon of applied coating solids on a daily weighted basis until a powder clearcoat option is commercially available.
- Even though a Washington State P2 expert familiar with the RFP industry identified Lasco as a "first in class" pollution preventer, Lasco found that the flexible permit encouraged and facilitated company efforts to pursue additional P2 opportunities. To fulfill the flexible permit's P2 program requirement (which is linked to Lasco's BACT determination for advance approved changes), Lasco instituted a "P2 Task Force" at the Yelm plant. The task force is charged with identifying P2 opportunities and coordinating P2 activities throughout the plant. Lasco representatives stated that its employees are now more cognizant of how source emissions affect the community and of the importance of P2 as a result of the flexible permit development process and the increased organizational focus on P2.
- As part of its required P2 program, Imation conducted routine P2 meetings with a cross-functional team of plant managers and personnel at the Weatherford plant. P2 training for plant employees and research and development staff further heightened organizational focus on identifying P2 opportunities. Imation representatives also reported that the formal tracking of progress towards the

plant's ten percent emissions reduction goal (i.e., based on emissions per unit of production) has increased plant personnel's awareness of and attentiveness to P2.

Finding 4: Companies with the flexible permits believe that air permitting is on their critical response path.

Companies participating in the review reported that conventional permits can constrain their ability to compete effectively. Though the factors differ somewhat for each source, the companies indicated that the combination of increasingly globalized competition and a shift to new modes of production substantially increased the pressure to operate highly flexible, nimble, and responsive research, development, and production operations. In this context, conventional, case-by-case air permitting, which the companies state can cause delay and uncertainty, can act as a mission-critical bottleneck to their operations.

Global competition across multiple industry sectors has shortened product life-cycles and increased the importance of moving new products quickly from development to market.

Companies report that global competition, which intensified during the 1990s through the integration of financial markets, reductions in trade barriers (e.g., NAFTA), increased industrial development in Asia and other regions, and substantially shortened product development time frames, has exposed U.S.-based operations to more and often lower cost producers. Examples of specific company competitiveness needs include the following.

- Intel reported that it operates in a highly competitive market and needs to meet aggressive product development schedules. Intel currently introduces a new generation of semiconductor chips every 12 to 24 months, with each new product cycle supported by a major "fab revamp." These operational changes are very time sensitive, to meet product release schedules from computer and electronics manufacturers, and involve highly interdependent and sequenced steps.
- 3M management indicated that the reduction in trade barriers associated with NAFTA and other international trade agreements, combined with the overall globalization of competition and the ability of potential competitors to purchase and install rapidly "off-the-shelf" production equipment, enables other companies to reach rapidly into 3M's market share with low cost product. In this context, 3M reports that "first to market" (where a week delay can be very significant) has become a critical business success factor, particularly in specialty product markets, such as the automotive and medical sectors. 3M reported that many specialty tape products become obsolete, and are replaced by newer products, within six to nine months of initial production.
- DaimlerChrysler indicated that its vehicle development process, in part due to advances in computer-assisted design, has decreased from five years to about 18 months, substantially reducing its ability to accommodate conventional permitting time frames while meeting product development schedules.
- Saturn indicated that the automotive market has shifted significantly in recent years, necessitating more rapid responsiveness to market demands. In this context, Saturn has recently expanded its available product line and expects further changes in the near future, each of which requires significant production line retooling and process adjustments. Saturn also indicated that the vehicle development process has significantly shortened from five years to about 18 months. Previous lead times allowed ample time, in most cases, to secure needed permits while remaining on product development and release schedules. Under the new time frames, air permitting is now on its critical path.

Advance production concepts, designed to help firms compete effectively, encourage rapid, and sometimes iterative operational and equipment changes to continuously improve resource productivity, operational efficiency, and product quality.

Production theory and techniques have undergone substantial revision with emphasis placed on continuous resource productivity improvements. This emphasis - as reflected in such advanced production concepts as Lean Manufacturing and Six Sigma - substantially influences the day-to-day operating environments at many companies. These systems are characterized by a major drive to increase the velocity of production processes (reduce the time required to transform raw materials into product), increase asset utilization and cash flow, substantially shorten research and development time frames, continually improve process yields, and respond to heightened customer expectations for quality, product features, and delivery responsiveness. Specific examples from the permit reviews include the following.

- Intel reported a need to make rapid (and sometimes iterative) process and equipment adjustments in production processes to improve yield, lower costs, reduce chemical usage, and otherwise improve operations. Many of these changes involve switching chemicals used in tools and process chemical formulations, adjusting gas flow rates, and moving or adding tools (e.g., photo lithography equipment, plasma etchers, liquid acid baths).
- 3M indicated that, in response to competitive pressures, it is involved in a major corporate-wide drive to reduce cycle times and improve asset utilization and cash flow. These initiatives require for their success an in-plant culture of continual improvement and substantial flexibility for production operations.
- Lasco indicated that the key focus in the bathtub industry is making minor product modifications on an ongoing basis (rather than launching major new products like in the semiconductor industry). In this context, Lasco's competitive strategy focuses on continually increasing material yields, which requires seeking ways to utilize less and/or increase the capture of its input materials on a per unit basis. Lasco also needed flexibility to change production lines rapidly to accommodate different product types as short-term demand fluctuated among them.
- Saturn identified factory "agility" as a key to its ability to compete within the General Motors network of plants for new product lines, citing its flexible permit (and the factory responsiveness it provided) as a critical factor in its selection to produce the L850 "world engine."
- Imation representatives indicated that the company desired to use the Weatherford plant to experiment with and pilot new coating technologies and product recipes to respond quickly to changes in customer demand, as well as new production innovation opportunities. These changes involve short-term experimental use of manufacturing equipment, at times requiring changes to equipment configurations and the emissions profiles of the equipment. Imation further indicated that market demands frequently require rapid process changes, including substituting or introducing new raw material, relocating, modifying or adding new equipment, and/or interchanging pollution control devices.

Companies indicated that responding effectively to increasingly industry competitiveness requires operating environments capable of responding rapidly to changing market circumstances (e.g., develop and introduce new products rapidly and adjust production to address customer requests), moving production rapidly among facilities to achieve optimal asset utilization, and generally engendering a culture of continual operational improvement. The companies indicated that this results in an operating environment where changes to equipment, operating parameters, equipment configurations, and locations are more common and are often subject to tight deadlines.

Companies report that conventional permitting can be problematic due to the potential delay and uncertainty associated with such actions.

Although some variability exists, Federal and State and local air permitting rules generally prohibit an air pollution source from constructing, modifying, reconstructing, or operating an emissions unit, stationary source, or control device without explicit approval (typically in the form of an air permit or permit modification undertaken on a case-by-case basis at the time a source desires a change). The typical process for obtaining any needed New Source Review (NSR) approval involves the following:

- Communicating the nature of prospective changes to the permitting authority and discussions to determine if NSR would apply.
- Determining all the applicable regulatory requirements that the desired change would "trigger."
- Preparing and submitting any necessary permit application providing the details of the desired change. In many cases, permitting authorities may request additional information before a source's permit application is considered to be complete.
- Reviewing the application at the permitting authority and framing a draft permit (to ensure all applicable requirements are met, air quality protection is maintained, and needed technology requirements are imposed).
- Seeking and addressing public comments on the draft permit or permit modification, if required by Federal, State, or local rules governing the applicable requirements. In some cases, this step may involve public hearings.
- Issuance of the permit or revision required to undertake the change.

Permitting authorities reported that this process can take as little as 30 days (for a minor change that does not require public comment), but can extend to six or more months depending on the type of change, environmental impacts, applicable requirements, and public concerns. A typical time frame (required or strongly suggested by agency rules) for most minor source construction permit actions is 90 to 180 days, although certain permitting authorities indicated that past or current permit back logs inhibit their ability to respond within these time frames. Some states such as Oregon have provisions that allow "minor" operational changes (as defined by their specific rules) to proceed in parallel with the permitting process. Companies indicated that they utilize this option with some hesitancy since the outcome of the review is uncertain and the consequences of failing to obtain the permit (or be subject to an unexpected requirement) can be substantial.

Companies indicated that this case-by-case permit process can introduce significant delay and uncertainty into their operational decision-making and research, development, and production activities. Although case-by-case permitting actions can impose administrative costs from applicability determinations and permit application development, companies' concerns focused on the potential opportunity costs and competitiveness costs associated with delay and uncertainty in the permit process.

Companies reported that operational change delay results from the need to obtain a permit prior to "constructing" each planned operational change (or aggregated group of changes). In the new competitive environment described by the companies, they often do not have substantial advance notice of the specific operational changes needed to address customer demands or market opportunities. As a result, the need to delay implementation of the change to meet conventional permitting requirements can lead to lost market opportunity. Companies further indicated that many of the continual resource productivity improvements they desire to undertake require experimentation and highly iterative process changes. In this context, the need to obtain a permit before each iterative step turns continual improvement into an uncertain process that operations managers are disinclined to undertake.

- Intel identified 150 to 200 changes per year that they believe would have triggered minor NSR permitting. This number of changes, combined with the Oregon DEQ approval time frame of up to 60 days per change, suggest that there would likely have been significant delay under a conventional permit. Even if few delays would have resulted in production downtime or missed market opportunities, the costs would likely have been significant under a conventional permitting scenario, as many of the changes improved the cost-competitiveness of Intel's products through resource productivity improvements. Industry estimates of the opportunity costs of production downtime and time delays run as high as several million dollars in just a few days, due to lost sales to computer makers and other factors. Intel representatives indicated that the impact of continued time delays would likely be to redirect Intel's production investment and operating facilities to locations where changes could be accommodated within existing environmental regulations (e.g., other U.S. States or to other countries where Intel operates, such as Ireland or Israel) as they had done prior to receiving their flexible permit.

- DaimlerChrysler and General Motors (Saturn's parent company) reported that they have experienced PSD review processes lasting more than 2 years.

Several of the companies indicated that uncertainty in the permitting process creates "friction" for the operational change process because it increases risk. Companies indicated that uncertainty emerges from a number of aspects of the permitting process. First, companies reported that they are at times unsure about the applicability of permitting requirements to maintenance, repair, and replacement activities. Second, future permit requirements can be unpredictable due to the discretion inherent in setting emissions limits, making technology determinations, and establishing monitoring, recordkeeping, and reporting requirements. Third, the length of the permit review and approval process can be unpredictable, due to such factors as permitting authority backlogs and the degree of public interest. According to the companies, these factors combine to make it difficult for a company to accurately estimate the time frame and cost of a permitting action and, therefore, how the need to permit will affect the financial attractiveness and overall viability of an operational change.

Companies with flexible permits stated that they have similar needs at other facilities and are interested in pursuing flexible permits for those facilities.

The six companies reported that they have identified similar flexibility needs at other facilities, and they expressed interest in pursuing flexible permits for those facilities. For example:

- Imation's Camarillo, California source has been issued a flexible permit through the EPA's Project XL initiative, modeled in several respects on the Weatherford permit. Imation representatives stated that they believe the flexibility techniques used in the Weatherford permit would be beneficial to other Imation facilities as well.
- DaimlerChrysler pointed to a plant in the Midwest as a primary example of the company's need to expand the use of flexible permitting approaches to other facilities. The plant's eight existing permits have multiple, unit-specific technology limits, emissions limits for different time periods, and a variety of operating conditions specific to each emissions unit, for a total of 128 specific permit conditions (as compared to only 16 for the Newark Assembly Plant's permit). Since the late 1980s, the source has been addressing permit modifications and other concerns on a continuous basis. More specifically, since 1992 the plant obtained 12 permits or permit revisions, with two involving Federal NSR. Three recent amendments took, on average, over a year to complete. DaimlerChrysler believes that had the plant been operating under a flexible permit, this number of permit transactions could have been reduced to only two, saving time and money as well as facilitating timely completion of P2 activities. DaimlerChrysler representatives indicated that the company has set a goal of having flexible permits for all DaimlerChrysler facilities in the U.S. within two years. However, DaimlerChrysler reported that permitting authorities in several other States are opting to hold off on negotiating such permits until EPA guidance and/or rulemaking are complete.

Finding 5: Companies with the flexible permits utilized their flexibility provisions.

Flexibility provision utilization during the permit terms exhibited rates and types of changes consistent with the needs expressed by the companies during permit development.

All of the companies have utilized advance approval provisions contained in their flexible permits.

- As mentioned, Intel reported that the Aloha plant made an average of approximately 150 to 200 operational and equipment modifications per year during the Title V permit term that would likely have been subject to Oregon's case-by-case Notice of Construction approval process under a conventional permit. These changes, primarily associated with "fab revamps" to scale-up production of new semiconductors and iterative changes to optimize existing production processes (including P2-driven changes), were implemented using the advance approval provisions in the Title V permit.
- 3M made 34 equipment and operational changes that utilized the advance approval conditions. 3M estimated that 15 to 20 of the changes would likely have required some form of permitting action under Minnesota's conventional permitting process, with two of these changes likely having triggered at least case-by-case PSD permitting analyses. 3M indicated that the advance approval provisions accommodated all of the source's change needs (i.e., no additional construction permitting actions were necessary), enabling the company to upgrade aging equipment and improve the yield and per unit emissions performance associated with coating lines.
- DaimlerChrysler's NAP made over 90 operational and equipment changes utilizing the permits' advance approval provisions between 1995 and 2000. Advance approved modifications were made to coating system components, coatings, cleaning activities, fuel-fired sources, source locations, ventilation systems, and emissions control systems.
- Lasco made five changes during the Title V permit term (as of July 2001) that utilized the advance approval provisions. The advance approvals enabled Lasco to add two new emissions units, increase its stack height to remedy odor concerns, modify its emission factor to account for improved emissions performance, and modify its control technology without requiring case-by-case permitting actions.
- Despite only having about one year of implementation experience under its flexible permit, Saturn has made several of the changes outlined in its PSD permit application, including construction of the L850 engine line and the second assembly line in General Assembly. Saturn reported that it is likely that changes to existing emissions units have been made during the first year of the permit term (i.e., June 2000 to August 2001) that utilize the advance approval provision in permit condition B.10.1. Saturn is not required to maintain records of these changes, provided the changes meet established criteria in the permit and plant-wide emissions remain below established caps.
- Imation and Oklahoma DEQ reported that the Weatherford plant has made frequent use of the flexibility provisions that advance-approve the use of alternative raw materials. In at least four cases, this included a streamlined toxics evaluation by the State, allowing the source to rapidly implement raw material changes at the source. Imation also utilized the advance approved alternative operating scenarios for control devices and methods on three occasions.

In addition, some companies stated that the number of changes made is not the only indicator or importance to them. Equally important to them is the ability to make certain critical changes when other business factors dictate.

Companies reported that the advanced approval provisions in the flexible permits fully addressed their operational change needs. With the exception of Lasco, the companies did not need to undertake any nonadvance approved construction permitting actions (e.g., minor NSR and major NSR) during their flexible permit terms (i.e., typically a 5 year period). Also, the permitting authorities indicated that the sources did not make any changes under the advance approval provisions that were not authorized under the advance approval provisions.

- Lasco was required to submit a Notice of Construction permit application and seek a Title V permit amendment to install a regenerative thermal oxidizer during the flexible permit term. This was necessary since this change was not advance approved in the permit, and since the change required new MRR requirements.

Some companies did not utilize all of the flexibility provisions in their permits, but they anticipated using these flexibility provisions in the future.

While all six companies utilized at least some of the flexibility provisions in their permits, not all flexibility provisions had been used at the time of this review (with the exception of Intel). Several sources indicated that, while they can reasonably anticipate desired operational and equipment changes (or types of changes) well in advance, the exact timing of change implementation is often influenced by multiple factors, such as changing organizational investment priorities and resources and fluctuations in customer demand. Companies typically reported that they anticipate using their unused flexibility provisions later in their permit terms or following permit renewal. For example:

- During the first 14 months under the flexible permit, Saturn did not implement the advance approval provisions which allow construction of new emissions sources (i.e., permit condition B.10.2). Saturn and TDEC anticipate that this provision will be useful in the future to accommodate changes associated with vehicle model year changeovers.
- As of December 2001, the Weatherford site had not implemented two changes that were specifically described in the advance approved minor NSR change provisions (i.e., permit condition Section H, Subsection 2, Requirement 1b and 1c). Imation indicated that the source may undertake these changes in the future.

The flexible permits appear to accommodate a substantial number of advance approved changes while providing sufficient clarity to support practical enforceability.

The permitting authorities indicated that the actual changes made under the flexible permits were fully consistent with those envisioned during permit design and that the changes were made in a manner consistent with the constraints imposed by the permits. The flexible permits vary in the degree of specificity with which advance approved modifications are described in the permits. Each of the permits, however, imposes clear boundaries for determining which changes would not be covered under the advance approval conditions. Changes triggering new applicable requirements, including new or modified MRR requirements, that were not already addressed in the permit, are subject to conventional permitting and approval procedures.

- Changes advance approved in Intel's Title V permit were clearly defined categorically and by conditions documented in the permit. For example, advance approved changes could only be made at the stationary sources comprising Emissions Unit 1 (EU1); construction of entirely new stationary sources are not covered; changes to a pollution control device are not covered; and no new applicable requirement can be triggered by an advance approved change. In addition, advance approved changes must not result in source non-compliance with the VOC RACT requirement and the source PSELs.
- 3M's flexible permit contained specific categories of changes advance approved by the permit, such as updating drive mechanisms and electrical components on coating equipment and replacing or

upgrading coater ovens, provided that 3M satisfied specific requirements described in the permit (e.g., remain below emissions caps and meet applicable New Source Performance Standards). If 3M desired to make a change not specifically covered by the listed advance approved categories of changes, they would be required to proceed with a conventional permitting process for the modification, unless MPCA agreed that the change was "consistent with" the changes advance approved by the permit.
- For DaimlerChrysler, some changes made under the flexible permit were not fully advance approved, but were eligible to go through an expedited review process if all applicable requirements were met and if no public hearing was requested during the public notice period.

Several companies reported that they did feel a need to contact their permitting authority during the permit term to discuss or clarify whether a particular modification would be allowed under the advance approval provisions in their pilot permit.

- 3M indicated that on two or three occasions, they contacted MPCA to discuss planned changes that were not explicitly addressed by the permit but appeared to be covered by the "consistent with" phrasing included in the permit. In each of these instances, MPCA indicated that the planned change would not require a permitting action.
- On one occasion, Lasco filed a Notice of Construction permit application to change the venting of the regenerative thermal oxidizer (RTO). After the application was submitted, OAPCA informed Lasco that the proposed change was covered by the advance approval provisions and the application was unnecessary.

Some companies indicated the flexible permits have facilitated an increase in the rate and a shift in the type of changes made, when compared to a conventional permitting approach.

Some of the companies indicated that they would not have made certain changes, had such changes not been advance approved in their flexible permit. They typically stated that the time frames associated with conventional minor NSR and other types of air permitting, as well as uncertainty regarding the applicability of certain regulatory requirements, often creates sufficient "friction" (e.g., cost, delay, and risk) to make a proposed change unattractive. The EPA found evidence that proposed P2 changes are particularly vulnerable to being shelved under a conventional permitting approach, since they often involve iterative experimentation that could heighten regulatory transaction costs. In addition, P2 modifications often receive lower organizational investment priority unless they simultaneously address an important operational need. Advance approval provisions facilitated research and development into alternative processes. When research uncovered a promising process technique, the company could implement the change without waiting for case-by-case approval and permitting.

- Intel reported that successful pollution prevention initiatives directed at ongoing processes can be iterative in nature. The company typically conducts a series of experiments on its manufacturing process to see if the changes produce the desired results. Many of these individual changes could be subject to construction permitting actions, thus imposing a stop-and-go aspect to the experimental process. Intel indicated that, under such conditions, operations personnel might well view experimentation for purposes of pollution prevention as being very disruptive of the manufacturing process and therefore recommend that it not proceed.
- Lasco reported that the company is inclined not to make changes that have potential to trigger additional air permitting requirements, attributing this reluctance to potential costs, delay, and uncertainty associated with permitting actions. For example, Lasco installed more complex putty systems for attaching boards to the inside of bath units at other Lasco facilities to prevent the systems from triggering air permitting requirements. The advance approval provisions enabled Lasco to

incorporate a new putty station design into the product production line at the Yelm site in a streamlined manner, resulting in material savings and VOC emissions reductions.

Finding 6: The flexible permits enhanced information sharing between the companies and permitting authorities.

All six permitting authorities stated that the flexible permits enhanced their overall understanding of company activities and emissions as compared to conventional permitting approaches. The flexible permits did, however, alter the timing and format of certain types of information, such as information regarding changes implemented under advance approval provisions, when compared with information available under conventional permits. In several areas, such as plant-wide emissions performance and P2 performance, the flexible permits typically required information that is not required by conventional permits.

The flexible permit development process provided permitting authorities with a clearer understanding of the maximum plant-wide emissions levels anticipated during the permit terms.

The flexible permits provided clear information regarding the maximum level of emissions that would be allowed during the permit term, in the form of established emissions caps. If a source desired to exceed its emissions cap, it would thereafter be required to undergo a major NSR permitting process that would require public comment. For example, in accepting the PTE cap of 249 tons/year of VOC emissions, Lasco had to reduce its actual emissions, providing assurances to local residents that plant-wide emissions would thereafter be held relatively steady, despite company plans to increase production during the permit term.

During permit development, companies were required to share more information regarding the type of changes anticipated during the permit term, providing a more comprehensive, up-front picture of anticipated operational activities and associated environmental performance than a conventional permitting process.

The permitting authorities believe that the flexible permit development process, through the discussions of advance approved changes, provided them with a clear advance understanding of the types of modifications that the companies anticipated during the permit term. Under a conventional permitting approach, change information would typically only be available in a more fragmented, incremental manner, as companies pursued approval to make changes on a case-by-case basis. Under the flexible approach, applicable requirements associated with each advance approved change are identified up-front in the permit, affording a long-term view of potential applicable requirements, resulting emissions control requirements, and environmental outcomes. This enabled the permitting authority to have a more comprehensive picture of changes, and associated environmental performance outcomes, that would likely occur over the permit term (e.g., 5 years).

During permit implementation, information regarding changes made by the companies using the advance approval provisions varied among the flexible permits but was generally comparable to or greater than that produced under a conventional permitting process; the flexible permits did alter the timing and format of change information, as compared to conventional permitting approaches.

Variability is evident across the six flexible permits with respect to how advance approved changes were required to be documented and reported. Most of the flexible permits required some form of notices and/or summary lists of advance approved changes made to be submitted to the permitting authority, in addition to maintenance of an on-site log of advance approved changes. At one end of the range, 3M was required to submit advance notices and post-construction notices to MPCA for each change implemented using the advance approval provisions (note: during the permit term, MPCA eliminated the advance notice requirement, streamlining relevant information into the post-construction notices). 3M was also required to submit annual summaries of advance approved changes made during the year. At the other end of the range, Intel's permit did not require the company to report information on specific changes implemented using the advance approval provisions for a given six-month period if the maximum capacity to emit for the source declined through P2 or other means during this period, when compared to the previous six-month period. Saturn's permit requires the source to register new advance approved emissions sources with TDEC, although reporting on specific advance approved changes to existing emissions sources listed in the permit is not required. Under the Intel and Saturn pilot permits, it is likely that less information on certain specific advance approved changes was available to the permitting authorities, when compared with a conventional permitting approach, in cases where such changes would have triggered the need for a NSR permit application. This assessment assumes that these advance approved changes would have been undertaken by the companies under a conventional permitting approach. The permitting authorities indicated that the information available under the flexible permits was, at a minimum, sufficient to verify compliance with all applicable requirements and to keep them appropriately informed of source activities.

Permitting authorities generally indicated that some form of recordkeeping and reporting regarding source implementation of advance approved changes is important. Inspectors with DNREC and OAPCA reported that it is helpful to have information on changes made using advance approval provisions during their inspections, whether this information was reported in advance or maintained in logs at the source.

Under a conventional permitting approach, a company typically submits a notice of construction or other such permit application to the permitting authority for approval prior to implementing a change that triggers NSR. These applications typically include specific information on proposed modifications. In addition, companies are generally required to submit a notice of completion to the permitting authority once the company has finished "construction" of the change. While the same type of change information is typically made available under a flexible permit, the timing and format of the information differs from that required under a conventional approach. First, the advance approval provisions in flexible permits provide some information at the beginning of the permit term regarding specific changes or categories of changes that are anticipated during the permit term. No such advance information is required under conventional permitting approaches. Second, under flexible permits, companies generally do not submit permit applications for individual changes, unless the changes are only partially advance approved. Instead, information on actual changes made that fit the advance approval descriptions is typically provided to the permitting authority soon after the change is implemented, typically in the form of a post-construction notice. In addition, most pilot sources operating under flexible permits are required to record information on changes made using the advance approval provisions in an on-site log that is available to agency inspectors. Third, the flexible permits frequently require some form of aggregated summary reporting on changes made using the advance approval provisions. The companies are typically required to list all advance approved changes made during a particular reporting period, such as the past month, quarter, or year. Permitting authorities indicated that the summary reporting further helps to create an aggregated picture of changes made at the source, when compared with a series of case-by-case permit applications in the agency file.

The section below discusses more detail regarding the timing, type, format, and accessibility of change information available under the flexible permits.

- 3M's permit required the company to provide written notice to MPCA for each change implemented by the plant that utilized the advance approval provisions in the permit. A written notice was due to MPCA ten days prior to beginning actual construction and a subsequent notice was required to MPCA two weeks after commencing operation. In May 1996, MPCA representatives reported that the agency believed that the post-commencement notice for changes was sufficient to provide the agency and the public with a documented record of advance approved changes actually made at the source. 3M was also required to submit an annual summary report of advance approved changes implemented during the past year.

- Imation is required to submit a notice of completion 30 days after the completion of construction of advance approved changes.
- Lasco's flexible permit required the company to submit notices of construction completion to OAPCA for each advance approved change undertaken. Lasco is also required to maintain an on-site log of changes implemented under the advance approval provisions. The permit also requires Lasco to submit a semi-annual summary of advance approved changes undertaken.
- DaimlerChrysler is required to submit monthly reports listing changes made using the advance approval provisions during the prior month. The NAP is also required to maintain an on-site log of changes made under these provisions and to submit an annual summary list of advance approved changes implemented.
- Saturn is required to register with TDEC new emissions sources constructed under the advance approval provisions of the permit. This registration includes the submission of a completed application form, a brief process description, documentation of BACT or minor source BACT (for sources below established emissions threshold levels) for the new source, and periodic monitoring parameters for any control equipment. The permit also requires Saturn to submit a plan to assess the emissions of toxic, volatile pollutants from the source within two years of permit issuance.
- Intel's permit required the company to submit a list of advance approved changes made during each six-month period, if there was a net increase in the maximum capacity to emit at the source for that period, when compared with the maximum capacity to emit for the previous six-month period. This occurred once during the five-year permit term.

Several permitting authorities reported that they received more change information from companies operating under the flexible permits than would have been available under a conventional permitting approach. These permitting authorities reported that the flexible permits encouraged sources to report on operational and equipment changes, even if these changes would not have triggered minor NSR applicability under a conventional approach. Since the advance approval provisions removed the need to make case-by-case determinations of NSR applicability for individual changes implemented during the permit term (companies only needed to determine whether the changes satisfied the advance approval criteria specified in the permit) companies tended to report more changes. For example, 3M indicated that the company viewed the permit as a valuable asset, and they indicated that they desired to protect this asset by ensuring a high level of communication with MPCA. Some permitting authorities indicated that the conventional NSR program may sometimes create disincentives for companies to report changes for which the applicability of NSR is uncertain, since such discussions with the permitting authority to determine applicability could prove time intensive and lengthy. Permitting authorities indicated that the flexible permits remove any incentive for companies to "push the interpretation" of applicability determinations in a direction that would result in less change reporting.

- MPCA representatives reported that 3M reported information on changes that would not have triggered minor NSR applicability under a conventional permitting approach, providing MPCA inspectors and the public with more information on changes implemented at the source.
- DNREC inspectors indicated that DaimlerChrysler reported information on changes beyond those that would have been required under a conventional permitting approach. The inspectors indicated that this enhanced their understanding of company activities.

During permit implementation, the flexible permits required the provision of more comprehensive and useful information on plant-wide emissions performance to permitting authorities.

Permitting authorities reported that the plant-wide emissions reporting required under the flexible permits provides more comprehensive and easy-to-understand information on actual environmental performance during the permit term. In some cases, such as for the DaimlerChrysler and 3M permits, the frequency of emissions reporting information was also greater than that typically required under a conventional permit. Even when more frequent emissions reporting was not required, however, the companies were required to maintain current emissions calculations on-site to demonstrate compliance with the established plant-wide emissions caps. The flexible permits all require companies to make these emissions calculations available to permitting authority inspectors and personnel upon request. Conventional permitting approaches typically require preparation of an emissions inventory by the source on an annual basis.

- DaimlerChrysler is required to submit monthly emissions reports to DNREC that include comprehensive, plant-wide information on VOC and NO_x emissions. The monthly frequency of these reports is greater than what would typically be available under conventional permits.
- The 3M flexible permit required the St. Paul Tape Plant to submit quarterly reports to MPCA on the source's plant-wide emissions. The permit required 3M to report on all plant emissions units, including those that had been "grandfathered" by the Clean Air Act. These previously "grandfathered" emissions units were also required to be included in the plant's emissions monitoring activities and enforceable compliance limits. MPCA indicated that daily and annual rolling totals of VOC emissions provided near "real time" information on actual plant-wide emissions.
- The Intel Title V permit retained Intel's original PSELs, pollutant-specific, plant-wide short-term and annual caps on actual emissions. Intel submitted semi-annual monitoring reports to Oregon DEQ containing semi-annual compliance certification, emissions statements, and excess emissions upset log. Since Oregon regulation required PSEL, Oregon DEQ stated that their emissions reporting was very similar to that required by other Title V facilities in the State.
- Oklahoma DEQ indicated that Imation's flexible permit requires annual emissions reporting, similar to that required under a conventional Title V permit, including annual compliance certification and an annual emissions inventory. Oklahoma DEQ indicated that the flexible permit incorporates a previously "grandfathered" source that would not have been included in compliance reporting under a conventional permit.
- Under its flexible PSD permit, Saturn is required to monitor and log monthly plant-wide emissions data which are maintained on-site and available for TDEC inspection. Saturn and TDEC indicated that plant-wide emissions reporting will be required in the forthcoming Title V permit for the source.

During permit implementation, four of the six flexible permits required companies to share information regarding P2 activities and performance with the permitting authorities. Conventional permits do not typically require companies to share P2 information with the permitting authority or public.

The flexible permits developed for Intel, Imation, and Lasco under EPA's P4 program each require the companies to implement P2 programs. The companies were required to report information on their P2 programs to the permitting authority, in addition to periodic reports on P2 activities, accomplishments, and performance. DaimlerChrysler is also required to submit routine reports documenting P2 activities.

- Imation's implementation of a P2 program is voluntary, but there is an explicit link in the permit between adoption of an approved pollution prevention program and the BACT determination for advance approved changes. Therefore, to access advance approvals that require BACT, Imation must have an approved P2 program in place, which Imation did implement during the permit term. The Lasco permit contained a similar connection between BACT and a P2 program. The flexible permit requires Imation to submit an annual P2 executive summary describing the pollution prevention activities and programs adopted on site, as well as progress against a P2 target of 10 percent per unit emissions reduction during the permit term.

- Intel was required to submit an annual P2 progress report to Oregon DEQ, and a final report at the end of the permit term.
- DaimlerChrysler is required to report annually on their P2 activities as part of the annual compliance certification.
- Lasco is required to submit an annual P2 progress report, which documents P2 techniques, goals and accomplishments. Additionally, prior to the end of the third and fifth year of the permit term, Lasco is to submit a report demonstrating compliance with the P2 Program.

Finding 7: The flexible permits generally provided to the public equivalent or greater information than conventional permits.

The EPA's examination of the public record and the availability of information to the public during the development and implementation of the flexible permits indicates that the permits shifted the timing, type, and format of information to the public on emissions performance, operational and equipment changes, and P2 activities. As discussed in Finding 6 above, the six permits vary in the specific format, timing, and availability of certain types of information required, particularly related to certain specific advance approved changes implemented under the permits. In areas such as plant-wide emissions performance and P2 information, most of the flexible permits clearly increased the availability of information to the public. In all six cases, the permitting authorities indicated that, on balance, the flexible permits improved the availability of information to the public.

During permit development, the flexible permitting efforts followed or exceeded the permitting authorities' conventional communications and public involvement procedures.

Permitting authorities indicated that the availability and flow of information to the pubic during the development of the flexible permits satisfied or exceeded all requirements associated with the agency's standard operating procedures for permit development. This procedure typically includes making the draft permit available to the public at the permitting authority offices and at a local public library, publishing notice of the draft permit and public comment opportunities in one or more newspapers, holding a public comment period (e.g., typically 30 days), and conducting a public hearing if requested by the public. Some permitting authorities also publicize draft permits on their website or through other communication mechanisms.

In four of the flexible permit development efforts, including the three permits developed under the EPA's P4 program, the permitting authorities and companies voluntarily conducted one or more public meetings (i.e., in addition to any opportunity to hold a public hearing as part of the formal review process). While these meetings were not requested by the public, the permitting authorities and companies believed that the innovative nature of the permits increased the importance of taking active steps to inform local communities about the efforts. In addition, several of the permits experienced local media coverage about the innovative nature of the permits.

- At the beginning of the flexible permit development effort in 1996, citizens of Yelm, Washington did not view Lasco as a "good cooperate neighbor" due to past odor issues. The subsequent level of information flow to the public surrounding the Lasco permit development consisted of several meetings, many public notices, and extensive communication between Lasco and OAPCA. At the end of the permit development process, the Sierra Club submitted a letter supporting Lasco's flexible permit and thanking EPA Region 10, OAPCA, and Lasco for their proactive efforts to involve the community in the permit development process.

- Companies and permitting authorities involved in the development of the Imation, 3M, and Intel flexible permits each deemed an up-front public meeting in conjunction with the public comment period to be helpful in communicating to the public about the flexible permits, due to their innovative nature. In addition, the companies and permitting authorities were interested to understand early on any potential public questions or concerns about the permits. No adverse comments were subsequently received from the public for any of these permits.

The flexible permit development process increases the availability of information to the interested public regarding anticipated changes and emissions levels, as compared to a conventional permit development process.

As discussed in Finding 6 above, the flexible permit development processes provided clear information to the public regarding the maximum level of source emissions that would be allowed over the permit term, in the form of established emissions caps. Permitting authorities indicated that the emissions cap requirements in the draft permits and communicated during public meetings (when held) provide useful information to interested members of the public. If a source desires to exceed its emissions cap, it would thereafter be required to undergo a major NSR permitting process that would require public comment. The Lasco example demonstrates how such up-front information on total allowable plant-wide emissions can increase public understanding of the permit and anticipated environmental performance. In accepting the PTE cap of 249 tons/year of VOC emissions, Lasco had to reduce its actual emissions, providing assurances to local residents that emissions would thereafter be held relatively steady, despite company plans to increase production during the permit term. This awareness allayed one of the key concerns voiced by members of the Yelm community.

During development of the flexible permits, more information was available to interested members of the public regarding the type of changes the sources anticipated making during the permit term, when compared to a conventional permit development process. As discussed in Finding 6, the permitting authorities believed that the flexible permit development process, through the discussions of advance approved changes, provided them and interested members of the public with a clear advance understanding of the types of modifications that the sources planned to make during the permit term. Under a conventional permitting approach, change information would typically only be available in a more fragmented, incremental manner, as companies pursued approval to make changes on a case-by-case basis. Under the flexible approach, applicable requirements associated with each advance approved change are identified up-front in the permit, affording a long-term view of potential applicable requirements, resulting emissions control requirements, and environmental outcomes. This enabled the permitting authority and interested members of the public to have a more comprehensive picture of changes, and associated environmental performance outcomes, that would likely occur over the permit term.

During permit implementation, the flexible permits varied in the availability of information to the public about plant-wide emissions, operational and equipment changes, and pollution prevention activities; all permitting authorities indicated that, on balance, the flexible permits enhanced the availability of information to the public as compared to information typically available under conventional permitting approaches.

During permit implementation, the flexible permits required the provision of more comprehensive and, from several of the permitting authorities' perspectives, more useful information on plant-wide emissions performance to permitting authorities. As discussed in Finding 6, permitting authorities reported that the plant-wide emissions reporting required under the flexible permits provides more comprehensive and easy-to-understand information on actual environmental performance during the permit term. In some cases, such as for the DaimlerChrysler and 3M permits, the frequency of emissions reporting information was also greater than that typically required under a conventional permit. In other cases, such as for Imation and 3M, the flexible permits required the companies to report emissions from previously "grandfathered" emissions sources in their plant-wide emissions reporting. For all the flexible permits, the reports containing information on plant-wide emissions were available to the public in the permitting authorities' files.

The EPA found that there are a variety of techniques for making information available to the public regarding changes made using the advance approval provisions. These techniques include advance notices, post-construction notices, change registration, and periodic summaries of changes made (e.g., monthly, quarterly, or annual). For changes that do not meet the advance approval provisions, or that would cause a company to increase its emissions caps, the company would be required to undergo a conventional permitting process that would include submission of required application materials and completion of required public notice and comment procedures. When combined with the information on anticipated changes identified during the permit development process, as well as information on plant-wide emissions and P2 activities, the permitting authorities believe that flexible permits ensure the flow of sufficient information to enable the permitting authorities to effectively enforce for all applicable requirements, to ensure that air quality is protected in accordance with their SIPs, and to ensure consistency with the Clean Air Act's intent to provide for effective opportunities for public input into air permitting decisions.

As discussed in Finding 6, there was variability in the reporting requirements for changes implemented using the advance approval provisions. For four of the flexible permits, including those for 3M, DaimlerChrysler, Imation, and Lasco, the EPA found that approximately equivalent information on advance approved changes made was available to the public under the flexible permits, as compared to what permitting authorities indicated would have been available under conventional permitting approaches. In these cases, the timing and format of the advance approved change information was shifted when compared to conventional permitting approaches. In general, more general information on advance approved changes was available up-front during permit development, and more detailed information on specific changes made was available in the form of notices and lists of changes made, as opposed to minor NSR construction permitting applications. In addition, MPCA and DNREC found that the companies reported changes in addition to those that would likely have triggered minor NSR permit applications under a conventional permitting approach. For the Intel and Saturn flexible permits, as discussed in Finding 6, more general information on anticipated changes was available up-front during permit development, but less information on individual changes implemented using the advance approval provisions was available during permit implementation when compared to a conventional permitting approach, assuming that these changes would have been made under a conventional permitting approach.

During permit implementation, four of the flexible permits required companies to report information regarding P2 activities and performance to the permitting authorities. This information is available to interested members of the public through the permitting authority files for these sources. P2 information would not typically be available to the public under a conventional permitting approach.

- The Imation pilot permit required the company to submit annual P2 reports to Oklahoma DEQ describing the P2 activities and programs adopted at the site, as well as progress against an established P2 target. This information is available to the public in the permitting authority's files.
- Intel was required to submit an annual P2 progress report to Oregon DEQ, and a final report at the end of the permit term. This information is available to the public in the permitting authority's files.
- DaimlerChrysler is required to report annually on their P2 activities. This information is available to the public in the permitting authority's files.
- Lasco is to submit an annual P2 progress report, which documents P2 techniques, goals, and accomplishments. Additionally, prior to the end of the third and fifth year of the permit term, Lasco is to submit a report demonstrating compliance with the P2 Program. This information is available to the public in the permitting authority's files.

Finding 8: The flexible permits produced or are likely to produce net financial benefits to companies and permitting authorities.

Companies and permitting authorities reported that the flexible permits have resulted in net financial benefits, or that they anticipate that this will be the case. Companies and permitting authorities indicated that initial permit development costs exceeded those required to develop conventional permits, due to factors related to the pilot nature of the permits, as well as to factors inherent to developing flexible permitting techniques. In each case, however, companies and permitting authorities reported that the flexibility provisions have decreased, or are expected to decrease, the administrative costs of operating under the permit sufficiently to more than offset the higher initial permit development costs.

Permit development costs for the flexible permits were significant, but these higher costs were largely attributed to the pilot nature of the permits.

Companies and permitting authorities involved in the flexible permitting efforts reported that the costs, primarily resulting from staff time devoted to development of the flexibility provisions, were greater than those typically experienced in the development of conventional permits.

- MPCA representatives estimated that about 1000 hours of MPCA staff time were devoted to development of the permit. MPCA representatives noted that a primary factor contributing to the length of the permit development was that this was the first flexible permit developed in Minnesota, as well as one of the first developed and issued in the U.S.
- The development of Lasco's flexible Title V permit spanned approximately 16 months, from initiation of discussions (e.g., P4 group discussions) until the permit was issued. However, in addition to this being a team-oriented "demonstration" project necessitating additional review and public participation (see below), this was OAPCA's first Title V permit. OAPCA representatives reported that these factors contributed to the overall length of the permit development process. In the future, OAPCA indicated that flexible Title V permits will likely take only slightly more time to develop and issue than conventional Title V permits (e.g., approximately 180 hours versus 160 hours).

Permitting authorities indicated that a substantial amount of the higher permitting costs were attributable to the pilot nature of the permits. These pilot costs stemmed partly from the need for frequent conference calls or meetings between the permitting authorities, the EPA Regional Offices, and the EPA headquarters to ensure the flexible permitting techniques would be approved by the EPA in the absence of guidance on flexible permitting. Additional costs also resulted from the fact that each of the six flexible permits were the first developed under these permitting authorities' jurisdictions, and there was limited national experience with specific flexibility provisions from which to draw upon. Permitting authorities indicated that the pilot-related transaction costs would likely be reduced significantly or eliminated if the EPA were to issue guidance and/or rulemaking that clarified the flexible permitting approaches and techniques that are acceptable to the EPA.

Some portion of the higher permit development costs, however, were associated with tailoring of flexible permitting techniques to address the specific applicable requirements, needs, and circumstances of the sources. Permitting authorities and companies indicated that these costs would be incurred in the development of any new permit containing flexibility provisions, even if the use of flexible permitting techniques becomes routine and is supported by EPA guidance or rulemaking. For example, communications between the companies and permitting authorities regarding the changes that companies' anticipate making during the permit term are typically necessary to develop advance approval provisions. Other flexible permitting techniques, such as the development of replicable operating and testing procedures and streamlining of applicable requirements, also entail more significant interactions between a company and permitting authority during permit development.

- 3M and MPCA reported that additional time was required during permit development to develop the advance approval descriptions. This involved discussions to identify the specific changes and categories of changes that 3M anticipated making during the permit term.

Companies and permitting authorities that have renewed their flexibility provisions in subsequent permits indicated that the renewal costs have been minimal, as compared to costs required under a conventional permit renewal process. While some advance approval provisions may need to be updated at permit renewal, to accommodate new change needs anticipated by the company over the subsequent permit term, this process generally requires significantly less company and permitting authority resources than were required for the initial development of flexibility provisions for the source. This means that potential financial benefits for companies and permitting authorities can be extended to subsequent permit terms.

- Oregon DEQ incorporated many of Intel's flexibility provisions into the company's subsequent synthetic minor air permit without requiring additional permitting authority resources.
- DNREC reported that it was able to incorporate the flexibility provisions in DaimlerChrysler's original pilot flexible permit into the company's Title V air operating permit without requiring resources beyond those necessary to issue a conventional Title V permit.

Companies and permitting authorities reported that they experienced financial benefits from implementation of the flexible permits that more than offset the higher up-front permit development costs.

Companies and permitting authorities reported that financial benefits arose during permit implementation from the reduced administrative costs associated with company operational and equipment changes made under the advance approval provisions. Companies indicated that the advance approval provisions reduced the staff time and resources necessary to implement changes covered by these provisions. Company personnel found that they did not need to perform detailed applicability determinations for individual changes, provided that the changes satisfied the advance approval conditions listed in the permit. Such applicability determinations for advance approved changes were performed during permit development and clarified in the permit. Companies indicated that this streamlined applicability determination process and the improved certainty related to how changes would be addressed under the permit reduced the companies' staff time needed to process changes. Further savings resulted from the companies' reduced need to prepare applications for construction permits and/or permit modifications for individual changes, due to the advance approval provisions. Companies indicated that the time necessary to complete permitting authority notifications of advance approved changes and/or to record such changes in on-site logs was significantly less than the staff time necessary to prepare permit applications under a conventional permitting approach.

- DaimlerChrysler representatives estimated that the flexible permits save the company significant staff time that would have been associated with applicability determinations and permit actions for changes made using the advance approval provisions. They estimated that approximately 505 hours of staff time were saved under the initial flexible permit. These savings are projected to increase in the future as the company makes more changes utilizing the advance approval provisions in the permit.
- Under a conventional permit, Intel would have needed to prepare approximately 150 to 200 notice of construction applications per year (that were not required under the flexible permit). Intel estimated that each application would have required an average of approximately 8 hours, resulting in 1,200 to 1,600 hours of staff time per year.
- Lasco estimated that to execute a construction permit requires approximately 50 staff hours. Additionally, to process a permit modification, Lasco would need to submit a pubic notice (with an

estimated cost of $350) and to hold a public hearing (with an estimated cost of $400). For all five changes made using the advance approval provisions, Lasco estimated a cost savings of more than $20,000.

Permitting authorities also reported that they have experienced, or anticipate experiencing, administrative cost savings during permit implementation.

- MPCA representatives indicated that they view flexible permits as saving agency resources by reducing the number of case-by-case change reviews and permitting actions. MPCA estimated that each of their minor NSR permit actions (if straightforward) require an average level of effort equivalent to approximately $1,000, and 3M estimated that approximately 15 to 20 of the 34 changes undertaken likely would have required a minor permitting action. From MPCA's standpoint then, the flexible permit provided an administrative savings benefit of between $15,000 and $20,000. Further, 3M indicated at least two of their changes may have been major permit actions requiring approximately 100 hours of processing by MPCA. At $125 per hour, this would represent an additional savings to MPCA of $25,000.
- Oklahoma DEQ representatives stated that the Imation permit has saved time for DEQ personnel, enabling them to "operate more effectively" with their limited staff. They indicated that most of the time savings result from the reduced need for administrative processing of case-by-case construction permitting actions and air toxics approvals. DEQ representatives stated that they have identified at least five changes made under the advance approval provisions that would have required a permitting action under a conventional permitting approach, but that only required written notices under the flexible Title V permit. They indicated that, minus the flexibility provisions, each of these permitting actions would have required a 45-day review and approval process that could have extended well beyond that in some cases. They further indicated that this resource savings enables DEQ to focus scarce resources on inspections and other environmental and permitting priorities.
- The Intel permit saved Oregon DEQ significant staff time associated with processing notice of construction applications from Intel. Intel estimated that in the absence of the flexible permit, Oregon DEQ would have needed to process approximately 150 to 200 additional notice of construction applications per year. Even at a very low estimate of two staff hours per application, the staff time implications are significant (e.g., 300 to 400 hours).
- During the flexible permit term, Lasco made five advance approved changes that would have otherwise triggered case-by-case minor NSR permit actions. OAPCA estimated that Lasco's flexible permit saved them approximately 20 to 40 staff hours per advance approved change. The time savings includes time spent drafting a permit to construct, ensuring NAAQS compliance, modifying the Title V permit, and conducting the change-specific public review process. At $75/hour, the estimated administrative costs saved by the flexible permit for all five advance approved conditions ranges from $7,500 to $15,000.
- TDEC reported that the Saturn flexible permit has reduced agency paperwork associated with processing individual construction permit applications and permit modifications, allowing agency staff to focus on higher environmental priorities. They further indicated that the permit saved TDEC significant staff time associated with processing notice of construction applications from Saturn. The permit eliminates the need for full minor NSR permitting. Traditionally, permitting for minor NSR takes approximately 24 to 40 staff hours, plus issuance of a public notice and a town meeting or public hearing. This process has been streamlined to a State control technology review for new unit additions not subject to major BACT. TDEC representatives believe that during the life of the permit, TDEC will need to invest less hours of staff time to address the future air permitting needs associated with the Saturn plant, due to the anticipated future use of the advance approval provisions.

It should be noted that companies and permitting authorities cautioned that it is difficult to precisely estimate cost savings and financial benefits associated with flexible permit implementation, since it involves comparison with hypothetical experience under a conventional permitting approach. Companies and permitting authorities noted that the flexible permit provisions sufficiently altered the applicability determination for individual changes so as to make it difficult to retrospectively determine the precise level of effort and timing that would have been necessary to accommodate the changes under a conventional permitting approach. That said, companies and permitting authorities indicated that the estimated financial benefits identified in this report provide a reasonable approximation of the financial benefits that resulted from implementation of the flexible permits, compared to those costs that would likely have been expected had the companies been operating under conventional permits.

In additional to administrative cost savings, several companies identified financial benefits stemming from the ability to implement advance approved changes without the potential delay associated with conventional permitting time frames. Several companies indicated that this streamlined ability to implement advance approved changes improved the predictability of change implementation time frames for project planning and avoided what can be substantial opportunity costs. They further reported that this predictability and elimination of potential delay from air permitting provided important competitive advantages that enabled them to compete more effectively.

- From 3M's perspective, the flexible permit allowed the company to proceed as needed with operational change. This was critical from two perspectives: it allowed the plant to avoid acting as a bottleneck along the critical path of any particular product line that would be moving among 3M plants; and it allowed the plant to remain highly responsive to its marketplace and avoid either lost sales and/or permanent loss of market share. 3M did indicate that the changes made that potentially involved PSD permitting likely would not have been undertaken if handled on a conventional basis.
- DaimlerChrysler representatives indicated that the permit has increased the company's ability to respond to short-term changes in market demand, as well as to accommodate the tight project time lines associated with periodic model changeovers. DNREC and DaimlerChrysler representatives reported that under a conventional permitting approach, some of these changes would likely have triggered case-by-case applicability determinations and potential permitting actions that could have extended to 6 to 9 months each.
- The advance approved changes in Intel's flexible permit likely saved the Intel Aloha plant hundreds of business days associated with making operational and process changes to ramp up production for new products, respond to market demands, and optimize production processes. Industry estimates of the opportunity costs of production downtime and time delays run as high as several million dollars in just a few days due to lost sales to computer makers and other factors. The estimated 150 to 200 changes per year[5], combined with the Oregon DEQ approval time frame of up to 60 days per change[6], indicate that there would likely have been significant delay under a conventional permitting approach. Even if few delays would have resulted in production downtime or missed market opportunities, the costs would likely have been significant, as many of the changes improved the cost-competitiveness of Intel's products. Intel representatives indicated that it is likely that the impact of continued time delays would be to redirect Intel's production investment and operating facilities to locations more conducive to change.
- Imation representatives reported that the flexibility provisions in the Title V permit enabled the company to experiment with new materials and to introduce the production of new products at the

[5]Estimates from Intel of the number of changes made per year under the flexible permit that would have triggered the need for notice of construction approval under a conventional permit.

[6]Under Oregon rules, ODEQ has up to 60 days to process notice of construction approval applications. Twenty-one days was selected as a reasonable estimate of the average actual time associated with receiving notice of construction approval from ODEQ.

Weatherford plant with minimal delay associated with air permitting and material toxicity assessments. Under the flexibility provisions, Imation is authorized to use alternative raw materials without receiving case-by-case approval or permit modifications that typically can take two to three months, provided that they follow established procedures and ensure emissions remain below specified limits. Even for materials for which Oklahoma had not previously reviewed, DEQ agreed to complete toxicity evaluations and establish MAAC limits within 72 hours of receiving a request from Imation. Imation representatives stated that these streamlined administrative procedures for addressing Oklahoma's air toxics requirements have eliminated air permitting delay associated with raw material changes. Among other product transitions, the flexibility provisions in the Title V permit have facilitated Imation's development of digital proofing films for graphic design applications. In addition to various product quality benefits, digital proofing films also require fewer coating layers during manufacturing than conventional proofing films. This results in fewer VOC emissions from solvents per unit. While customer demand for digital proofing materials is increasing, it is likely to take several years before digital proofing technology is in widespread use, due to the cost of converting to digital proofing hardware.

- Lasco engaged in a series of advance approved changes, updated its emission factor, and voluntarily installed an RTO. These actions combined to create "head room" under Lasco's cap, which Lasco then used to increase production. Lasco indicated that typically (and as reflected by the Yelm plant's lack of operational change prior to the flexible permit and experience at other Lasco facilities) the company is very averse to making changes that trigger permitting actions. At most, they wait to undertake such changes at the time of permit renewal. Contrary to its typical corporate behavior, Lasco Yelm engaged in a series of modifications that created the opportunity to increase production from 126,045 units/year (in 1997) to 132,548 units/year (in 2000) generating a significant annual increase in profit. In 2001, after the RTO was installed, Lasco decreased emissions per unit further to 3.13 lbs./unit, allowing production to increase to 147,429 units and reducing costs associated with styrene loss.
- Saturn indicated that the flexible permit was a principle factor in General Motors' selection of the source to manufacture the L850 engine, leading to the creation of 700 jobs. Saturn was awarded the contract primarily because it could implement the necessary changes within 24 months and accommodate future changes with minimal delay. The flexible PSD permit is enabling Saturn to add and modify coating, assembly and machining lines in a timely manner, while ensuring that best available pollution control technologies are installed and that air emissions remain under approved limits. Using a combination of the PAL emissions caps and advanced approvals, the flexible permit will allow Saturn to upgrade the plant over the next few years, with minimal delays, to produce several new vehicles, including Saturn's new fuel-efficient sport utility vehicle, the Saturn VUE™. Saturn representatives stated that the flexible permit avoids a potential NSR backlog associated with the conventional permitting process, thereby providing a competitive advantage to Saturn.

Finding 9: Permitting authorities are generally supportive of flexible permits as an option.

The permitting authorities reported that they are pleased with the benefits from the flexible permits. Additionally, they believe flexible permitting techniques are useful tools to address some companies' operational flexibility needs, to foster environmental improvements through emissions reductions, and to lessen permitting authority resource needs and backlogs associated with construction permitting, so that these public agencies can focus resources on higher environmental management priorities. Finding 10 discusses permitting authority perspectives on matching flexibility provisions with appropriate source candidates.

Permitting authorities are supportive of flexible permits, and they expressed their interest to renew the pilot flexible permits and to expand the use of flexible permits in their jurisdictions.

Permitting authorities demonstrated their support of flexible permits by retaining the flexibility provisions in the subsequent permit for the source, or by indicating their interest to do so.

- Oregon DEQ retained the advance approval provisions in Intel's synthetic minor air operating permit that replaced the Aloha plant's Title V permit in 1999.
- MPCA indicated that the agency is supportive of renewing 3M's flexibility provisions in the forthcoming Title V permit. In discussing options for the plant's Title V permitting application (under consideration by MPCA at the time of the EPA review), however, 3M management decided not to pursue such provisions due to uncertainty surrounding how the next VOC emissions limit would be defined. 3M voiced concerns that significantly lowered emissions caps could constrain the plant's ability to accommodate increased product demand or transfers of product lines from other 3M facilities.
- DNREC supported the renewal of all flexibility provisions from DaimlerChrysler's initial flexible construction and air operating permit into the plant's Title V permit, issued in October 1999.

Two permitting authorities further demonstrated their support of flexibility provisions by incorporating flexibility techniques into permits for other sources within their jurisdiction.

- MPCA reported that the agency has issued "dozens" of minor source and synthetic minor source permits that include flexibility provisions (e.g., plant-wide emissions caps and advance approval provisions) since the issuance of the 3M St. Paul Tape Plant pilot permit in 1993. MPCA also issued a permit to 3M's Maplewood, Minnesota research and development plant that included an advance approved BACT determination.
- DNREC has issued a Title V permit for DuPont's Edge Moor, Delaware plant that includes PALs and advance approval provisions, as well as several permits containing alternate operating scenarios.

Permitting authorities indicated that finalization of EPA policy and/or guidance on flexible permitting would increase their interest and efficiency in expanding the use of flexible permits.

Permitting authorities indicated that finalization of rulemaking and/or guidance related to flexible permitting is desired to provide greater clarity and certainty around the EPA's expectations. Most permitting authorities stated that, while they are supportive of flexible permitting approaches, they are somewhat hesitant to invest resources of any significant amount into new flexible permits in the absence of increased clarity regarding approaches that are acceptable to the EPA. Permitting authorities generally did not want to find themselves in a position where they have developed numerous flexible permits based on an approach or regulatory interpretation that does not correlate with the EPA's approved flexible permitting rules and/or guidance developed at some point in the future.

Several permitting authorities also noted the high transaction costs associated with developing "pilot" permits as an additional deterrent to expanding the use of flexibility techniques without EPA policy or guidance. Pilot initiatives typically demand a high level of interaction between the permitting authority, EPA Regional Offices, and various offices within the EPA headquarters to verify that the pilot approaches are acceptable. Permitting authorities indicated that EPA policy and/or guidance could reduce the amount of time spent in conference calls and meetings, and in the development of flexible permit language that does not meet the EPA's expectations, while also reducing the overall time frame for developing a flexible permit. One permitting authority believed that additional guidance was not needed for it to act but agreed with the other permitting authorities that EPA rules and/or guidance on flexible permitting might serve to improve the consistency of regulatory interpretations, expectations, and comments communicated by various EPA offices and regions.

While permitting authorities supported promulgation of EPA policy and/or guidance on flexible permitting, they hoped that any such policy would be accommodative of the approaches employed in the pilot flexible permits. In addition, DNREC representatives urged the EPA to not be overly prescriptive in any policy or guidance and to allow permitting authorities reasonable discretion in the implementation of approved flexibility techniques.

Permitting authorities stated that various forms of EPA outreach, training, and assistance would be useful to assist permitting authorities to develop effective flexible permits.

Permitting authorities and companies emphasized that the EPA could take several steps, in addition to promulgation of flexible permitting policy and/or guidance, to support the implementation of effective flexible permits. Suggestions included:

- Make documentation available regarding flexible permitting techniques. Materials should include examples of flexible permits, fact sheets on various flexible permitting approaches and tools, draft permit language related to various flexibility approaches, training materials, and other resources.
- Formalize a network of EPA flexible permitting experts who would be available to support permitting authorities interested to develop permits containing flexibility provisions.
- Conduct workshops and training sessions for EPA and permitting authority personnel who are interested to learn about flexible permitting techniques. Similar workshops or training sessions could be designed for sources to help them determine whether or not they may be appropriate candidates for flexible permitting techniques.
- Develop a tool to assist sources and permitting authorities to determine the appropriateness of flexible permitting techniques to potential source candidates.
- Develop an EPA website clearinghouse for information on flexible permitting techniques.

Finding 10: Permitting authorities indicated that flexible permit provisions should be matched with a company's need for flexibility and technical capacity to implement effectively its flexible permit requirements.

Permitting authorities indicated that while they believe flexible permitting techniques to be appropriate and beneficial for use with some companies, they may not be appropriate for all companies. They indicated that there are two critical factors that should be considered when determining the appropriateness of flexible permitting for candidate sources. First, the company should be able to demonstrate that it has a need for the flexibility. Second, the permitting authority should be confident that the source has sufficient capacity to operate effectively under a flexible permit, which typically includes additional monitoring, recordkeeping, and reporting requirements.

Permitting authorities believe that a candidate company should be able to demonstrate sufficient need for flexibility to justify the additional up-front staff time and resources needed for the permitting authority to tailor flexible permitting techniques to the source.

Permitting authorities indicated that they want to have some assurance that any additional up-front investment will result in benefits for the company, permitting authority, and/or environment before investing in the development of a flexible permit. Such need could be demonstrated by a company's ability to clearly articulate its operational change needs. Permitting authorities indicated that some companies seldom implement changes that trigger air permitting requirements, making them less appropriate candidates for flexible permits.

Permitting authorities indicated that a candidate company should exhibit the technical capacity to operate effectively under a flexible permit, as indicated by factors such as the source's compliance history, attentiveness to pollution prevention, and ability to track and manage operational changes and emissions.

Permitting authorities indicated that while they believe company compliance with flexible permits to be fully verifiable and enforceable, they believe that companies lacking sufficient capacity to operate effectively under a flexible permit could be at an increased risk of non-compliance. Additional monitoring, reporting, and recordkeeping conditions, such as the calculation of plant-wide emissions and maintenance of logs documenting operational changes and alternate operating scenarios, are typically required to assure compliance with flexible permit provisions. Permitting authorities indicated that some companies may not have sufficient capacity and capabilities to effectively meet such permit requirements on a sustained basis.

Permitting authorities stated that they view a company's past compliance history as the primary indicator of the company's capacity to operate under a flexible permit. Past patterns of compliance violations often signal that a company is not sufficiently able to handle additional monitoring, recordkeeping, and reporting requirements necessary under a flexible permit. Permitting authorities pointed to several other indicators of a company's capacity to operate effectively and in compliance under a flexible permit. These include:

- A company's capacity to track and manage operational and equipment changes.
- A company's ability to accurately monitor plant-wide emissions.
- A company's track record of communication and openness with the permitting authority.
- The presence of trained personnel at the source who understand air requirements.
- The presence of a P2 program and/or a track record of P2 accomplishment.

Permitting authorities indicated, however, that rigid criteria for determining the appropriateness of flexible permitting techniques for a company candidate, such as the complete absence of historic compliance violations, should not be established. They indicated that permitting authority personnel are accustomed to matching appropriate permitting techniques and requirements to address individual sources' applicable requirements and circumstances.

Table 1.1 Pilot Flexible Permits Evaluated in the EPA Flexible Permit Implementation Review

Source	Permitting Authority	Permit Type & Permit #	Permit Issuance	Permit Expiration
3M Company - St. Paul, Minnesota Tape Plant	Minnesota Pollution Control Agency (MPCA)	State Air Operating Permit (not a Title V permit); (Permit No. 23GS-93-OT-1)	March 4, 1993	March 4, 1998
DaimlerChrysler - Newark, Delaware Automobile Assembly Plant	Delaware Department of Natural Resources and Environmental Control (DNREC)	Construction/Operation Permit; (APC-95/0569-Construction/Operation)	September 1995	October 1999
		Title V Air Operating Permit; (AQM-003/00128)	October 1999	October 2004
Imation Corporation - Weatherford, Oklahoma Plant	Oklahoma Department of Environmental Quality (Oklahoma DEQ)	Title V Air Quality Permit; (Permit No. 97-380-TV)	June 9, 1998	June 9, 2003
Intel Corporation - Aloha, Oregon Semiconductor Fabrication Plant	Oregon Department of Environmental Quality (Oregon DEQ)	Title V Permit; (Oregon Permit No. 34-2681)	October 1995	October 1999
Lasco Bathware Corporation - Yelm, Washington Plant	Olympic Air Pollution Control Authority (OAPCA)	Title V Air Operating Permit; (Permit No. 01-97)	June 7, 1997	July 7, 2001
Saturn Corporation - Spring Hill, Tennessee Automobile Manufacturing & Assembly Plant	Tennessee Department of Environment and Conservation (TDEC)	Permit to Construct or Modify an Air Contaminant Source; (Permit No. 952233)	June 6, 2000	December 31, 2005[7]

[7]The permit expires on December 31, 2005, but the plant-wide applicability limits (PALs) extend to July 2010.

Table 1.2 Flexibility Provisions in Pilot Permits Reviewed by the EPA

Source	Key Flexibility Provisions
3M St. Paul, Minnesota	• Plant-wide emissions limits for VOC (4,596 tons/year; 30,600 lbs./day). • Advance-approvals for specified categories of renovations and other changes deemed to be "consistent with" the specified change categories. • Replicable testing procedure enabling updates to capture and destruction efficiency parameters for pollution control devices without requiring permit modifications.
DaimlerChrysler Newark, Delaware	• Plant-wide applicability limits (PALs) for NO_x (150.71 tons/year; 4.86 tons/day) and VOC (1,112.8 tons/year; 5.3 tons/day). • Advance-approvals for specified projects and categories of changes. • Case by case technology determination for significant new units. • Enforceable P2 performance requirement for topcoat emissions and P2 reporting requirements. • Replicable testing procedure for updating pollution control device parameters. • Permit conditions streamlining.
Imation Weatherford, Oklahoma	• Plant-wide PTE limit for VOC emissions (249 tons/year). • Advance-approvals for specified changes and classes of changes. • Advance-approvals for raw material changes, including streamlined determinations under State Air Toxics Program. • Alternative control device operating scenarios that provide flexibility in controlling or otherwise reducing VOC emissions. • Permit conditions streamlining, including streamlining of applicable MACT standards. • P2 Program and reporting requirements.
Intel Aloha, Oregon	• Plant Site Emissions Limits (PSELs) for VOC (190 tons/year; 8 tons/week) and CO (32 tons/year). • Potential-to-emit (PTE) limits on organic and inorganic hazardous air pollutants (HAPs). • Advance-approvals for a broad class of changes, provided no new applicable requirements and MRR requirements not covered in the permit. • Source-specific RACT limit based on units of production, designed to encourage P2. • Pollution Prevention (P2) Program and reporting requirements.
Lasco Bathware Yelm, Washington	• Plant-wide PTE limits for VOC emissions (249 tons/year; 1.71 tons/day). • Advance-approvals for categories of changes, including BACT and P2 requirements to address minor NSR requirements. • Replicable testing procedures for updating emission factors without requiring permit modifications. • P2 Program with goals and reporting requirements.
Saturn Spring Hill, Tennessee	• Variable PALs for VOC based on production (1,563 tons/year at 500,000+ vehicles per year; 198.5 tons/month). • PALs for NO_x, PM, SO, and CO (PALs are hybrids based on actual and allowable source emissions). • Advanced approvals for changes to existing emissions sources and construction of new emissions sources (with conditions). • BACT for all existing emissions units. • Case by case BACT determination for all new units. • Permit conditions streamlining.

Table 2.1 Key Emissions MRR Requirements in Pilot Permits Reviewed by the EPA

Source	Key Emissions Monitoring, Recordkeeping, and Reporting Requirements
3M St. Paul, Minnesota	• Mass balance approach to VOC emissions measurement; applies an overall control efficiency (capture and destruction) to the VOC input (derived from material usage tracking system); parametric monitoring is conducted of selected control system operating parameters (e.g., combustion temperature, exhaust gas flow). • Control device performance testing is required every two years for both capture efficiency and destruction efficiency. • Uncontrolled fugitive emissions from churn and mogul rooms measured by CEMS. • Daily calculation of VOC emissions from all emissions units (required within 41 hours) are maintained on-site. • Quarterly reporting to MPCA of daily plant-wide VOC emissions and 365-day rolling totals.
DaimlerChrysler Newark, Delaware	• Mass balance approach to VOC emissions measurement, based on EPA's "Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Topcoat Operations" (EPA-450/3-88-018, December 1988); parametric monitoring is conducted of selected control system (RTO) operating parameters (e.g., combustion temperature, inlet pressure); booth/oven splits, transfer efficiency, and incinerator efficiencies used in calculations are based on the most recent tests completed using the protocol. • Compliance with EDP primecoat operations is demonstrated pursuant to procedures in New Source Performance Standards (40 CFR 60.393 (c)(2)) through the use of capture and control. VOC RACT standards apply to the miscellaneous metal parts coating and final repair operations and dictate the compliance method. Compliance with these limits is demonstrated through the use of complying coatings or daily weighted averages. • Oven burners and miscellaneous NO_x sources use AP-42 emission factors in conjunction with monitored parameters to calculate emissions; source-specific emission factors were developed for the antichip, topcoat and EDP primecoat incinerators and the boilers. • Monthly reporting to DNREC of plant-wide VOC and NO_x emissions (daily, monthly, and 12-month rolling totals).
Imation Weatherford, Oklahoma	• Mass balance approach to VOC emissions measurement; parametric monitoring is conducted for all capture and control devices (RTO, catalytic oxidizer, and carbon adsorber). • Criteria air pollutant emissions are determined using fuel type, monthly fuel usage to the boilers and oxidizers, and appropriate AP-42 emission factors. • Daily and monthly calculation of VOC emissions (prorated hourly, daily, and 12-month rolling totals) are maintained on-site.
Intel Aloha, Oregon	• Mass balance approach to VOC emissions measurement; bi-monthly VOC emissions based on actual solvent monitoring; bimonthly emissions data with production activity data (i.e., total surface area of wafers processed, square centimeters[cm^2]) provides the information necessary to calculate an overall emission factor (EF) for the fab. Using the recent bimonthly EF with weekly production data provides total weekly VOC emissions (tons/wk). • Criteria air pollutant emissions are determined using fuel type, monthly fuel usage to the boilers and oxidizers, and appropriate AP-42 emission factors, except for Emission Unit 3 boiler's NO_x and CO emission factors which are based on manufacturer's data and verified by source test.
Lasco Bathware Yelm, Washington	• VOC emissions calculations based on raw material usage, VOC (styrene) content of the raw materials, and site-specific emission factors (pounds [lbs.] of emissions per lb. of styrene); site-specific emissions factors are based on source testing; material usage is calculated on a daily basis. • Monthly plant-wide VOC emissions are calculated each month, along with 12-month rolling totals.
Saturn Spring Hill, Tennessee	• Mass balance approach to VOC emissions measurement, based on EPA's "Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Topcoat Operations" (EPA-450/3-88-018, December 1988); parametric monitoring is conducted of selected control system operating parameters (e.g., combustion temperature, exhaust gas flow rates); booth/oven splits, transfer efficiency, and incinerator efficiencies used in calculations are based on the most recent tests completed using the protocol. • Criteria air pollutant emissions are determined using monthly natural gas usage data and appropriate AP-42 emission factors. • Monthly calculation of monthly and 12-month rolling plant-wide VOC emissions totals.

APPENDIX B

PROJECTION OF VOC EMISSIONS REDUCTION BENEFITS FROM PALS

Estimate of Environmental Benefits for Plantwide Applicability Limits (PAL) rule changes

I. Introduction

The purpose of this analysis is to provide a broad national estimate of the likely benefits expected to result from the plantwide applicability limit (PAL) provisions of the NSR Improvement rule. The EPA believes that PALs are likely to result in a net environmental benefit. These environmental benefits (which represent only a portion of the overall benefits of the PAL approach) arise primarily because of the incentives created when a facility caps its emissions in exchange for future flexibility to make changes without further NSR permit process. A source contemplating future changes must assure that its emissions do not exceed the cap, so it has an incentive to lower its emissions as much as possible as early as possible to make room under the cap for the future changes. Furthermore, it has an incentive to continue to control any new sources to preserve as much of this room as it can. Additionally, it is administratively much easier for sources to carry out pollution control projects under a PAL. Although these benefits are difficult to quantify, this analysis draws on EPA's experience to date with cap-type permits, and, making certain assumptions, makes a conservative estimate of the range of benefits that could result from these incentives.

II. Methodology

Because PALs are voluntary, it is extremely difficult at this time to model how many and which sources will take PALs, and for which pollutants. The source categories most likely to apply for PALs are those where frequent operational changes are made, where these changes are time-sensitive, and where there are opportunities for economical air pollution control measures. Our experience thus far shows that PALs are in greatest demand for changes involving emissions of Volatile Organic Compounds (VOC). For the purposes of this analysis, we focus on three categories likely to make widespread use of PALs for VOC, and assume that a significant number of sources in each category – from 50 to 75 percent – will, in fact, adopt PALs. The three categories are Pharmaceutical Manufacturing (SIC 2834), Semiconductor Manufacturing (3674), and Automobile Manufacturing (3711).

We then develop a range of likely emissions reductions that will result when these facilities adopt PALs. This range is based on experience with cap-type permits to date. We apply this range for the sources assumed to adopt PALs, calculating emissions reductions relative to the present baseline. For the purposes of this analysis we assume that the baseline is the actual emissions immediately preceding the change. We note that baseline may be calculated using periods of utilization of up to 10 years ago. However, we expect that the recent baseline is valid because, as EPA has separately discussed in detail, very few sources would qualify for a higher baseline going back 10 years. This is especially true for sources that had recently installed enforceable controls or taken other enforceable limitations, because the baseline requires these sources to account for these controls and adjust their baselines downward accordingly. For this reason we expect that the sources described in this analysis would be unlikely to obtain a baseline significantly different from the two years preceding the change.

It is important to note that this analysis is intended to be a macro-level analysis of expected national emissions benefits from PAL incentives. It is intended to represent the order of magnitude of the likely emissions benefits using broad national assumptions. It is not intended to provide estimates for any single plant. As noted above it is very difficult to model which individual facilities will voluntarily take PALs, and what the particular emissions reductions from the PAL pollutant(s) will be. Thus, the results of this analysis should not be used to estimate the particular benefits from a PAL at any single source.

III. Data from Flexible Permit Pilots

In order to estimate the emissions reductions that will likely occur as sources make room under their PALs, we examined cases where PAL-type permits are already in place. The EPA has been already actively involved in promoting the use of flexible air permits through various initiatives. Recently, the EPA reviewed six flexible permits that have been developed in recent years as pilot projects, and evaluated various outcomes, including emissions reductions. The full summary report, entitled "Evaluation of the Implementation Experience with Innovative Air Permits" is available separately. In general, the evaluation found (Finding #3) that flexible permits facilitated and encouraged emissions reductions and pollution prevention. It provided a range of reductions actually achieved at facilities with emission cap permits[1], which ranged from 27 percent to 83 percent reduction from the baseline emissions level. It is important to note that in several of these pilots, the cap level was set well below permit allowable emissions, and, in some cases, set below baseline actual emissions. In some cases, these are dramatic reductions. For example, one facility described in the pilot evaluation report lowered its actual emissions by over 5000 tons per year of VOC before accepting a PAL, and then further lowered its actual emissions by more than 3000 tons per year under its PAL. However, for the purpose of this analysis, we estimate *only* the reductions below the PAL level.[2]

While recognizing that the particular performance of a source operating under an emissions cap is dependent on a range of case-specific factors, the EPA believes that experience with the pilots thus far can be used to draw general conclusions about the range of reductions we

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[1]EPA judged that 5 of the 6 pilots contained caps similar to those that would be available under the NSR improvement rules. The other does not operate as a PAL and was excluded from this analysis.

[2]The NSR reform rule provides that PALs be established based on baseline plantwide actual emissions plus the NSR significance level, consistent with the otherwise applicable NSR trigger level at the facility.

expect to see under PALs. While we are confident that some PAL sources will achieve results similar to the top end of the range (*i.e.*, 80 percent), for this analysis we recognize that the estimates may be influenced by the fact that sources participating in the pilots were self-selecting. Although this is not certain to bias the results, we accounted for this potential bias by conservatively estimating that the typical range of reductions will be lower – from approximately 10 to 33 percent reductions.

IV. Results

To complete the aggregate analysis for the selected source categories, we obtained national emissions data from EPA's 1999 National Emissions Inventory (Version 1.5), shown in the first line of Table 1 below. The 1999 inventory was selected because it is the most recent year for which a complete inventory is available. The inventory was adjusted to include emissions that were representative of major sources, since the NSR Improvement rules address only the major source NSR program. We then applied the conservative reduction estimates to the VOC inventory for each of the source categories described above. As noted above, the results are intended to provide broad estimates. Although estimates are presented to the nearest ton, this is not intended to suggest that the data permit such a precise estimate. The estimates are shown in Table 1 below:

TABLE 1. ESTIMATE OF VOC REDUCTIONS UNDER PALS FROM SELECTED SOURCE CATEGORIES

Source Category	Pharmaceuticals	Semiconductors	Auto Manufacturing	TOTAL
VOC Emissions (1999 Inventory)	6,206	1,122	61,176	68,504
If 75% of sources take a PAL				
10% VOC Reductions	465	84	4,588	5,137
33% VOC Reductions	1,536	278	15,141	16,955
If 50% of sources take a PAL				
10% VOC Reductions	310	56	3,058	3,424
33% VOC Reductions	1,024	185	10,094	11,303
10% reduction at largest single source	109	17	419	
33% reduction at largest single source	358	57	1384	

Thus, from these three sectors alone, assuming 50 to 75 percent participation, it is likely that PALs will result in at least 3,400 to 17,000 tons per year of VOC reductions nationally. Because our analysis focuses only on these three categories, it is likely an underestimate, as several other source categories will certainly make use of PALs, though to a lesser degree in some instances. Overall national reductions will be higher when other sectors are considered, and when other pollutants are considered, but we cannot model this full range of reductions due to our limited ability to simulate sources' likelihood of taking PALs and the variety of reductions that would result under them. Nonetheless, this analysis illustrates that the benefits of PALs are likely to be on the order of magnitude of tens of thousands of tons per year of VOC.

It is also important to note that, even without the downward trend in actual emissions that occurs when PALs are used, a PAL would offer a net environmental benefit compared to NSR applicability for sources without PALs. This is because under current rules, many small unrelated changes may be made which increase emissions individually, but remain below the NSR significance levels. These increases would not occur with a PAL; emissions would truly be capped at the PAL level. The EPA cannot model the aggregate environmental impacts of these small emissions increases, or the benefit that would arise from capping them, but such benefits would be potentially large, and would be in addition to those estimated above for actual emissions declines.

Finally it is important to note that, should sources be unable to reduce their emissions as significantly as we have seen in these early cases, the emissions from the facility would still be capped, assuring no worse emissions than under current rules. In the extreme case where a facility could not meet its cap, its emissions increases would be subject NSR, just as they are today. Thus, the worst-case emissions scenario from adoption of the PAL option is no worse than the current rule. However, as noted above, evidence to date shows that the far more likely result is that net benefits will occur.

APPENDIX C

REPORT ON BACT DETERMINATIONS FROM RACT/BACT/LAER CLEARINGHOUSE

ANALYSIS OF CONTROL DEVICE USAGE AND PERFORMANCE FOR SELECTED INDUSTRY CATEGORIES FOR THE PERIOD 1988 TO 2002 AS REPORTED IN THE RACT/BACT/LAER CLEARINGHOUSE DATABASE

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1.0 Introduction

An analysis was performed on information obtained from the RACT/BACT/LAER Clearinghouse (RBLC) database to look for trends[3] in control device usage and performance over a 15-year period from 1988 to 2002. For selected industry categories, emission control information was obtained from the database for each determination[4] related to a new source review (NSR) or prevention of significant deterioration (PSD) permit. For ease of analysis, this information was broken down by 5-year periods (1988 to 1992, 1993 to 1997, and 1998 to 2002). For each 5-year period, the information was further grouped by industry category and pollutant. Based on this analysis, the following general conclusions were made regarding the usage of control devices and the reported control efficiencies of the control devices over the entire 15-year period: 1) for a given pollutant, no obvious trends were evident in the level of control based on individual control devices; 2) for a given pollutant, no trends were evident in the level of control considering all control devices together; 3) the types of control devices used for a particular pollutant across industry categories remained consistent; and 4) the types of control devices used within a given source category remained consistent for each pollutant.

1.1 The RBLC Database

This analysis was based on a copy of the entire RBLC database in Access format that we received from the EPA. This copy of the database, current as of August 16, 2002, contained all information available to the public through the Technology Transfer Network (TTN) on EPA's Internet site (www.epa.gov/ttn/catc/rblc/htm/rbqry.html).

The RBLC is a database for air pollution control and pollution prevention technology determinations required for major new and modified sources subject to new source review (NSR)

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[3] As used in this report, the term "trend" refers simply to a general increasing or decreasing tendency in the use of a control device for a particular pollutant or the control efficiency of a particular control device over a period of time. The term is not meant to imply that a statistical analysis was performed on any of the data. A statistical analysis was not possible because of the small number of data points overall, lack of data points throughout the entire 15-year period, and incomplete explanation of what some of the reported control efficiency values mean.

[4] In the context of the RBLC database, a "determination" is the collection of information related to one pollutant emitted by one emission source as listed in a PSD/NSR permit. For example, a recovery boiler at a pulp and paper mill may trigger PSD/NSR for VOC, NO_x, and CO. Thus, there would be three determinations in the RBLC database for this source, one each for VOC, NO_x, and CO.

permitting requirements. The RBLC began as the BACT/LAER Clearinghouse in 1981 as a collection and distribution service for State and local agency BACT and LAER determinations. BACT, or best available control technology, is required on major new or modified sources in attainment areas. LAER, or lowest achievable emission rate, is required on major new or modified sources in nonattainment areas.

Although the EPA voluntarily established the RBLC as an aid to State and local permitting agencies, it became a statutory requirement in section 108(h) of the Clean Air Act Amendments of 1990 (CAAA). The CAAA also added RACT, or reasonably available control technology, to cover requirements for existing sources located in nonattainment areas. State agencies are required to submit LAER determinations to the RBLC under section 173(d) of the CAAA; however, all other submissions are voluntary.

1.2 Outline of Report

This report is organized as follows. The introduction provided in this chapter is followed by a description of how we obtained data from the RBLC database in Chapter 2. Chapter 3 discusses the data analysis, and Chapter 4 presents our conclusions.

A large amount of data was obtained from the RBLC database and imported into Excel spreadsheets to facilitate our subsequent analysis. This information has been summarized in several appendices to present the information in a usable format. Appendices A through E contain summaries of the RBLC information obtained for carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM/PM10), sulfur dioxide (SO_2), and volatile organic compounds (VOC), respectively. Appendix F lists the number of entries in the RBLC database by industry process type code.

2.0 Selection of the Industry Categories[5] and Preparation of the RBLC Access Database

2.1 Initial Selection of Industry Categories

Eleven industry categories were initially selected, based on expected prevalence of NSR/PSD permits, number of facilities, and listing of the source category in 40 CFR 51.166(b)(1)(i)(*a*). These initial industry categories are listed in Table 2-1.

Table 2-1. Initial Selection of Industry Categories

Industry	RBLC Process Type Code
Petroleum and Natural Gas Production and Refining	50.000 - 50.999
Chemicals Manufacturing	60.000 - 69.999 (except 69.011)
Pharmaceuticals Production	69.011
Kraft Pulp Mills and Pulp and Paper Production	30.002 and 30.004
Automobiles and Trucks Surface Coating	41.002
Ferrous Metals Industry	81.000 - 81.999
Natural Gas Transmission	SIC 4922[a]

[a] There is no specific RBLC process type code for this process.

2.2 Preparation of RBLC Access Database

A copy of the RBLC database as of August 16, 2002, including transitional entries (recent entries and corrections, flagged as transitional until audited) was supplied by EPA in

[5] As used here, the term "industry category" refers to the process type codes used in the RBLC database. The term can be used to refer to a general grouping of similar processes (e.g., process type code 41.000 is the general grouping of all surface coating, printing, and graphic arts processes) or it can be used to refer to a specific type of process (e.g., process type code 41.002 is automobiles and trucks surface coating). A complete listing of process type codes can be obtained through the RBLC web site at http://www.epa.gov/ttn/catc/dir1/proctype.txt.

Access format. Queries were performed on this database, as described below, to prepare a master database formatted appropriately for the subsequent analyses.

An initial query was performed to join the three tables of interest (facilities, processes, and pollutants) from the Access database, giving a single table with complete facility and process information for every pollutant listed at each facility. There were a total of 25,120 entries in the resulting table. Each entry in this table represents a single pollutant and its associated permitted limit, along with general information on the facility and the process emitting the pollutant (i.e., a “determination”). Next, a query was performed to eliminate data from permit actions not based on regulatory programs of interest. This query included only permit actions listing their basis as BACT, BACT-NSPS, BACT-PSD, LAER, or NSPS. Other determinations, such as those based solely on a State rule or that did not specify a basis, were excluded. The table resulting from this query (referred to as the “master table”) was used as the basis for the analysis presented in this memorandum and contained a total of 20,400 entries or about 81 percent of the total determinations in the August 16, 2002, RBLC database.

2.3 Selection of Additional Industry Categories

While the initial selection of industry categories covered a large portion of the determinations in the RBLC database, the master table was used to select additional industry categories to assure a wide coverage of industry types. Additionally, it was desired to include as many of the industry categories that had the most number of determinations in the RBLC database as possible in this analysis. To this end, a query of the master table was performed that counted the number of determinations for each process type code. The resulting list was sorted by the number of determinations and then used to identify other industry categories of interest. The additional industry categories selected were: municipal waste combustors; portland cement manufacturing; surface coating, printing, and graphic arts (except automobiles and trucks surface coating); and various smelting processes. The final list of industry categories used for this analysis is presented in Table 2-2. The complete list of all industry categories and the number of determinations for each is shown in Appendix F, with entries used in this analyses shown as shaded. The selected industry categories represent more than 5,700 separate determinations.

2.4 Database Queries for Information on Selected Industry Categories

After the industry categories were selected, queries were run on the master table to obtain the desired data for each of the 5-year time periods. First, a query was performed to select the data from each industry category. This was accomplished by selecting data according to the process type code (or SIC code for the natural gas transmission category). The data for each industry category were then used as the basis for another series of queries subdividing the data from the last fifteen years into each of the five-year periods.

Table 2-2. Final List of Industry Categories

Industry	RBLC Process Type Code
Petroleum and Natural Gas Production	50.000 - 50.999
Chemicals Manufacturing	60.000 - 69.999 (except 69.011)
Pharmaceuticals Production	69.011
Kraft Pulp Mills and Pulp and Paper Production	30.002 and 30.004
Automobiles and Trucks Surface Coating	41.002
Ferrous Metals Industry	81.000 - 81.999
Natural Gas Transmission	SIC 4922[a]
Municipal Waste Combustors	21.001
Portland Cement Manufacturing	90.028
Surface Coating, Printing, and Graphic Arts (except automobiles and trucks)	41.000 - 41.999 (except 41.002)
Smelting	82.006, 82.007, 82.009, 82.012, 82.013, 82.014

[a] There is no specific RBLC process type code for this process.

Finally, a series of queries was performed on each of the 5-year periods, subdividing the data according to pollutant. Queries were performed for carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), particulate matter (PM/PM10), and volatile organic compounds (VOC). The resultant data sets were exported to Excel[6] for further analysis. For each industry category of interest, five Excel worksheets were created (one for each pollutant), each containing three pages of data (corresponding to the three 5-year periods).

Quality assurance checks on the final data sets included double-checking the construction of all queries to insure that the proper information was selected and placed in the corresponding columns in the Excel spreadsheets. Additionally, approximately 40 facilities representing about 200 individual determinations were selected from the Excel spreadsheets. The public online version of the RBLC was then used to retrieve the records for each of these facilities (as identified by the RBLC facility identification number). The information for each determination was compared to that in the Excel spreadsheets. In all cases, the spreadsheet data was identical to that obtained online.

[6] Excel spreadsheets were used to facilitate sorting the data for various analyses, such as sorting by control device, control efficiency, or process type.

3.0 Data Analysis

Appendices A through E summarize the data contained in the Excel spreadsheets described in Chapter 2. One appendix has been provided for each pollutant. Each of these appendices presents, for all of the industry categories, the total number of determinations, number of determinations reporting a control device, control devices used, and reported control efficiencies. It should be noted that not all of the determinations reported a control efficiency value when a control device was reported. The appendices are arranged as follows: Appendix A - CO; Appendix B - NO_x; Appendix C - PM10; Appendix D - SO_2; and Appendix E - VOC.

3.1 Control of CO Emissions

3.1.1 Summary

The total number of determinations in the RBLC database for the selected industry categories is presented in the following table, along with the number of determinations that reported control devices.

5-Year Period	Total Number of Determinations	Number of Determinations with Control Device Reported
1988 to 1992	132	5
1993 to 1997	116	32
1998 to 2002	177	22

3.1.2 Controls

In general, the most prevalent means of control was a combustion unit that oxidized the CO. These devices included oxidizers, flares, afterburners, and boilers. Reported control efficiencies were typically in the range of 98 to 99.9 percent. Scrubbers were also reported in several instances, but only one control efficiency, 98 percent, was reported. Several sources in the ferrous metals industry category reported the use of direct evacuation systems (DES) (a specific type of combustion unit typically used to capture and control emissions from a furnace). One such source reported a control efficiency of 65 percent, but other similar sources were generally in the 90 to 98 percent range.

3.1.3 Trends

There was no discernable variation in the type of devices used over the 15-year period. Combustion devices were used throughout the period, although specific control devices were not reported in some of the 5-year periods. For example, flares were not reported in the first 5-year period, but oxidizers were. Scrubbers were prevalent in each 5-year period, and ferrous metal industry sources used direct evacuation systems consistently.

In nearly all cases for combustion devices, the control efficiency was greater than 95 percent. In the first 5-year period, two combustion devices other than DES were reported, with control efficiencies of 98 to 98.8 percent. The range of values for combustion devices ranged from 85 to 99 percent for the nine determinations that reported these values in the second 5-year period. In the third 5-year period, there were seven values ranging from 98 to 99.7 percent. No trends were apparent from this data.

No trends could be established for scrubbers because only one control efficiency value was reported.

For DES used by the ferrous metals industry, only one source reported a control efficiency in the first 5-year period. This value, 100 percent, appears to be the capture efficiency based on other information reported. In the second period, only one of ten determinations using a DES reported a control efficiency, which was 90 percent. Five determinations out of ten in the third 5-year period reported control efficiencies. Four of these values fell within the range of 90 -98 percent, with the fifth value being 65 percent. It was unclear whether this low value was the result of less efficient capture of emissions or whether the destruction efficiency was lower than for the other units. Regardless, there was no apparent overall variation in the control efficiency over the 15-year period.

For all types of control, the range of reported control efficiencies was 98 to 98.8 for the first 5-year period, 75 - 99 for the second period, and 65 to 99.7 for the third period. Discounting the two lowest values (65 and 75 percent) because they were specific to controls used in the ferrous metals industry, all the values were 95 percent or greater. No trends were suggested by these data.

3.2 Control of NO_x Emissions

3.2.1 Summary

The total number of determinations in the RBLC database for the selected industry categories is presented in the following table, along with the number of determinations that reported control devices.

5-Year Period	Total Number of Determinations	Number of Determinations with Control Device Reported
1988 to 1992	132	20
1993 to 1997	163	81
1998 to 2002	161	55

3.2.2 Controls

Low NO_x burners were the predominant means of control, with reported control efficiencies in the range of 18 to 71 percent. Also widely reported was selective noncatalytic reduction (SNCR) (injection of ammonia or urea in the upper furnace). The control efficiencies for SNCR varied from 34 to 60 percent. Selective catalytic reduction (SCR) (injection of ammonia in the presence of a catalyst) was also reported, with control efficiencies varying from 70 to 97.2 percent. Some combustion units were reported, such as flares and oxidizers, but no control efficiencies were reported. However, other control devices were listed that are probably combustion devices like an oxidizer, but insufficient information was reported to identify the device. These included "vapor combustion unit" at 98 percent, "thermal denox" at 75 percent, and "catalytic combustor" at 96.6 percent.

3.2.3 Trends

Low NO_x burners had a wide range of control efficiencies reported. During the first 5-year period, four values were reported in the range of 18 to 62 percent. Two of these values were 30 percent or less, and the other two values were at the high end of the range at 62 percent. There were five reported values in the second 5-year period. The range of these values was 20 to 71 percent, with all but one value 50 percent or greater. In the third 5-year period, only one value at 40 percent was reported. The majority of values in the first and second 5-year periods appear to show increasing values of NO_x emission reduction. However, no firm conclusion can be drawn because there is only one value in the third period. Additionally, the presence of a high value (62 percent) in the first period and a low value (40 percent) in the third period may simply suggest there is a typically a wide range of control efficiencies for low NO_x burners depending on the particular application. One explanation may be the use of combustion controls (limiting the amount of excess oxygen) along with the low NO_x burners to achieve the higher control efficiencies.

The control efficiencies for SNCR remained consistent with all values in the range of 34 to 60 percent for the first and second 5-year periods. No control efficiencies were reported for SNCR in the third 5-year period, although their use was reported. For SCR, only one value was reported for each of the 5-year periods, so insufficient information was available to ascertain a trend with respect to SCR.

Two determinations reported the use of low NO_x burners in combination with SCR. The control efficiency values were 89 and 70 percent for the first and second 5-year periods, respectively. Again, there were insufficient data to draw any conclusions.

For all types of control, the range of reported control efficiencies was 18 to 96.6 percent for the first 5-year period, 20 - 98 percent for the second period, and 40 to 98 percent for the third period. No trends were apparent from these data.

3.3 Control of PM10 Emissions

3.3.1 Summary

The total number of determinations in the RBLC database for the selected industry categories is presented in the following table, along with the number of determinations that reported control devices.

5-Year Period	Total Number of Determinations	Number of Determinations with Control Device Reported
1988 to 1992	279	208
1993 to 1997	274	192
1998 to 2002	354	253

3.3.2 Controls

Baghouses and fabric filters were used predominantly to control PM10 emissions, and scrubbers and electrostatic precipitators (ESPs) were used to a lesser extent. There were 188 reported control efficiency values for baghouses and fabric filters in the range of 80 to 99.96 percent. The vast majority (approximately 93 percent) of these readings were 95 percent or greater. For scrubbers, 47 values were reported in the range of 80 - 99.6 percent. Two additional values of 50 and 70 percent were reported. Nearly all of the other values were at least 95 percent. ESPs had the tightest range of values, with 26 readings in the range of 99 to 99.91 percent, and one value at 90.8 percent. In addition, combinations of these controls were reported (such as a ESP in combination with a scrubber); the control efficiencies of these combinations were comparable to those of the individual control devices.

3.3.3 Trends

The control efficiencies for baghouses and fabric filters remained consistent over each of the 5-year periods. For the first period, the values ranged from 84 to 99.99 percent, with the majority of values above 95 percent. During this period, one value of 100 percent was reported, but this was probably a capture efficiency value. The range in the second period was 98 to 99.96 percent, and 90.8 to 99.9 percent in the third period. Because so many of the values in each of the 5-year periods were 95 percent or above, no trends were apparent.

The control efficiencies for scrubbers ranged from 80 to 99.9 percent in the first period, 40 to 99.96 percent in the second period, and 95 to 99.8 percent in the third period. Similar to baghouses and fabric filters, nearly all the values were 95 percent or greater, with only a few lower values. Again, no trends were apparent.

In the first 5-year period, the control efficiencies for ESPs ranged from 99 to 99.91 percent, with one value reported at 90.8 percent. The range for the second period was 99.45 to 99.9 percent, and for the third period the range was 99.5 to 99.7 percent. No trends were evident from these data.

For all types of control, the range of reported control efficiencies was 50 to 99.99 percent for the first 5-year period, 30 - 99.96 percent for the second period, and 86 to 99.9 percent for the third period. For all the control efficiency values below 90 percent in the first and second periods, the control device was a scrubber. In the third period, the control efficiencies for scrubbers were all 95 percent or greater. Although the bottom range of control efficiencies for this period is higher in recent years, it does not appear that this is because the performance of scrubbers has necessarily increased towards the end of the 15-year period. Rather, it appears that there are certain processes where the performance of a scrubber will typically be low. This explanation is supported by the fact that numerous control efficiency values for scrubbers were reported in the first and second 5-year periods that were 95 percent or greater. Therefore, it appears that high performance scrubbers were available throughout the entire 15-year period.

3.4 Control of SO_2 Emissions

3.4.1 Summary

The total number of determinations in the RBLC database for the selected industry categories is presented in the following table, along with the number of determinations that reported control devices.

5-Year Period	Total Number of Determinations	Number of Determinations with Control Device Reported
1988 to 1992	138	61

1993 to 1997	74	30
1998 to 2002	109	24

3.4.2 Controls

In most cases, the control device for SO_2 emissions was a scrubber. The range of control efficiencies reported for scrubbers was 70 to 99.9 percent, with values distributed across the entire range. In the petroleum and natural gas production industry, other control devices reported include tail gas units (99.7 to 99.9 percent), multistage Claus process (98 to 98.8 percent), flares (97.8 percent), and oxidizers (90 to 99.9 percent). One lime injection system was reported in the ferrous metals industry with a control efficiency of 69.4 percent.

3.4.3 Trends

In the first 5-year period, 25 control efficiency values were reported for scrubbers, ranging from 70 to 99.4 percent. Nineteen of these values were below 90 percent. The municipal waste combustion industry category accounted for all 19 of these lower values, 15 of which were listed as 70 percent. There was no indication in the RBLC as to why so many determinations were at 70 percent, particularly when the permit dates for many of these sources were after December 20, 1989, the applicability date for 40 CFR subpart Ea (NSPS for municipal waste combustors, which specifies 80 percent control for SO_2 emissions). Of the remaining six values, two were at 90 percent, and the others were at 98 percent or greater. Control efficiency values for scrubbers were reported for six determinations across various industry categories in the second 5-year period. Four of these values were in the 70 to 80 percent range, and three were at 90 percent. In the third 5-year period, seven values for scrubbers were reported across various industry categories. One each was reported at 75 and 93.5 percent, while the remaining five values were 98 percent or greater. These data show that control efficiencies of 98 percent or higher were prevalent in both the first 5-year period and the third period, which indicates that high levels of control were available for SO_2 emissions throughout the 15-year period. There is insufficient information to determine why no values higher than 90 percent were reported in the second 5-year period. However, based on the presence of similar levels of control of 98 percent or higher in the first and third periods, it appears that there is no trend over the 15-year period.

Control efficiencies for tail gas units were reported in the first and third 5-year periods. In all cases, the values were above 99 percent. Oxidizers were reported in the first and second periods, with the values going from 95 percent (reported by one determination) in the first period to 90 to 99.9 percent (each reported by one determination) in the second period. Given the small number of data points, no trends could be determined. Flares were reported only in the first 5-year period.

For all types of control, the range of reported control efficiencies was 70 to 99.9 percent for the first 5-year period, 70 - 99.9 percent for the second period, and 69.4 to 99.9 percent for the third period. No trends were apparent from these data.

3.5 Control of VOC Emissions

3.5.1 Summary

The total number of determinations in the RBLC database for the selected industry categories is presented in the following table, along with the number of determinations that reported control devices.

5-Year Period	Total Number of Determinations	Number of Determinations with Control Device Reported
1988 to 1992	589	237
1993 to 1997	281	99
1998 to 2002	423	114

3.5.2 Controls

The most prevalent control device reported for VOC emissions was an oxidizer, some with total enclosures. For the entire 15-year period, control efficiencies were reported for 228 oxidizers, ranging from 10 to 99.99 percent. Carbon adsorbers were the next most used control device, with 35 control efficiency values reported, ranging from 70 to 99 percent. Other control devices reported were afterburners (64 to 97 percent), condensers and vapor recovery (55 to 99 percent), and flares (90 to 98 percent). Combinations of these control devices were also reported, such as vapor recovery with a flare, and carbon adsorption along with an oxidizer. The control efficiency values for these combinations were comparable to those of the individual devices.

3.5.3 Trends

In the first 5-year period, the control efficiency values reported for oxidizers ranged from 10 to 99.99 percent. Approximately 55 percent of these values were 95 percent or greater, and 12 percent of the values were 98 percent or greater. In the second and third periods, the control efficiency range was 32 to 98 percent and 32 to 99 percent, respectively. For the second period, 45 percent of the values were 95 percent or greater, and 3 percent were 98 percent or greater. For each of the 5-year periods, the portion of the reported control efficiency values that were 95 percent or greater was 55, 45, and 48 percent. Similarly, the portion of the reported control efficiency values that were 98 percent or greater was 12, 3, and 6 percent.

One explanation for this apparent decreasing trend in oxidizer performance is that pollution prevention measures began to play a greater role in reducing emissions. As shown in the RBLC, most of the PSD limits for coating operations are expressed in terms of an emission limit or rate (e.g., lb emitted/gal coating, lb emitted/gal coating solids) rather than a percent reduction of the emissions emitted to the atmosphere. Therefore, less control had to be achieved through the use of a control device, and oxidizers could increasingly be operated at 95 percent rather than 98 percent or higher.

Based on other information provided in the RBLC, some of the very low control efficiency values for oxidizers took into account the capture efficiency throughout the process and were typically for surface coating operations. For example, VOC emissions from a surface coating operation occur from the spray booth where the coating is applied, the flashoff area between the spray booth and drying oven, and the drying oven. The oxidizer in many of these cases controlled emissions from only the drying oven. When taking into account the emissions from the spray booth and flashoff area, the resulting overall control for the process (not just the oven) can be very low. Apparently, this overall value was reported as the control efficiency for the oxidizer in a number of cases.

Control efficiency values for carbon adsorbers in the first 5-year period ranged from 73 to 99 percent. During the next two periods, the ranges were 92 to 98 percent, and 95 to 98 percent. A possible explanation for the increase in the lower end of the range across the 5-year periods is that technology improved such that processes that could not achieve a higher control efficiency in the first period could do so in later periods. However, there were also a number of values reported at 90 percent or greater during all three periods. Therefore, the lower control efficiency values in the first period could have been due to process-specific factors (such as the use of a solvent that it is not readily absorbed by carbon).

The range of control efficiency values reported for afterburners was 86 to 95 percent in the first period. Three sources reported a value of 95 percent for the second period, and the range for the third period was 94 to 97 percent. No trends were apparent from these data.

Condensers in the first 5-year period had reported control efficiencies of 55 to 99 percent, with nearly all the values at 95 percent or greater. During the second period the range was 95 to 99 percent, and only one value of 90 percent was reported in the third period. No information was provided in the RBLC to account for the lower values reported in the first 5-year period. However, because the majority of values in this period were 95 percent or greater, no overall trend across the 15-year period was apparent.

In the first period, the range of control efficiency values reported for all types of control was 95 to 98 percent, and for the second period one value of 98 percent was reported. The range for the third period was 90 to 98 percent. Given the small deviation in these values, no trend was evident.

4.0 CONCLUSIONS

No trends were evident in the type of control devices used during the 15-year period, either by pollutant or industry category. There were several instances where the RBLC data suggested that the performance of a specific control device increased for a given pollutant over the 15-year period of 1988 to 2002. For example, the maximum reported control efficiency for low NO_x burners increased from 62 to 71 percent from the first to second 5-year period. Similarly, the maximum reported control efficiency for oxidizers used to control SO_2 emissions increased from 95 to 99.9 percent during this same period. However, due to small numbers of data points in some of the 5-year periods and reasonable alternative explanations, no definite trends could be established. Considering all types of control for a given pollutant, no trends in the level of control were observed over the 15-year period.

APPENDICES

Appendix A. RBLC Historical Data for 1988 to 2002
CO Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 50.000 - Petroleum/Natural Gas Production and Refining									
Petroleum refining conversion, separation, and treating processes	14 (1)	High temp. regenerator	98.8	14 (4)	Boiler or oxidizer on catalytic cracking units	85	8 (1)	Vapor combustion unit	98
RBLC Process Type: 60.000 - Chemicals Manufacturing									
Process vents and combustion sources	16 (2)	Oxidizer Scrubber	98 98	4 (0)	N/A	N/A	7 (6)	Oxidizer (1) Flare (2) Scrubber (3)	98 98 Not reported
RBLC Process Type: 69.011 - Pharmaceuticals Production									
None listed									

Appendix A. RBLC Historical Data for 1988 to 2002 (cont.)
CO Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 30.002 and 30.004 - Kraft Pulp Mills and Pulp and Paper Production									
Boilers, kilns, and recovery furnaces	31 (0)	N/A	N/A	24 (12)	Afterburner (2) Scrubber (7) Baghouse (1) Oxidizer (2)	95 Not listed Not listed Not listed	22 (0)	N/A	N/A
RBLC Process Type: 41.002 - Automobiles and Trucks Surface Coating (OEM)									
Coating operations	None reported	N/A	N/A	1 (0)	N/A	N/A	7 (0)	N/A	N/A

Appendix A. RBLC Historical Data for 1988 to 2002 (cont.)
CO Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 81 - Ferrous Metals Industry									
Furnaces, ladle dryers, degassers	12 (1)	Direct shell evacuation system	100 (appears to be capture efficiency, not control)	43 (15)	Flare (3) Baghouse (1) Slot/post combustion chamber (1) Direct evacuation canopy (10)	98 - 99 (2) (1 not listed) 99 75 90 (1) (9 not listed)	86 (13)	Oxidizer (3) Direct evacuation canopy (10)	99.7 65 - 99 (5) (5 not listed)
RBLC Process Type: Natural Gas Transmission									
Compressor engines, boiler, turbines	13 (0)	N/A	N/A	15 (0)	N/A	N/A	32 (0)	N/A	N/A

Appendix A. RBLC Historical Data for 1988 to 2002 (cont.)
CO Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 21.001 - Municipal Waste Combustors/Incinerators									
Incinerators and combustors	39 (1)	Scrubber	Not listed	4 (1)	Scrubber	Not listed	3 (0)	N/A	N/A
RBLC Process Type: 90.028 - Portland Cement Manufacturing									
Kiln, calciner	2 (0)	N/A	N/A	11 (0)	N/A	N/A	9 (0)	N/A	N/A
RBLC Process Type: 41.000 - Surface Coating/Printing/Graphic Arts (except autos/trucks)									
Coating application operations, offset presses	5 (0)	N/A	N/A	None reported	N/A	N/A	1 (0)	N/A	N/A
RBLC Process Type: 82 - Smelting, Nonferrous Metals									
Furnaces	None listed	N/A	N/A	None listed	N/A	N/A	2 (2)	Oxidizer (1) Afterburner (1)	90 Not listed

Appendix B. RBLC Historical Data for 1988 to 2002
NOx Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 50.000 - Petroleum/Natural Gas Production and Refining									
Process vents, flares	12 (5)	Low NOx burners (5)	18 (1) (4 not listed)	19 (10)	Low and ultra low NOx burners (8) Flare (1) SCR (1)	50 -63 (2) (6 not listed) Not listed Not Listed	6 (3)	Vapor combustion unit (1) SCR (1) Ultra low NOx burners (1)	98 Not listed Not listed
RBLC Process Type: 60.000 - Chemicals Manufacturing									
Process vents	19 (3)	Catalytic combustor (1) Low NOx Burners (2)	96.6 62	16 (2)	SNCR (1) SCR with low NOx burners (1)	98 70	9 (5)	SCR (1) Ammonia injection (1) Low NOx burners (1) Scrubber (2)	97.2 60 Not listed Not listed
RBLC Process Type: 69.011 - Pharmaceuticals Production									
None listed									

Appendix B. RBLC Historical Data for 1988 to 2002 (cont.)
NOx Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 30.002 and 30.004 - Kraft Pulp Mills and Pulp and Paper Production									
Furnaces, recovery boilers, kilns and paper machines	33 (0)	N/A	N/A	28 (18)	Incinerator (1) Low NOx burners (8) Scrubber (7) SNCR (2)	Not listed Not Listed Not listed Not listed	19 (4)	Scrubber (1) Low NOx burners (3)	Not listed Not listed
RBLC Process Type: 41.002 - Automobiles and Trucks Surface Coating (OEM)									
Coating operations	None listed	N/A	N/A	7 (6)	Low NOx burners (6)	Not listed	19 (9)	Low NOx Burners (9)	Not listed
RBLC Process Type: 81 - Ferrous Metals Industry									
Furnaces, ladle dryers, degasser	10 (2)	SCR and low NOX burners (2)	89 (1) (1 not listed)	51 (32)	Low NOx burners (28) SNCR (1) Direct evacuation canopy (2) TDS post combustion chamber (1)	20 (1) (27 not listed) Not listed Not listed Not listed	60 (32)	Low and ultra low NOx burners (31) Scrubber (1)	40 (1) (30 not listed) Not listed

Appendix B. RBLC Historical Data for 1988 to 2002 (cont.)
NOx Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: Natural Gas Transmission									
Compressor engines, boiler, turbines	19 (2)	Low NOx Burners (2)	30 (1) (1 not listed)	23 (4)	Low NOx burners (4)	66 - 71 (2) (2 not listed)	33 (4)	Low NOx burners	Not listed
RBLC Process Type: 21.001 - Municipal Waste Combustors/Incinerators									
Combustors and incinerators	31 (8)	SNCR (5)	54 (1) (4 not listed)	7 (6)	SNCR (4)	42 - 60 (2) (2 not listed)	3 (3)	SNCR (3)	Not listed
		SNCR and thermal denox (1)	34		Scrubber (2)	Not listed			
		Thermal denox (1)	75						
		Scrubber (1)	Not listed						
RBLC Process Type: 90.028 - Portland Cement Manufacturing									
Kiln, calciner	3 (0)	N/A	N/A	10 (3)	SNCR w/urea injection (1)	50	9 (2)	Low NOX burners (2)	Not listed
					Low NOx burners (2)	Not listed			

Appendix B. RBLC Historical Data for 1988 to 2002 (cont.)
NOx Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 41.000 - Surface Coating/Printing/Graphic Arts (except autos/trucks)									
Coating application operations, ovens, offset presses	5 (0)	N/A	N/A	2 (0)	N/A	N/A	3 (1)	Low NO_x burners	Not listed
RBLC Process Type: 83 - Smelting, Nonferrous Metals									
None listed									

Appendix C. RBLC Historical Data for 1988 to 2002
PM10 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 50.000 - Petroleum/Natural Gas Production and Refining									
Process vents, flares	15 (4)	ESP (1) Sulfur scrubber (2) Scrubber (1)	90.8 50 (1) (1 not listed) Not listed	10 (4)	Scrubber (1) Cyclone w/scrubber (2) Flare (1)	94 93 Not listed	1 (0)	N/A	N/A
RBLC Process Type: 60.000 - Chemicals Manufacturing									
Process vents, separators, silos, bagging	56 (43)	Cyclones (4) Baghouse (31) Scrubber (6) Metal filters (1) Cyclone and baghouse (1)	99.94 - 99.99 (2) (2 not listed) 99 - 99.9 (9) (22 not listed) 90 - 99.6 99.9 99	23 (20)	Cyclone and scrubber (1) Baghouse (9) Scrubber (6) Flare and baghouse (3) ESP (1)	99.9 98 - 99.9 (2) (7 not listed) 95 - 99.9 (2) (4 not listed) Not listed Not listed	28 (26)	Baghouse (14) Scrubber (10) ESP (1) Cyclone and scrubber (1)	99 - 99.9 (5) (9 not listed) Not listed Not listed 95

PM10 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 69.011 - Pharmaceuticals Production									
Dry products	1 (1)	Rotoclone w/fabric filters	95	None listed	N/A	N/A	None listed	N/A	N/A

PM10 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 30.002 and 30.004 - Kraft Pulp Mills and Pulp and Paper Production									
Recovery boilers and furnaces, kilns, smelt tanks, mat'l handling	61 (55)	Scrubber (27) ESP (24) ESP w/scrubber (2) Cyclone and scrubber (2)	92.9 - 99.9 (10) (17 not listed) 99 - 99.9 (16) (8 not listed) 99.5 99.8	49 (45)	Baghouse or fabric filter (9) Scrubber (19) ESP (9) Rotoclone scrubber (3) Scrubber w/demister (3) Afterburner (1) Oxidizer (1)	99 - 99.96 70 - 99.96 (9) (10 not listed) 99.45 - 99.75 (4) (5 not listed) 30 - 98 40 (1) (2 not listed) 90 Not listed	30 (12)	Scrubber (5) ESP (2) Cyclone (1) Bag filter (4)	95 - 99.8 (3) (2 not listed) 99.5 - 99.7 90 Not listed

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 41.002 - Automobiles and Trucks Surface Coating (OEM)									
Stamping, welding, coating operations	11 (11)	Dry filters (4)	80 - 99 (3) (1 not listed)	4 (3)	Scrubber (2)	90	26 (20)	Dry filter and scrubber (2)	98 - 99.5
					Fabric filter (1)	Not listed			
		Scrubber (7)	80 - 98					Scrubber (10)	98 - 99.1 (5) (5 not listed)
								Dry filter (7)	98 (1) (6 not listed)
								ESP (1)	Not listed

PM10 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 81 - Ferrous Metals Industry									
Furnace, mat'l handling, casting	53 (31)	Baghouse or fabric filter (26) Direct shell evac. and scrubber (2) Scrubber (1) Wet ESP (1) Mist Elim (1)	99 -100 (18) (8 not listed; 100% is probably capture) 99.9 99 99 95	109 (56)	Baghouse or fabric filter (48) Cartridge filter (2) Scrubber (5) Direct shell evac. w/baghouse (1)	99 - 99.9 (11) (37 not listed) 67 99.6 (1) (4 not listed) 99	157 (120)	Baghouse or fabric filter (118) Scrubber (1) Cyclone and baghouse (1)	90.8 - 99.9 (46) (72 not listed) 99 Not listed
RBLC Process Type: Natural Gas Transmission									
Compressor engines and turbines	1 (0)	N/A	N/A	1 (0)	N/A	N/A	18 (0)	N/A	N/A

Appendix C. RBLC Historical Data for 1988 to 2002 (cont.)
PM10 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 21.001 - Municipal Waste Combustors/Incinerators									
Combustors and incinerators	31 (29)	Baghouse or fabric filter (25)	90 - 99.7 (18) (7 not listed)	5 (5)	Baghouse (3)	99.7 - 99.9 (2) (1 not listed)	3 (3)	Fabric filters (3)	Not listed
		ESP and scrubber (1)	99		Baghouse and scrubber (2)	Not listed			
		ESP (2)	Not listed						
		Scrubber (1)	Not listed						
RBLC Process Type: 90.028 - Portland Cement Manufacturing									
Kilns, mat'l handling, crushing, storage	18 (12)	Baghouse (11)	99.88 - 99.99 (10) (1 not listed)	57 (49)	Baghouse or fabric filter (40)	99 - 99.9 (32) (8 not listed)	75 (66)	Baghouse or fabric filter (64)	99 - 99.9 (11) (53 not listed)
		ESP (1)	99.91		ESP (9)	99.9 (1) (8 not listed)		ESP (2)	Not listed

Appendix C. RBLC Historical Data for 1988 to 2002 (cont.)
PM10 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 41.000 - Surface Coating/Printing/Graphic Arts (except autos/trucks)									
Coating application operations and offset presses	20 (10)	Dry filters (8) ESP (1) Baghouse (1)	90 - 99.91 (6) (2 not listed) Not listed Not listed	17 (10)	Dry filters (8) ESP or baghouse (2)	85 - 99.9 (3) (5 not listed) Not listed	12 (3)	Dry filters (2) Oxidizer (1)	Not listed Not listed
RBLC Process Type: 82 - Smelting, Nonferrous Metals									
Furnaces, mat'l handling	12 (12)	Baghouse or fabric filter (6) ESP, cyclone, and scrubber (2) Scrubber (4)	84 - 99 (2) (4 not listed) Not listed Not listed	None listed	N/A	N/A	4 (3)	Mist eliminator (1) Baghouse (2)	90 86 (1) (1 not listed)

Appendix D. RBLC Historical Data for 1988 to 2002
SO2 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 50.000 - Petroleum/Natural Gas Production and Refining									
Process vents, sulfur recovery units, oxidizer, flare	29 (14)	Tail gas unit (6) Multi-stage Claus process (2) Oxidizer (1) Cold bed adsorption (1) Flare (3) Scrubber (1)	99.7 - 99.9 98 - 98.8 95 - 99.7 98 97.8 (1) (1 not listed) 90	12 (7)	SCR and oxidizer (2) Oxidizer (2) Scrubber (3)	99 - 99.9 99 - 99.9 90	4 (3)	Tail gas unit (2) Absorber	99.8 Not listed

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 60.000 - Chemicals Manufacturing									
Process vents	15 (6)	Double absorption and demister (2) Double absorption (3) Absorption (1)	99.4 (1) (1 not listed) Not listed 99.4	16 (10)	Double absorption w/catalyst and demister (1) Double absorption w/demister (3) Double Absorption (2) Flare (3) Baghouse (1)	Not listed Not listed Not listed Not listed Not listed	9 (7)	Double absorption w/demister (2) Double absorption (2) Scrubber (3)	99.9 (1) (1 not listed) 98 (1) (1 not listed) 98 - 99.9
RBLC Process Type: 69.011 - Pharmaceuticals Production									
None reported									

Appendix D. RBLC Historical Data for 1988 to 2002 (cont.)
SO2 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 30.002 and 30.004 - Kraft Pulp Mills and Pulp and Paper Production									
Recovery furnaces and boilers, smelt tanks, kilns	45 (12)	Scrubber	98 (2) (10 not listed)	13 (4)	Scrubber	70 (1) (3 not listed)	17 (2)	Scrubber	93.5 (1) (1 not listed)
RBLC Process Type: 41.002 - Automobiles and Trucks Surface Coating (OEM)									
Coating operations	None listed	N/A	N/A	1 (0)	N/A	N/A	6 (0)	N/A	N/A
RBLC Process Type: 81 - Ferrous Metals Industry									
Furnaces, degasser	4 (1)	Direct shell evacuation	Not listed	15 (3)	Baghouse (2) Dry scrubber (1)	Not listed Not listed	45 (7)	Lime injection system (2) Direct evacuation (1) Baghouse and dry injection scrubber (3) Direct evacuation w/baghouse (1)	69.4 Not listed Not listed Not listed

Appendix D. RBLC Historical Data for 1988 to 2002 (cont.)
SO2 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: Natural Gas Transmission									
Compressor engines, turbines	4 (0)	N/A	N/A	3 (0)	N/A	N/A	17 (0)	N/A	N/A
RBLC Process Type: 21.001 - Municipal Waste Combustors/Incinerators									
Combustors and oxidizers	29 (27)	Scrubber (24) Scrubber and fabric filter (2) Scrubber and ESP (1)	70 - 90 (20) (4 not listed) 85 70	6 (6)	Scrubber and fabric filter or baghouse (2) Scrubber (4)	80 - 85 70 - 80 (3) (1 not listed)	3 (3)	Scrubber and fabric filter (1) Scrubber (2)	75 75 (1) (1 not listed)
RBLC Process Type: 90.028 - Portland Cement Manufacturing									
Kiln, calciner	3 (0)	N/A	N/A	8 (0)	N/A	N/A	7 (2)	Baghouse (1) Scrubber (1)	99 Not listed
RBLC Process Type: 41.000 - Surface Coating/Printing/Graphic Arts (except autos/trucks)									
Coating application, coaters, offset presses	5 (0)	N/A	N/A	None listed	N/A	N/A	1 (0)	N/A	N/A

SO2 Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 82 - Smelting, Nonferrous Metals									
Furnaces	4 (1)	ESP, cyclone, and scrubber	Not listed	None listed	N/A	N/A	None listed	N/A	N/A

Appendix E. RBLC Historical Data for 1988 to 2002
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 50.000 - Petroleum/Natural Gas Production and Refining									
Process vents, flares, tanks	21 (4)	3-stage Claus unit (1) Condenser (1) Vapor recovery (2)	99 99 98	19 (8)	Oxidizer (4) Carbon adsorber (1) Vapor recovery w/ flare (2) Vapor recovery (1)	98 (1) (3 not listed) 97 95 95	10 (2)	Vapor control w/enclosed flare (2)	90 - 98

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 60.000 - Chemicals Manufacturing									

Appendix E. RBLC Historical Data for 1988 to 2002 (cont.)
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
Process vents, tanks	86 (29)	Oxidizer/ scrubber (3)	99.99	20 (10)	Flare (1)	98	30 (16)	Oxidizer (3)	95 - 98 (2) (1 not reported)
		Oxidizer (8)	98 - 99.99		Oxidizer (7)	95 (6) (1 not listed)		Carbon adsorber (8)	98
		Vapor combustor (4)	99.9		Scrubber (1)	Not listed		Condenser (1)	90
		Condenser / scrubber (2)	99.9 (1) (1 not listed)		Condenser (1)	Not listed		Scrubber, stripper, or absorber (4)	Not listed
		Flare (3)	95 - 98						
		Condenser (4)	95 - 98 (2) (2 not listed)						
		Vapor compression (2)	95.5						
		Scrubber and carbon adsorber (1)	95						
		Carbon adsorber (1)	90						
		Scrubber (1)	75						

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 69.011 - Pharmaceuticals Production									
Process vents, dryers, coaters	5 (5)	Condenser (1) Scrubber and carbon adsorber (1) Carbon adsorber (2) Condenser and scrubber (1)	98 95 90 (1) (1 not listed) Not listed	6 (6)	Oxidizer (6)	95	None listed	N/A	N/A
RBLC Process Type: 30.002 and 30.004 - Kraft Pulp Mills and Pulp and Paper Production									
Recovery boilers and furnaces, smelt tanks, kilns	27 (3)	Condenser (2) Scrubber (1)	55 - 65 Not listed	37 (13)	Afterburner (3) Oxidizer (3) Scrubber (7)	95 90 (1) (2 not listed) Not listed	82 (3)	Oxidizer (1) Scrubber (1) Vapor recovery (1)	90 Not listed Not listed

Appendix E. RBLC Historical Data for 1988 to 2002 (cont.)
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 41.002 - Automobiles and Trucks Surface Coating (OEM)									
Coating operations	72 (28)	Oxidizer (22) Carbon adsorber and oxidizer (5) Afterburner (1)	68 - 95 (16) (6 not listed) 67 - 84.6 Not listed	69 (26)	Oxidizer (20) Carbon adsorption and oxidizer (4) VOC concentrator and oxidizer (1) Afterburner (1)	32 - 95 (8) (12 not listed) 80.8 50 Not listed	88 (39)	Oxidizer (25) Carbon adsorption and oxidizer (11) Afterburner (1) Carbon adsorber (2)	32 - 95 (16) (9 not listed) 60 - 90 (6) (5 not listed) 94 Not listed

Appendix E. RBLC Historical Data for 1988 to 2002 (cont.)
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 81 - Ferrous Metals Industry									
Furnaces, casting	17 (3)	Oxidizer (3)	90	32 (3)	Direct evacuation canopy (2) Oxidizer (1)	74 (1) (1 not listed) Not listed	70 (13)	Oxidizer (6) Scrubber (2) Direct evacuation canopy (4) Direct evacuation canopy w/post combustion (1)	88.9 - 98 (3) (3 not listed) 88.9 - 94 90 (1) (3 not listed) Not listed
RBLC Process Type: Natural Gas Transmission									
Compressor engines and turbines	7 (0)	N/A	N/A	9 (0)	N/A	N/A	32 (1)	Catalyst	50
RBLC Process Type: 21.001 - Municipal Waste Combustors/Incinerators									
Combustors and incinerators	17 (0)	N/A	N/A	1(0)	N/A	N/A	None listed	N/A	N/A

Appendix E. RBLC Historical Data for 1988 to 2002 (cont.)
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 90.028 - Portland Cement Manufacturing									
Kilns	None listed	N/A	N/A	6 (0)	N/A	N/A	5 (0)	N/A	N/A

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 41.000 - Surface Coating/Printing/Graphic Arts (except autos/trucks)									

Appendix E. RBLC Historical Data for 1988 to 2002 (cont.)
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
Coating application, offset presses, ovens	337 (165)	Oxidizer (119)	18 - 99.9 (113) (6 not listed)	82 (33)	Oxidizer (19)	70 - 97 (15) (4 not listed)	106 (40)	Oxidizer (31)	66 - 99 (27) (4 not listed)
		Oxidizer w/total enclosure (10)	95 - 98 (8) (2 not listed)		Condenser (1)	99		Carbon adsorber (4)	95 - 98 (3) (1 not listed)
		Oxidizer and carbon adsorption (7)	74 - 95 (4) (3 not listed)		Carbon adsorber (7)	95 - 98 (6) (1 not listed)		Afterburner (1)	97
		Oxidizer w/ condenser (2)	95 - 99		Carbon adsorber w/total enclosure (3)	92 - 97.7 (3)		Oxidizer w/total enclosure (1)	95
		Carbon adsorption (15)	70 - 99		Oxidizer w/total enclosure (1)	97		Carbon adsober w/total enclosure (2)	96
		Scrubber (1)	98		Solvent recovery w/total enclosure (1)	95		Oxidizer w/zeolite concentrator (1)	Not listed
		Afterburner (9)	64 - 95 (8) (1 not listed)		Afterburner (1)	Not listed			
		Condenser (2)	Not listed						

Appendix E. RBLC Historical Data for 1988 to 2002 (cont.)
VOC Emission Control

Emission Source Description	1988 to 1992			1993 to 1997			1998 to 2002		
	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range	Number of Determinations (Number reporting control device)	Control Devices Used	Control Efficiency Range
RBLC Process Type: 82 - Smelting, Nonferrous Metals									
None listed									

Appendix F. Number of RBLC Database Entries by Industry Process Type Code		
Industry Process Type	**Number**	**Industry Process Code Description**
15.004	870	Natural Gas
41.002	402	Automobiles and Trucks Surface Coating (OEM)
90.028	317	Portland Cement Manufacturing
30.002	285	Kraft Pulp Mills
90.011	277	Coal Handling/Processing/Preparation/Cleaning
70.007	263	Feed and Grain Handling, Storage & Processing (including Mills and Elevators)
90.024	260	Non-metallic Mineral Processing (except 90.011, 90.019, 90.017, 90.026)
11.110	240	Coal (includes bituminous, subbituminous, anthracite, and lignite)
11.005	239	Natural Gas Combustion
81.004	218	Iron Foundries
70.999	192	Other Food and Agricultural Products Sources
41.013	187	Miscellaneous Metal Parts and Products Surface Coating
90.019	186	Lime/Limestone Handling/Kilns/Storage/Manufacturing
15.002	178	Diesel Fuel
13.900	175	Other Fuels and Combinations (e.g., solid/liquid, liquid/gas)
13.310	172	Natural Gas (includes propane and liquefied petroleum gas)
99.999	163	Other Miscellaneous Sources
81.007	153	Steel Manufacturing (except 81.005 & 81.006)
15.006	149	Fuel Oil
41.016	140	Plastic Parts & Products Surface Coating (except 41.015)
81.006	137	Steel Foundries
30.005	132	Reconstituted Panelboard Plants (waferboard, particleboard, etc.)
15.999	128	Other Internal Combustion Sources
41.023	113	Printing/Publication (except 41.007 & 41.019-022)
14.900	112	Other/Unknown Fuels and Combinations (e.g., solid/liquid, liquid/gas)
41.999	112	Other Surface Coating/Printing/Graphic Arts Sources
90.003	107	Asphalt Concrete Manufacturing
21.001	105	Municipal Waste Combustors/Incinerators
90.999	104	Other Mineral Processing Sources
15.007	103	Multiple Fuels
50.006	102	Petroleum Refining Treating Processes (hydrotreating, acid gas removal, SRU's, etc.)
11.006	94	
41.025	86	Wood Products/Furniture Surface Coating (except 41.006)
11.900	85	Other Fuels and Combinations (e.g., solid/liquid, liquid/gas)
64.003	83	Processes Vents (emissions from air oxidation, distillation, and other reaction vessels)
12.900	80	Other Fuels and Combinations (e.g., solid/liquid, liquid/gas)
30.004	78	Pulp and Paper Production other than Kraft
12.110	77	Coal (includes bituminous, subbituminous, anthracite, and lignite)
69.999	77	Other Chemical Manufacturing Sources
90.006	75	Cement Manufacturing (except 90.028)
50.999	72	Other Petroleum/Natural Gas Production & Refining Sources (except 42 - Liquid Marketing)
12.310	71	Natural Gas (includes propane and liquefied petroleum gas)
41.022	71	Printing - Publication
41.021	69	Printing - Packaging
90.012	68	Concrete Batch Plants
49.008	61	Organic Solvent Cleaning & Degreasing (except 49.006)
50.003	61	Petroleum Refining Conversion Processes (cracking, reforming, etc.)
64.004	61	Storage Tanks (SOCMI only - also see 42.001-42.999 and 62.020)
50.007	60	Petroleum Refining Equipment Leaks/Fugitive Emissions
13.230	58	Other Liquid Fuel & Liquid Fuel Mixtures
42.005	58	Petroleum Liquid Storage in Fixed Roof Tanks
42.006	56	Petroleum Liquid Storage in Floating Roof Tanks

Appendix F. Number of RBLC Database Entries by Industry Process Type Code		
Industry Process Type	**Number**	**Industry Process Code Description**
63.999	55	Other Polymer and Resin Manufacturing Sources
50.008	54	Petroleum Refining Flares and Incinerators (except acid gas/SRU incinerators - 50.006)
41.014	53	Paper, Plastic & Foil Web Surface Coating (except 41.007 & 41.018)
22.006	52	Contaminated Soil Treatment
90.016	51	Glass Manufacturing
90.017	51	Calciners & Dryers and Mineral Processing Facilities
11.120	50	Biomass (includes wood, wood waste, bagasse, and other biomass)
82.010	49	Secondary Aluminum Production
90.009	49	Clay Products (including Bricks & Ceramics)
49.005	47	Fiberglass/Reinforced Polymer Products Manufacturing (except 49.004)
81.002	46	Coke Production (except 81.001)
99.015	46	Rubber Tire Manufacturing and Retreading
49.999	45	Other Organic Evaporative Loss Sources
50.010	45	Shale Processing
50.002	43	Natural Gas/Gasoline Processing Plants
70.015	43	Vegetable Oil Production
64.999	42	Other SOCMI Processes
82.005	42	Primary Aluminum Production
14.100	41	Solid Fuel & Solid Fuel Mixtures
30.999	41	Other Wood Products Industry Sources
41.004	41	Can Surface Coating
13.110	37	Coal (includes bituminous, subbituminous, anthracite, and lignite)
99.009	37	Industrial Process Cooling Towers
11.002	36	
41.018	36	Pressure Sensitive Tapes and Labels Coating
11.310	35	Natural Gas (includes propane and liquefied petroleum gas)
13.320	34	Other Gaseous Fuel & Gaseous Fuel Mixtures
99.004	34	Commercial Sterilization Facilities
99.014	34	Polystyrene Foam Products Manufacturing
11.004	33	
69.015	33	Carbon Black Manufacturing
29.004	30	Medical/Infectious Waste Incineration
15.005	29	Process Gas
42.009	29	Volatile Organic Liquid Storage
81.999	29	Other Ferrous Metals Industry Sources
30.003	28	Plywood and Veneer Operations
61.009	28	Phosphate Fertilizers Production
90.015	28	Glass Fiber Manufacturing (except 90.033)
41.001	27	Aerospace Surface Coating
62.999	27	Other Inorganic Chemical Manufacturing Sources
50.009	26	Petroleum Refining Wastewater and Wastewater Treatment
62.015	26	Sulfuric Acid Plants
12.120	25	Biomass (includes wood, wood waste, bagasse, and other biomass)
13.120	25	Biomass (includes wood, wood waste, bagasse, and other biomass)
49.004	25	Fiberglass Boat Manufacturing
99.001	25	Abrasive Blasting
29.999	24	Other Waste Disposal Sources
64.002	24	Equipment Leaks (valves, compressors, pumps, etc.)
70.010	24	Fruit and Vegetable Processing
11.008	23	
21.999	23	Other Municipal Waste Processing/Disposal Facilities
64.001	23	Batch Reaction Vessels (except 69.011)

Appendix F. Number of RBLC Database Entries by Industry Process Type Code		
Industry Process Type	**Number**	**Industry Process Code Description**
65.999	23	Other Synthetic Fibers Production Sources
69.011	23	Pharmaceuticals Production
90.023	21	Mining Operations (except 90.032)
22.005	20	Treatment, Storage and Disposal Facilities (TSDF) (except 22.002, 22.003 & 22.006)
41.006	18	Flatwood Paneling Surface Coating
63.036	18	Polyvinyl Chloride and Copolymers Production
82.999	18	Other Non-Ferrous Metals Industry Sources
90.010	18	Coal Conversion/Gasification
12.230	17	Other Liquid Fuel & Liquid Fuel Mixtures
14.200	17	Liquid Fuel & Liquid Fuel Mixtures
49.009	17	Paint/Coating/Adhesives Manufacturing
50.004	17	Petroleum Refining Feedstock (blending, loading and unloading)
70.008	17	Alcoholic Beverages Production
70.013	17	Starch Manufacturing
11.130	16	Other Solid Fuel & Solid Fuel Mixtures
11.999	16	
22.002	16	Hazardous Waste Incineration
41.012	16	Metal Furniture Surface Coating
42.004	16	Petroleum Liquid Marketing (except 42.001-003 & 42.005-006)
62.020	16	Inorganic Liquid/Gas Storage & Handling
63.028	16	Polyethylene Terephthalate Production
90.034	16	Asphalt Roofing Products Manufacturing
14.300	15	Gaseous Fuel & Gaseous Fuel Mixtures
62.019	15	Sulfur Recovery (except 50.006)
70.016	15	Alcohol Fuel Production
61.012	14	Fertilizer Production (except 61.009)
90.008	14	Clay and Fly Ash Sintering
99.006	14	Electronics Manufacturing (except 99.011)
99.012	14	Welding & Grinding
99.016	14	Polyurethane Foam Products Manufacturing
41.019	13	Printing - Forms
64.005	13	Transfer of SOCMI Chemicals (loading/unloading, filling, etc.)
41.005	12	Fabric Coating/Printing/Dyeing (except 41.017)
49.002	12	Dry Cleaning - PERC/Chlorinated Solvents
50.001	12	Oil and Gas Field Services
82.001	12	Lead Acid Battery Manufacturing
90.026	12	Phosphate Rock Processing
90.033	12	Wool Fiberglass Manufacturing
99.011	12	Semiconductor Manufacturing
29.002	11	Industrial Wastewater/Contaminated Water Treatment
42.003	11	Gasoline Marketing (except 42.001 & 42.002)
62.010	11	Phosphoric Acid Manufacturing
70.012	11	Roasting (except 70.005)
12.320	10	Other Gaseous Fuel & Gaseous Fuel Mixtures
21.004	10	Sewage Sludge Incineration
30.007	10	Woodworking
41.026	10	Leather Surface Coating
50.005	10	Petroleum Refining Separation Processes (distillation and light ends recovery)
64.006	10	Wastewater Collection & Treatment
82.013	10	Secondary Lead Smelting
90.004	10	Asphalt Processing (except 90.002, 90.003 & 90.034)
21.002	9	Municipal Waste Landfills
41.010	9	Magnetic Wire Surface Coating

Appendix F. Number of RBLC Database Entries by Industry Process Type Code		
Industry Process Type	**Number**	**Industry Process Code Description**
70.003	9	Bread Bakeries
90.029	9	Refractories
11.320	8	Other Gaseous Fuel & Gaseous Fuel Mixtures
13.210	8	Residual Fuel Oil (ASTM # 4,5,6)
13.220	8	Distillate Fuel Oil (ASTM # 1,2, includes kerosene, aviation, diesel fuel)
30.001	8	Charcoal
90.022	8	Mineral Wool Manufacturing
99.013	8	Electroplating/Plating (except Chrome - 99.002, 99.005 & 99.007)
10.000	7	COMBUSTION
15.003	7	Gasoline
21.003	7	Publicly Owned Treatment Works (POTW) Emissions (except 21.004)
30.006	7	Wood Treatment
41.017	7	Polymeric Coating of Fabrics
49.003	7	Dry Cleaning - Petroleum Solvents
62.014	7	Nitric Acid Plants
63.002	7	Acrylonitrile-Butadiene-Styrene Production
63.012	7	Ethylene-propylene Rubber Production
70.006	7	Cotton Ginning
11.220	6	Distillate Fuel Oil (ASTM # 1,2, includes kerosene, aviation, diesel fuel)
12.130	6	Other Solid Fuel & Solid Fuel Mixtures
12.220	6	Distillate Fuel Oil (ASTM # 1,2, includes kerosene, aviation, diesel fuel)
15.000	6	INTERNAL COMBUSTION
22.004	6	Site Remediation (except 22.006)
42.002	6	Gasoline Bulk Terminals
42.010	6	Volatile Organic Liquid Marketing (except 42.009)
81.005	6	Stainless Steel/Specialty Steel Manufacturing
82.012	6	Secondary Copper Smelting & Alloying
90.021	6	Metallic Mineral/Ore Processing (except 90.018, 90.020 & 90.031)
99.020	6	Rocket Demilitarization
29.003	5	Industrial Landfills
41.007	5	Flexible Vinyl & Urethane Coating/Printing
49.006	5	Halogenated Solvent Cleaners
63.015	5	Maleic Copolymers Production
99.005	5	Decorative Chromium Electroplating
11.001	4	
13.130	4	Other Solid Fuel & Solid Fuel Mixtures
29.001	4	Automobile Body Shredding/Incineration
41.020	4	Printing - News Print
42.999	4	Other Liquid Marketing Sources
81.003	4	Ferroalloy Production
81.008	4	Steel Pickling - HCL Process
90.018	4	Lead Ore Crushing and Grinding
90.031	4	Taconite Iron Ore Processing
99.003	4	Comfort Cooling Towers
99.007	4	Hard Chromium Electroplating
99.008	4	Hospital Sterilization Facilities
11.000	3	Utility- and Large Industrial-Size Boilers/Furnaces (more than 250 million Btu/hr)
12.210	3	Residual Fuel Oil (ASTM # 4,5,6)
15.001	3	Aviation Fuels
41.009	3	Magnetic Tape Surface Coating
41.011	3	Metal Coil Surface Coating
41.024	3	Ship Building & Repair Surface Coating
49.010	3	Paint Stripping

Appendix F. Number of RBLC Database Entries by Industry Process Type Code		
Industry Process Type	**Number**	**Industry Process Code Description**
61.999	3	Other Agricultural Chemical Manufacturing Sources
62.018	3	Sodium Carbonate Production
82.009	3	Primary Zinc Smelting
90.001	3	Alumina Processing
90.035	3	Asbestos Manufacturing
11.230	2	Other Liquid Fuel & Liquid Fuel Mixtures
20.000	2	WASTE DISPOSAL
22.999	2	Other Hazardous Waste Processing/Disposal Facilities
40.000	2	ORGANIC EVAPORATIVE LOSSES
49.001	2	Aerosol Can Filling
49.013	2	Automobile Refinish Coatings
62.003	2	Chlorine Production
62.006	2	Fume Silica Production
63.026	2	Polyester Resins Production
63.031	2	Polystyrene Production
69.016	2	Soap & Detergent Manufacturing
81.001	2	Coke By-product Plants
82.003	2	Lead Oxide and Pigment Production
82.006	2	Primary Copper Smelting
82.015	2	Secondary Zinc Processing
99.010	2	Rocket Engine Test Firing
11.003	1	
11.007	1	
30.000	1	WOOD PRODUCTS INDUSTRY
41.000	1	SURFACE COATING/PRINTING/GRAPHIC ARTS
41.003	1	Automotive Refinishing
41.008	1	Large Appliance Surface Coating
42.001	1	Gasoline Bulk Plants
62.007	1	Hydrochloric Acid Production
62.008	1	Hydrogen Cyanide Production
63.013	1	Flexible Polyurethane Foam Production
63.025	1	Polycarbonates Production
63.033	1	Polyvinyl Acetate Emulsions Production
64.000	1	SYNTHETIC ORGANIC CHEMICAL MANUFACTURING INDUSTRY (SOCMI)
65.003	1	Spandex Production
69.008	1	Explosives Production
69.012	1	Photographic Chemicals Production
70.005	1	Coffee Roasting
70.009	1	Fish Processing
80.000	1	METALLURGICAL INDUSTRY
82.002	1	Lead Acid Battery Reclamation
82.011	1	Secondary Brass & Brass Ingot Production
82.014	1	Secondary Magnesium Smelting
90.007	1	Chromium Refractories Production
90.020	1	Mercury Ore Processing
TOTAL	10828	

*Shaded entries indicate the industry process type codes used for the analysis.

APPENDIX D

EVOLUTION OF SO_2 NO_x AND PARTICULATE MATTER CONTROLS FOR COAL-FIRED ELECTRIC UTILITY PLANTS

EVOLUTION OF SO_2 NO_x AND PARTICULATE MATTER CONTROLS FOR COAL-FIRED ELECTRIC UTILITY PLANTS

The following is a short description of the evolution of emission control technologies for the emissions of sulfur dioxide (SO_2), nitrogen oxides (NO_x) and particulate matter from coal-fired electric utility plants. This description was originally drafted by EPA in the context of evaluating an electric utility plant for possible NSR violations, and was edited to remove confidential/enforcement-sensitive material related to the case. It is presented here because it provides background relevant for assessing the impacts of the Clean Unit Test under NSR Improvement.

1. *Sulfur Dioxide*

As of the early 1980s, two SO_2 emissions control options were potentially available:

1. Wet Limestone Scrubber
2. Wet Lime scrubbing buffered by Magnesium Oxide

All wet scrubbing type sulfur removal controls employ absorption by passing the flue gasses through an injected mist of reagent - generally limestone or lime.[1] The reagent is crushed into a fine powder, hydrated into a wet slurry, and then injected into the flue gas stream via specialized high pressure pumps and nozzles. The airborne slurry mist absorbs the sulfur and precipitates out of the injection chamber where it is de-watered and neutralized for landfill. In many cases, the by-product material is of sufficient quality it can be sold as wallboard-quality gypsum. The use of magnesium oxide as a buffering agent may increase the effectiveness of SO_2 removal.

Both wet scrubbing technologies had been in widespread use by the early 1980s. For example, in the U.S., at least eight other facilities were operating using wet limestone systems by the end of 1982, and twelve facilities were using magnesium oxide (MgO) enhanced lime. Design removal efficiencies for these facilities ranged from 80 to 95%.[2] Wet scrubbers were put in place at the above facilities for a variety of reasons, but by 1982 there were at least two Federal requirements for the use of scrubbers for SO_2 control.

The first of these federal requirements is the New Source Performance Standards (NSPS) for coal-fired power plants. The NSPS had been amended in 1979, and applies to power plants constructed or modified after 1978.[3] Those standards require removal of up to 90% of flue gas

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[1] "Estimating Costs of Air Pollution Control," 1990, Vatavuk, W.M., Lewis Publishers, Chelsea, MI., pp. 194-199.

[2] See report of William Ellison, PE, Ellison Consultants, developed in connection with United States v. Illinois Power and Dynegy Midwest Generation, Inc.

[3] See 40 C.F.R. § 60.40a (1979), "Standards of Performance for Electric Utility Steam Generating Units for Which Construction is commenced after September 18, 1978."

SO_2 (depending on the sulfur content of the coal). NSPS is set at level that is technically feasible, and cost effective.[4]

The second requirement is the BACT requirement of the PSD regulations, which, in 1982, had been in effect for almost four years.[5] At least seven coal-fired power plants were issued PSD permits between 1978 and 1983 with the requirement for between 80 and 95% control.[6] For example, Nevada Power's Harry Allen Station was issued a permit in early 1981 with a 95% removal requirement and an emission rate of 0.1 pound/million BTU.[7] In 1980, the Platte River Power Authority, Rawhide Station was issued a permit with an 80% removal requirement and an emission rate limit of 0.13 pound/million BTU.[8] In addition, in 1982, the Allegheny Power, Mitchell 33 Unit, a power plant firing up to 2.9% sulfur coal, began operation of a scrubber removing 95% of the stack gas.[9]

Taken together, it is clear that by 1982, scrubbing technologies to remove SO_2 were required of many power plants and in place at many others. Both wet limestone scrubbers and wet lime scrubbers with magnesium buffering had been used and had demonstrated removal efficiencies of up to 95%. These two wet scrubbing technologies, with efficiencies of up to 95%, were therefore both technologically feasible and well demonstrated in practice.

By 1985, at least thirty-five additional (compared to 1982) coal fired power plants were in operation with scrubbers to remove SO2 from their exhaust gas. Most of these scrubbers were wet limestone or wet lime buffered with magnesium oxide.[10,11]

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[4] See C.A.A.§ 111(a)(1).

[5] In 1978, EPA revised its regulations pursuant to the 1977 Clean Air Act Amendments. Prior to that date, BACT was defined to be equal to NSPS, where an NSPS existed. The 1978 regulation conformed the regulations to the new statutory language, and provided that the permit applications that were "complete" prior to the new regulation would be processed under the old regulations.

[6] See Appendix A, Table 5: RACT/BACT/LAER summary: 1982 timeframe.

[7] Ibid.

[8] Ibid.

[9] See report of William Ellison, PE, Ellison Consultants, "Table 5, Pre-1983, Tangentially-Fired, Low NO_x Burner Installations"

[10] See report of William Ellison, PE, Ellison Consultants, "Table 2, SCR Installations"

[11] See "Table 30: Flue Gas Desulfurization (FGD) Capacity in Operation at U.S. Electric Utility Plants as of December 1999." This information can be found at website address: http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t30p1.html and following pages

By 1988, power plant owners had more experience with all the scrubber options. In addition, many new facilities had come on line by 1988 utilizing scrubbers to remove SO2. Over 148 coal-fired power plants with scrubbers were in operation in the U.S. by the end of 1988. Most of these scrubbers were operating at a removal efficiency of 80 to 95%.[12] Outside the U.S. similar increases in scrubber capacity occurred. Most significant is the Preussen Electric Borken 2 and 3 facilities, which started operation in 1988, and which employed scrubbers with a design removal efficiency of 97% of SO_2.[13]

A newer technology was the dry scrubbing process. In the dry scrubbing process, flue gas is sent to a spray dryer absorber (SDA). In the SDA, a fine mist of lime slurry is sprayed into the flue gas. Heat from the flue gas evaporates the moisture in the slurry cloud while the alkaline slurry simultaneously absorbs the SO_2 in the flue gas. The result is the conversion of the calcium hydroxide component of the slurry into a fine powder of calcium/sulfur compounds, and lowering of the flue gas temperature. Removal efficiencies of up to 90% with western coal have been demonstrated.[14]

All three scrubbing technologies are technically feasible and available today. Both wet scrubbing technologies have been demonstrated to remove over 95% of SO_2 from western coal, and up to 97% of SO_2 from eastern, high sulfur coals. Dry scrubbing has been demonstrated to remove up to 90% of SO_2 from western coal. Since the early 1980s, the control devices for controlling SO_2 have been relatively stable with the major change being mostly in terms of the effectiveness of removal.

2. *Nitrogen Oxides*

Several emissions control options were potentially available in 1982 for NO_x control:

1. Low NO_x Burners ("LNB")
2. Overfire Air ("OFA")
3. Selective Catalytic Reduction ("SCR")
4. Flue Gas Recirculation ("FGR")

a. Technical Feasibility

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[12] See "Table 30: Flue Gas Desulfurization (FGD) Capacity in Operation at U.S. Electric Utility Plants as of December 1999." This information can be found at website address: http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t30p1.html and following pages

[13] See report of William Ellison, PE, Ellison Consultants, "Table 1, FGD Installations"

[14] See "Retrofitting Lime Spray Dryers at Public Service Company of Colorado," R. Telesz et. al., Presented to Power-Gen International 2000, November 200. This document may be found at website address: http://www.babcock.com/pgg/tt/pdf/BR-1707.pdf.

Low NO_x burners limit NO_x formation by controlling both the stoichiometric and temperature profiles of the combustion process in each burner flame zone. This control is achieved with mechanical designs that regulate the aerodynamic distribution and mixing of the fuel and air which results in reduced oxygen concentration in the primary combustion zone, reduced flame temperature, or reduced residence time at the peak NO_x formation temperature. There are many types of Low-NO_x burners for use on many types of boilers (except cyclone boilers.)[15]

LNBs were installed in numerous facilities by 1982. At least seven plants were operating with LNBs worldwide by 1982.[16] At least one burner manufacturer had developed a burner capable of reaching levels of less than 0.4 pound NO_x/million BTU. That burner was installed at Utah Power and Light's Hunter Unit 2 and started operation in 1981.[17,18] At least two other power plants were permitted by 1982 with emission rates near 0.4 pound NO_x/million BTU–Nevada Power's Harry Allen Station, and Tucson Electric Power's (TEP) Springerville Unit 3.[19] Units 1 and 2 at TEP's Springerville, permitted in 1978, have achieved levels of approximately 0.4 pounds per million BTU.[20] All of the foregoing power plants were designed as tangentially fired boilers.

The relevant NSPS requirement was an emission rate of 0.6 pound/million BTU for coal fired power plants burning bituminous coal. In 1982, several plants were in operation[21] or were permitted for lower levels using LNBs.[22] These installations demonstrate that, using LNBs, facilities would be capable of reaching lower emission rates than the NSPS requires.

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15 Babcock & Wilcox, *Steam/its generation and use* (39th ed. 1978).

16 See report of William Ellison, PE, Ellison Consultants, "Table 5, Pre-1983, Tangentially-Fired, Low NO_x Burner Installations"

17 See report of William Ellison, PE, Ellison Consultants, "Table 5, Pre-1983, Tangentially-Fired, Low NO_x Burner Installations"

18 Conversion from parts per million to pounds per million BTU based on *Emissions standards handbook: air pollutant standards for coal-fired power plants*, Appendix, Hermine N. Soud, IEA Coal Research, December 1991.

19 See Appendix A, Table 1.

20 See U.S. EPA, Clean Air Markets Division, "Emissions Scorecard." This information can be found at website address: http://www.epa.gov/airmarkets/emissions/score00/index.html. TEP's emission rate for 2000 was reported to have been 0.39 pounds/MMBTU. TEP has presumably maintained the same burners since the boilers were built.

21 See report of William Ellison, PE, Ellison Consultants, "Table 5, Pre-1983, Tangentially-Fired, Low NO_x Burner Installations"

22 See Appendix A, Table 1.

Overfire air is a combustion control technique where a percentage (~5 - 20%) of the total combustion air is diverted from the burners and injected through ports about the top burner level. The zone where the coal is injected is slightly oxygen deficient (sub-stoichiometric) thereby suppressing production of NO_x. Combustion is completed in the over-fire air zone. Overfire air is sometimes called air staging. Overfire air limits NO_x emissions by two mechanisms: (1) thermal NO_x formation is delayed and suppressed because of the lower flame temperature and extended combustion zone, and (2) fuel NO_x formation is suppressed because of the lower oxygen concentration in the lower furnace and the lower temperature.[23] Overfire air was installed in numerous facilities by 1982. By 1982, at least five plants were operating worldwide using OFA. However, OFA installations in the 1982 time frame in tangentially fired boilers appear to be an integral part of LNB designs, and also appear designed to meet a limit of 0.7 pound per million BTU. [24]

Selective Catalytic Reduction involves injecting ammonia into the flue gas before the gas reaches a catalyst, at a specific temperature. The catalyst lowers the energy required to complete the reaction of the ammonia with the NO_x to form nitrogen and water, therefore the catalyst can be placed in a lower temperature zone of the boiler. The most common catalysts are a vanadium/titanium composition, with vanadium pentoxide (V2O5) as the active catalyst and a titanium support, and operate at about 750F in hot side SCR systems. Zeolite catalysts are crystalline aluminosilicate compounds and can operate at a lower temperature, typically found after the preheater. Zeolite catalysts would be used in cold side SCR systems.[25]

Selective Catalytic Reduction was in use by 1982 on at least five coal-fired power plants worldwide.[26,27] However, the largest boiler with SCR installed at this time was 350 MW. In addition, in 1982, there were roughly two years of world-wide experience with SCR systems.

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[23] See U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, "Alternative Control Technologies Document NO_x Emissions from Utility Boilers" March 1994. This information can be found at website address: http://www.epa.gov/ttn/catc/dir1/utboiler.pdf.

[24] See report of William Ellison, PE, Ellison Consultants, "Table 5, Pre-1983, Tangentially-Fired, Low NO_x Burner Installations"

[25] See U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, "Alternative Control Technologies Document NO_x Emissions from Utility Boilers" March 1994. This information can be found at website address: http://www.epa.gov/ttn/catc/dir1/utboiler.pdf.

[26] See report of William Ellison, PE, Ellison Consultants, "Table 2, SCR Installations," developed in connection with United States v. Illinois Power and Dynegy Midwest Generation, Inc.

[27] See Ando, Jumpei, "SO_2 and NO_x Removal for Coal Fired Boilers in Japan," presented at the Seventh Symposium on Flue Gas Desulfurization, May, 1982.

Flue gas recirculation involves reintroducing flue gas from the economizer or air heater into the furnace for NO_x control using ductwork and an additional fan. The method was originally developed for controlling superheater and reheater steam temperatures. NO_x is reduced by lowering the temperature in combustion zone and therefore suppressing NO_x formation.

By 1982, flue gas recirculation was in use at a large number of combustion processes.[28] All of these installations appear to be designed to meet an emissions limit of 0.7 pounds/MMBTU.[29] However, little data are available suggesting use and effectiveness of FGR for NO_x control at coal fired boilers. For that reason, I have excluded FGR from further analysis as a BACT option.

By 1985, SCR had been used for coal fired boilers for at least five years. For example, by 1985, at least three Japanese facilities (*i.e.*, Shiminoseki, Shin Ube and Tomatoatsuma) had operated five years.[30] In addition, at least sixteen SCR systems on coal fired power plant boilers in Japan were in operation or under construction by this time, including both new and retrofit facilities. These power plant boilers ranged in size from 125 to 700 megawatts in size.[31] Planned reduction rates are not available for all of these facilities, but for a subset in operation by 1984, reduction ranged from 57 to 81%.[32] Operational problems experienced in the early stages of SCR development had been solved by this time.[33] Two German facilities that would begin operation in 1986 were likely under construction.[34] Also, by 1985, SCR had begun to be used in the United States. For example, use of SCR, by 1984, resulted in a Lowest Achievable Emission Rate (LAER) emission rate for combined cycle gas turbines.[35],[36]

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[28] See report of William Ellison, PE, Ellison Consultants

[29] Ibid.

[30] See report of William Ellison, PE, Ellison Consultants

[31] See Ando, Jumpei, "*SO_2 and NO_x Removal For Coal-Fired Boilers in Japan*," presented to the Seventh Symposium on Flue Gas Desulfurization, May, 1982.

[32] See U.S. EPA, Air and Energy Engineering Research Laboratory, Office of Environmental Engineering and Technology, "Recent Developments in SO_2 and NO_x Abatement Technology," September 1985.

[33] Ibid, page 5-2.

[34] See report of William Ellison, PE, Ellison Consultants, "Table 2, SCR Installations"

[35] Personal conversation with Robert Pease, Air Quality Analysis/Compliance Supervisor, South Coast AQMD, September 19, 2001. Mr. Pease visited Japan in June 1984 to observe the operation of SCR on a large gas turbine. In July 1984, Mr. Pease prepared a report for the AQMD about its operation, and shortly thereafter began to require combined gas turbines to meet a 9 ppm NO_x limit.

[36] LAER is generally the most effective emission limit that has been achieved for a source category. Consequently, the LAER emission rate, and the technology on which it is

An additional technology was Selective Non-Catalytic Reduction (SNCR). This process involves injection of ammonia into the combustion chamber at a point where the temperature is in a precise range.[37] SNCR systems have lower capital costs than SCR, but typically have higher ammonia emissions levels compared to SCR, *i.e*. 30 to 40 parts per million (ppm) compared to as little as 1 ppm for SCR systems.[38] Beginning in about 1985, many coal fired power plants were permitted using SNCR.[39]

SNCR had been demonstrated by 1988 on a number of facilities overseas firing high sulfur coal, as well as many fluidized bed coal fired boilers permitted and under construction in the U.S. using low sulfur coal. By 1988, at least seven coal-fired power plants in the U.S. were required to use SNCR to control NO_x.[40] Emissions reductions of approximately 50% were expected at these facilities, and the permits included emissions limits in the range of 0.09-0.15 pounds/million BTU.[41,42]

With respect to SCR, by 1988, significant additional experience had been gained worldwide in the application of this technology to coal fired boilers. SCR had been installed on at least two cyclone, (or "wet bottom") boilers, as well as many other coal fired power plants.[43] By 1988, twenty-five coal-fired boilers in Japan, six in Germany and two in Austria had begun

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based, would generally be the most effective emission control option in a BACT analysis, and must be considered.

37 See U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, "Alternative Control Technologies Document NO_x Emissions from Utility Boilers" March 1994. This information can be found at website address: http://www.epa.gov/ttn/catc/dir1/utboiler.pdf.

38 See U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, "Alternative Control Technologies Document NO_x Emissions from Utility Boilers" March 1994. This information can be found at website address: http://www.epa.gov/ttn/catc/dir1/utboiler.pdf.

39 References: PSD permit #s SE 85-01, 85-05, SJ 85-06, SJ 85-07, SJ SE 86-04, SJ 86-08, 86-09.

40 See PSD permit #s SE 85-01, 85-05, SJ 85-06, SJ 85-07, SJ SE 86-04, SJ 86-08, 86-09.

41 Ibid.

42 See Kern County Air Pollution Control District, Engineering Analysis of Mt.Poso/Pyropower Cogeneration Facility, November 1986, page 67. "...an emission rate of 0.092 pound NO_x/MMBTU satisfies NO_x LAER requirement."

43 Ibid.

commercial operation of SCR systems for NO_x control.[44] These installations were across a wide range of boiler size. For example, the German boilers vary in capacity from 153 MWe (Walheim, wet bottom boiler) to 770 MWe (Ibbenbuehren), and burn coal with sulfur contents up to 1.3%.[45] The use of SCR at these boilers achieved NO_x control efficiencies ranging from 67 to 92 percent. Six other facilities were under construction overseas and would begin operation by 1992.[46] Because all but one of these German facilities had SCR with design NO_x reduction levels of approximately 80% or greater,[47]

SCR systems are now in wide use in the U.S. and worldwide, and have been applied to meet BACT emission limits for coal fired power plants since 1990.[48] Reported reduction efficiencies are up to 90%. At least 229 units at coal fired power plants worldwide, including at least thirteen in the U.S., are now using SCR to control NO_x emissions.[49] [50]

OFA has also become a very widely used technology. OFA can reduce emissions by as much as 50% in cyclone fired boilers.

Reburn is a NO_x control technology that involves diverting a portion of the fuel from the burners to a second combustion area (reburn zone) above the main combustion zone. Additional air is then added above the reburn zone to complete fuel burnout. The reburn fuel can be either natural gas, oil, or pulverized coal; however, most experience to date is with natural gas reburning. There are many technical issues in applying reburn, such as maintaining acceptable boiler performance when a large amount of heat input is moved from the main combustion zone to a different area of the furnace. Utilizing all the carbon in the fuel has been a problem in the past when pulverized coal is the reburn fuel.[51] Notwithstanding these concerns, at least one

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[44] See ENSR Consulting and Engineering, "Keystone Cogeneration Facility BACT for Nitrogen Oxides, Addendum," June 1990.

[45] See report of William Ellison, PE, Ellison Consultants, "Table 2, SCR Installations"

[46] Ibid.

[47] See report of William Ellison, PE, Ellison Consultants, "Table 2, SCR Installations"

[48] See, *e.g.* New Jersey Department of Environmental Protection, permit number 01-89-3086, issued on December 26, 1990 to Chambers Cogeneration Limited Partnership.

[49] See "Performance of Selective Catalytic Reduction on Coal-Fired Steam Generating Units," USEPA, June, 1997. This document may be found at website address: http://www.epa.gov/airmarkt/arp/nox/scrfinal.pdf.

[50] See SCR Installations Spreadsheet, EPA Clean Air Markets Division, 2001.

[51] See U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, "Alternative Control Technologies Document NO_x Emissions from Utility Boilers" March 1994. This information can be found at website address: http://www.epa.gov/ttn/catc/dir1/utboiler.pdf.

demonstration project on a cyclone fired boiler showed reburn technology achieving a NO_x reduction of 50%, with minimal operational problems.[52]

SNCR has been described earlier. Emissions reductions of up to 80% of NO_x have been demonstrated using SNCR on coal fired boilers.[53]

Optimization systems are new technologies. Although these systems are often known generically as "neural nets," different manufacturers use various software and hardware. Optimization systems attempt to reduce NO_x and improve boiler efficiency by monitoring a number of parameters, and then providing information to a plant's distributed control system. More than 200 boilers, most of them coal fired, are using an optimization technology. Reductions of as much as 40% are possible with optimization systems.[54]

Some of the above technologies may be used effectively in conjunction with one another, and feasible combinations therefore should be considered. Specifically either SCR or SNCR may follow almost any other NO_x emissions control technology. For example, use of OFA may be followed by an SCR system. OFA and reburning (both coal and gas) are considered to modify the combustion process, while SCR and SNCR are post-combustion processes. Emissions reductions achieved through use of combustion modification followed by SCR or SNCR are multiplicative. In other words, an emission reduction of 50% from an LNB followed by 80% control via SNCR will yield an overall reduction of 90% reduction. One exception to this rule is optimization systems, which operate on the combustion process. Little information is available as to the effect of optimization systems in conjunction with other emissions reductions retrofits.

Several power plants have recently been built or modified with a combination of LNBs and SCR. For example, the Chambers Cogeneration facility, an new plant permitted in 1990, has both LNBs and SCR,[55] as does the Hawthorn facility, a new plant permitted in 2001.[56]

Since the early 1990s, the available control devices for controlling NO_X have been relatively stable with the major change being mostly in terms of the effectiveness of removal, and the

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[52] See "Demonstration of Coal Reburning for Cyclone Boiler NO_x Control," McDermott International Inc, 2001. This information can be found at website address: http://www.mtiresearch.com/expernce.html#Demonstration of Coal Reburn.

[53] See report of William Ellison, PE, Ellison Consultants, "Table 2, SCR Installations"

[54] See "What's New in the Power Industry," World Bank, 2001, found at website address http://www.worldbank.org/html/fpd/em/power_industry10.htm.

[55] See New Jersey Department of Environmental Protection, permit number 01-89-3086, issued on December 26, 1990 to Chambers Cogeneration Limited Partnership.

[56] See "PREVENTION OF SIGNIFICANT DETERIORATION CONSTRUCTION PERMIT 888 REVIEW DOCUMENT," issued to Kansas City Power and Light for the Hawthorn Generating Station.

introduction of combustion optimization systems for improved NOx control and boiler efficiency.

3. *Particulate Matter*

The following emissions control options have been available for many years for particulate matter control.

1. Electrostatic Precipitator (ESP)
2. Baghouse

An ESP is a particle control device that uses electrical forces to move the particles out of the flowing gas stream and onto collector plates. The particles are given an electrical charge by forcing them to pass through a corona, a region in which gaseous ions flow. The electrical field that forces the charged particles to the walls comes from electrodes maintained at high voltage in the center of the flow lane.

Once the particles are collected on the plates, they must be removed from the plates without reentraining them into the gas stream. This is usually accomplished by knocking them loose from the plates, allowing the collected layer of particles to slide down into a hopper from which they are evacuated. Some precipitators remove the particles by intermittent or continuous washing with water.

ESPs are configured in several ways. Some of these configurations have been developed for special control action, and others have evolved for economic reasons. Removal efficiencies of greater than 99% have been demonstrated for years.

A fabric filter unit consists of one or more isolated compartments containing rows of fabric bags in the form of round, flat, or shaped tubes, or pleated cartridges. Particle-laden gas passes up (usually) along the surface of the bags then radially through the fabric. Particles are retained on the upstream face of the bags, and the cleaned gas stream is vented to the atmosphere. The filter is operated cyclically, alternating between relatively long periods of filtering and short periods of cleaning. During cleaning, dust that has accumulated on the bags is removed from the fabric surface and deposited in a hopper for subsequent disposal.

Fabric filters collect particles with sizes ranging from submicron to several hundred microns in diameter at efficiencies generally in excess of 99 or 99.9 percent. The layer of dust, or dust cake, collected on the fabric is primarily responsible for such high efficiency. The cake is a barrier with tortuous pores that trap particles as they travel through the cake.

Gas temperatures up to about 500^{o} F, with surges to about 550^{o} F can be accommodated routinely in some configurations. Most of the energy used to operate the system appears as pressure drop across the bags and associated hardware and ducting. Typical values of system pressure drop range from about 5 to 20 inches of water. Fabric filters are used where high-efficiency particle collection is required. Limitations are imposed by gas characteristics (temperature and corrosivity) and particle characteristics (primarily stickiness) that affect the fabric or its operation and that cannot be economically accommodated. Important process variables include particle characteristics, gas characteristics, and fabric properties. The most important design parameter is the air- or gas-to-cloth ratio (the amount of gas in ft^3/min that penetrates one ft^2 of fabric) and the usual operating parameter of interest is pressure drop across the filter system.

The major operating feature of fabric filters that distinguishes them from other gas filters is the ability to renew the filtering surface periodically by cleaning. Common furnace filters, high efficiency particulate air (HEPA) filters, high efficiency air filters (HEAFs), and automotive induction air filters are examples of filters that must be discarded after a significant layer of dust accumulates on the surface. These filters are typically made of matted fibers, mounted in supporting frames, and used where dust concentrations are relatively low. Fabric filters are usually made of woven or (more commonly) needlepunched felts sewn to the desired shape, mounted in a plenum with special hardware, and used across a wide range of dust concentrations.

Since the early 1980s, the control devices for controlling particulate matter have been relatively stable with some improvement in control efficiency.

Table 1: Summary of Power plants with High SO_2 Removal: 1985 time frame

Power Plant/Unit	% Sulfur in Coal	% SO_2 Removal	Year Online
IP&L Petersburg Unit 4	4.5	95	1980
LADWP Intermountain 1& 2	0.6	90	1986, 1987
Montana Power Colstrip Unit 3&4	0.8	95	1984, 1986
Muscatine Unit 19	3.2	90	1983
PacifiCorp Hunter Unit 3	0.6	90	1983
Plains Electric Escalante Unit 1	0.8	95	1984
PECO Cromby Unit 1*	2.6	95	1982
PECO Eddystone 1 and 2	2.6	92	1982
Springfield Dallman Unit 33	3.3	95	1980
Tampa Electric Big Bend Unit 4	3.5	95	1985
Texas MPA Gibbons Creek Unit 1	0.3	90	1983
West Penn Power Mitchell Unit 33	4.0	95	1982

Source: http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t30p1.html and following pages.

Table 2 BACT Determinations for NO_x

Permit Issue Date	Plant Name Unit Company	Plant Capacity	APCD Type/ Removal Efficiency
12/20/90	Chambers Cogeneration LP	1386 MMBTU/hr	LNB/SCR
9/6/91	Keystone Cogeneration	2116 MMBTU/hr	LNB/SCR
8/8/95	Mon Valley Energy Partners	966 MMBTU/hr	LNB/SCR
10/10/97	Encoal Co-gen	244 MW	LNB/SCR
8/12/99	Hawthorn 5, KCP&L	6300 MMBTU/hr	SCR

APPENDIX E

CHARACTERIZATION OF ENVIRONMENTAL IMPACTS OF THE POLLUTION CONTROL PROJECT EXEMPTION

Pollution Control Project Exclusion
Characterization of Environmental Impact

I. Introduction

The EPA proposed in 1996, and is now finalizing, a provision in the NSR regulations that facilitates streamlined approval of pollution control projects (PCPs). The NSR regulations can act as a disincentive for PCP's in cases where the project has the potential to trigger NSR. NSR may be triggered if the project will increase emissions, either actually or hypothetically, of a pollutant other than the one being controlled (*i.e.,* a collateral increase). When NSR is triggered, it introduces delays, transaction costs, and other potential expenses that could render the project uneconomical. As a result, the project is cancelled and the potential environmental benefit from the PCP is never realized. We are now acting to remove this disincentive.

The EPA has long recognized the value of excluding PCPs from NSR review. A current exclusion for PCPs exists in the NSR rules for utilities, and is implemented as national policy for other source categories.[1] The EPA is now codifying into its rules the exclusion for the other categories. We are also improving the implementation of the exclusion to promote more clarity and certainty about what projects qualify for the exclusion, to expand the exclusion to include more types of environmentally beneficial projects, and to streamline the process for obtaining a project's approval for the exclusion. Thus, the NSR Improvement rule changes will likely promote a greater number of environmentally beneficial projects. This analysis characterizes the benefits that will result from this aspect of the final rule.

II. Methodology

Because the PCP exclusion has been implemented under the current rule since 1994, the benefit of promulgating rules that codify the PCP exclusion is probably small, and results from a modest increase in the number of projects that will qualify. In order to characterize this effect, we would need to be able to predict two highly uncertain variables. First we would need to estimate the increase in projects that will go forward under the rule that would not have gone forward under the policy. Second, we would need to characterize the expected environmental impact of this small group of projects. For reasons explained below, our ability to quantify these is limited, so this analysis is primarily qualitative, with quantitative information presented where available.

The EPA cannot model source behavior with sufficient specificity to predict the increase in the number of projects that will qualify for the PCP exclusion as a result of our rule change.

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[1]The current exclusion is codified in the WEPCO rule for electric utility steam generating units, but is implemented through guidance for other source categories. The guidance is a July 1,1994 memo from John Seitz, Director of OAQPS, to the EPA Regional Air Division Directors.

There is anecdotal evidence provided by commenters that some sources are not applying for the PCP exclusion for their environmentally beneficial projects because: (1) the exclusion is too narrow, and (2) the process for qualifying for the exclusion is still uncertain and time-consuming. We expect that the rule changes, which are targeted at addressing both of these concerns, could lead to more applicants. However, because of the voluntary and case-specific circumstances that dictate the viability of individual projects, we cannot at this time estimate how great the increase will be. To provide some sense of magnitude, the EPA has found that fewer than 10 sources per year nationwide have applied for and received the exclusion since 1994, based on a survey of EPA Regional Offices.[2]

With respect to the question of the typical benefits that result from PCP's, we begin by noting that, on a qualitative level, the PCP exclusion will result in environmental benefits because the regulations require that this be the case. The rules do this by requiring that the project either be selected from a list of presumptively environmentally beneficial projects or that it be approved by the permitting authority as environmentally beneficial after considering case-specific factors, with opportunity for public comment. As added safeguards, the project must also be evaluated to assure that collateral increases are minimized, that no NAAQS or air quality increment will be violated, no adverse impacts will occur on a Class I area, and, in nonattainment areas, any collateral increases must be offset by decreases elsewhere in the nonattainment area.

The qualitative argument outlined above is supported by information illustrating the benefits of typical PCPs that have been or may be undertaken under current policy. This information is presented below. First, we provide examples which illustrate the variety of projects that have qualified for the exclusion, and represent typical emissions associated with those projects. Although it is not possible to predict what kinds of sources will take advantage of the PCP exclusion in the future, nor to make a nationwide estimate of the net environmental benefit of PCPs, the information presented here can serve to illustrate the magnitude and direction of the emissions changes associated with these provisions. Second, we provide broader (*i.e.*, nationwide) estimates of emissions associated with a particular type of PCPs: projects to comply with a Maximum Achievable Control Technology (MACT) standard for control of Hazardous Air Pollutants (HAP).[3] A subset of these standards contains requirements that may be met through installation of a control technology that reduces HAP emissions but increases criteria pollutant emissions. In some of these cases, MACT rule developers estimated emissions increases and decreases from the MACT source category. Where such information is available, we present it here.

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[2]The survey found that, based on a review of the available records, 55 sources have qualified for the exclusion since the 1994 policy memo.

[3]Although the PCP exclusion is aimed at promoting PCPs not otherwise required by the Act, the final rule will, for equitable reasons, also allow mandatory pollution controls to qualify for the exclusion if they meet all the applicable safeguards and requirements. We do not presently have sufficient data to determine how much of the expected PCP benefit will come from these mandatory projects, but the range of benefits presented here for all PCPs is likely valid for both the voluntary and mandatory subsets of PCPs.

III. Data on Individual Pollution Control Projects

The EPA estimates that approximately 55 sources, or about seven per year, have undertaken projects using the NSR PCP exclusion since 1994. It is not possible to detail every such project here. However, we present four specific examples that illustrate the range of activities that have qualified for the PCP exclusion in the past. It is important to note that, for each of these projects, the permitting authority had to determine that the project was environmentally beneficial and had to comply with the other PC safeguards (*e.g*., air quality analysis, offsets where applicable, etc.) This information is not intended to provide detailed engineering descriptions of each project; rather it is intended to present basic information on the types of benefits that have resulted from PCPs approved under current rule. The examples are:

1. A complex of six coal-fired boilers produces steam for use in industrial processes and electrical generation. The facility proposed to install flue gas recirculation (FGR) and methane reburn processes as a way of controlling nitrogen oxide emissions from the boilers. Estimated actual decreases in NO_x were 635 tons/year, while the corresponding actual CO increases were about 25 tons/year. The project would have triggered NSR under current rules because the comparison of past actual CO emissions to future potential CO emissions would have exceeded the NSR significance level, but qualified for the exclusion due to substantial NO_x reductions.

2. A pulp and paper mill is conducting a series of modifications to comply with the Pulp and Paper "Cluster Rule."[4] Because these modifications include the installation of a steam stripper and an incinerator, there are projected increases in emissions of some criteria pollutants. However, there will be dramatic reductions in VOC and Total Reduced Sulfur (TRS). The following table shows the overall increase/decreases at the facility as a result of this project:

TABLE 1. Sample Emissions Changes From Pollution Control Project at Pulp and Paper Mill

Pollutant	Emissions from Project	Overall Decrease for Facility
Carbon Monoxide	35	0
Nitrogen Oxides	109	0
Particulate Matter	39	0
Sulfur Dioxide	39	0
Total Reduced Sulfur	3	1385
Sulfuric Acid Mist	53	0
VOC as Methanol	39	4,844

[4] 40 CFR Part 63 Subpart S.

3. A landfill installs a system to collect and combust the gases released from the landfill.[5] This results in the collection and capture of over 400 tons per year of methane, and smaller amounts of other gases. The gases are combusted at flares and are directed to internal combustion engines to generate electricity. Both combustion processes generate an increase in NO_x emissions. The overall NO_x emissions generated are 87.5 tons per year. The project results in an environmental benefit because methane emissions are dramatically reduced, methane being a greenhouse gas. A further environmental benefit stems from the fact that the internal combustion engines are used to generate electricity, which is consistent with EPA's goal of promoting clean, renewable energy. Note that since the project occurred in an ozone nonattainment area, NOx emissions from the engines and flare were required to be offset with reductions elsewhere in the nonattainment area.

4. An appliance manufacturer modifies its process for applying insulating foam to refrigerators, in order to accommodate a switch to a lower ozone-depleting compound in the refrigerator foam system (from Freon II to HCFC 141b). At the time, it was determined that the potential emissions of the new HCFC (approximately 1.5 million pounds/year) could trigger PSD. The project was determined to be environmentally beneficial not only because there is an anticipated reduction in emissions (*i.e*., the previous permit authorized 1.8 million pounds/year), but also, more importantly, there is more than a tenfold reduction in the ozone depleting potential of the emissions. Therefore, the pollution control project exemption was granted.

IV. MACT Standards

As EPA developed certain MACT standards, many commenters raised concerns that compliance with the standard could result in emissions increases of some pollutants that had the potential to trigger NSR[6]. In response, EPA noted the availability of the PCP exclusion under NSR, and noted that, on a case-by-case basis, projects to comply with MACT should generally qualify for the exclusion (as long as the PCP safeguards are met). This is because, in most instances, the HAP reduction is likely to be much larger than the criteria increase. In some cases the HAP reduction may be on the same order of magnitude as the criteria increase, but the MACT project still offers the added benefit of controlling a more hazardous pollutant.

To support this observation, during the development of some of the MACT standards, EPA provided rough estimates of the criteria pollutant increases likely to occur under various MACT controls. These can be compared to the corresponding HAP reductions to provide some sense of how the HAP reductions compare to the criteria increases. Table 2 shows the available data assembled from a survey of MACT standards. The estimates are on a nationwide basis. Table 2 indicates that, generally, MACT standards result in HAP reductions that outweigh any criteria pollutant increases. In some cases the HAP reductions are slightly more than the criteria

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[5]The system was actually installed and then expanded in two separate projects.

[6]This represents only a small portion of the total number of MACT standards; many MACT standards do not raise NSR issues because emissions do not increase or because criteria increases for a typical source would be below significance levels.

pollutant increases, while in other cases the HAP reductions are more than 100 times greater than the criteria increases.

A few cases deserve special attention. The pulp and paper I MACT standard and the Carbon Black Standard show the potential for SO_2 increases that approach or exceed the level of the HAP decreases. However, this is somewhat misleading because most of the SO_2 increase is created when the MACT control device combusts a sulfur-laden stream. Had the MACT controls not been present, the sulfur would still be present (*i.e.*, the controls do not introduce new quantities of sulfur; they simply convert sulfur already present into SO_2), in uncombusted forms, known as total reduced sulfur (TRS).

Of the 104,000 ton SO_2 increase in the Pulp and Paper MACT, 79,000 tons of that is estimated to be from the combustion of TRS.[7] In addition, a portion of the criteria pollutant increase comes from SO_2 emissions from wastewater treatment.[8] Thus the net benefit is much larger than it appears from the table. Similarly, the effect of combustion of sulfur-laden streams is also the source of the high SO_2 numbers for carbon black production. Much of the sulfur is in the form of H2S, which is beneficial to control, and is also destroyed by the combustion device. However, the reductions in H2S are not shown in the HAP reduction estimate, because H2S is not a HAP. EPA did not estimate the emissions reductions of H2S and other reduced sulfur compounds, but it will be roughly equal to the SO_2 increases shown in the table. Thus, although it appears that SO_2 is increasing as a result of the MACT controls, it is more accurate to say that sulfur already present is being converted to less hazardous form, which is a net environmental benefit.

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[7]Also note that SO_2 generally has a higher molecular weight than the uncombusted sulfur compounds, so the tons per year estimate for SO_2 is skewed toward a greater weight than the uncombusted sulfur.

[8]This treatment is required under multimedia pollution abatement requirements contained in the pulp and paper rule. Although these are environmentally beneficial, the current and anticipated future PCP exclusions do not provide for multimedia considerations.

TABLE 2. Estimated Emissions Changes from Selected MACT Standards for which Estimates were Available.

MACT Rule	Estimated criteria pollutant increase (Tons/yr)			Estimated HAP decrease (Tons/yr)	Control Device
	NO_x	SO_2	PM		
Gasoline Distribution	26	1	8	2500	Thermal Oxidizer
Pulp and Paper I	5700	104,000	91	153,000	Thermal Oxidizer
Plywood and Composite Wood Products	4,700			10,700	Thermal Oxidizer
Metal Coil Surface Coating NESHAP	28			1,316	Thermal Oxidizer
Mineral Wool Production NESHAP	137			51	Thermal Oxidizer
Printing Coating, and Dyeing of Fabrics and Other Textiles NESHAP	32			4,100	Thermal Oxidizer
Metal Can NESHAP	182	438	86	6,800	Thermal Oxidizer
Paper and Other Web NESHAP	484	666	27	32,000	Thermal Oxidizer
Polyether Polyols	90			2,000	Thermal Oxidizer
Carbon Black Production	1250	36,200	-810 (decrease)	2,010	Thermal Oxidizer

Finally, with respect to the Mineral Wool MACT, the EPA observes that the estimated NO_x increase, on a nationwide basis, is higher than the estimated HAP decrease. However as noted above, because of the hazardous nature of the pollutants being controlled (formaldehyde and phenol), there is still an environmental benefit to requiring these controls. Where the NO_x increase is of particular local concern because of ozone nonattainment, the PCP exclusion still requires that all the safeguards be met for an individual project (*e.g.*, the NO_x increase must be offset).

V. Conclusions

The information presented above indicates that there is quantitative support for the basic qualitative conclusion that PCPs result in a net environmental benefit. Based on this information we presently estimate that the environmental benefits from pollution control projects can range from about the same as the collateral emissions increase, to orders of magnitude greater than the emissions increase. These benefits may be enhanced when the pollutant being controlled is of greater concern (*e.g.*, HAPs) than the one being increased.

As noted above, it is not possible to estimate the expected increases and decreases of particular pollutants nationwide, but it is clear that the potential emissions reductions are quite large (*i.e.*, thousands of tons per year) in some cases. Currently, we estimate that the overall reductions from the PCP exclusion are small – probably on the order of a few thousand tons each year – due to the small number of projects of which we are aware, but these reductions likely vary widely from year to year and across pollutants. This figure does not account for the possibility that States are approving PCPs for which EPA does not have data, but this does not alter the basic conclusion that a small benefit will result. Further, we expect to see an increase in the number of pollution control projects as a result of our rule changes, but because of the voluntary and case-specific nature of these projects, we cannot at this time model or estimate how great the increase will be.

Clearly, there are environmental benefits that occur as a result of the reductions from these projects. As the examples above show, these benefits stem not only from reduced adverse effects of criteria pollutants, but also from reduced HAP exposures, decreased emissions of stratospheric ozone depletion compounds and greenhouse gases, and benefits in other media. Because of this range of benefits, the benefits of a given PCP can vary widely on a case-by-case basis, and are not always quantifiable in individual cases – much less on a national basis.

Finally, it should be noted that a project that simply balances decreases of one pollutant against increases of another, even where the decreases are larger than the increases, is not always environmentally beneficial, and would not always qualify for the PCP exclusion. The current PCP exclusion and the PCP rule changes include provisions, described above and explained in detail in the rule, to assure that any given project must be environmentally beneficial, that no NAAQS or air quality increment will be violated, that no adverse impacts will occur on a Class I area, and that in nonattainment areas, any increases from the project are offset. In conducting this analysis, we have assumed that the associated safeguards are met in accordance with the rule, and that the environmental benefit of all candidate projects is assured before the project is approved.

APPENDIX F

ACTUAL EMISSIONS BASELINE ANALYSIS

Change in Actual Emissions Baseline
Characterization of Environmental Impact

I. Introduction

The EPA proposed in 1996, and is now finalizing, a provision in the NSR regulations that adds certainty to the procedures for calculating pre-change baseline actual emissions, This 1baseline is used in determining whether an emissions increase will occur that triggers NSR. NSR is triggered when future emissions resulting from a change are significantly greater than past actual emissions. However, because of variability in sources' actual emissions, it is not always appropriate to define a source's past actual emissions as the period immediately preceding the change. For example, a source may have had some kind of recent outage that resulted in lower emissions immediately preceding the change which are not representative of normal operation.

The current NSR regulations acknowledge this circumstance by stating that actual emissions should be based on the two years preceding the change, but allowing for a more representative period where the permitting authority approves it. In practice, it is common for permitting authorities to approve periods beyond two years, and there is presently no limit on how far back the period may go if the emissions are found to be representative of normal source operation. However, questions arise about whether a source's past emissions increases are truly "representative" and resolution of these questions can result in uncertainty and delay.

For industries other than electric utilities, EPA is finalizing a provision that defines baseline actual emissions as the average rate actually emitted by an emissions unit during any consecutive 24-month period within the 10 years prior to a proposed change, adjusted downward to reflect any enforceable limits or restrictions (*e.g.*, new enforceable control devices) that have been imposed or voluntarily implemented since that 24-month period.[1] This preserves the two year long time frame for establishing baseline emissions, but allows the time frame to occur only within the 10 years preceding the change. Furthermore, this change allows the use of any two year period within the previous 10 years without the need for a determination on whether the two

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[1]For electric utility steam generating units (EUSGU), this would have replaced the presumption established in the preamble to 1992 WEPCO rulemaking that the baseline emissions for an EUSGU would be any consecutive 2-years within the period 5 years prior to a particular change. However, rather than change the baseline for EUSGU, EPA is simply codifying this existing presumption from the preamble. Under this presumption, a utility is still free to request a determination from the Administrator that another time period is more representative. In EPA's WEPCO final rule, it noted that the "any 2 in 5" presumption was consistent generally with the concept of the contemporaneous time period.

years selected are more or less representative than the two years immediately before the change.[2] Importantly, however, it requires that the emissions during this period be adjusted downward to account for enforceable controls and emissions restrictions.

The EPA anticipates that the primary benefit of this change will be to eliminate uncertainty and delay over which period is most representative. A second benefit is the removal of the existing rule's effect of "confiscating capacity" when changes occur during a low point in a source's natural business cycle (discussed in more detail below). However, the purpose of this analysis is to assess the environmental impact of the change, so no further attempt is made to quantify the benefits of reduced uncertainty, reduced delay, and the elimination of capacity confiscation.

II. Methodology

In order to determine the environmental impact of this provision, we must first assess which sources, if any, will be affected by the change in baseline, and then estimate what impact these sources will have on emissions. We attempted to review past permits to make this assessment, but found that it was not possible to do nationally with the data available to us. EPA's permit files do not typically contain actual emissions data going back 10 years, which would be needed to establish the baseline under NSR Improvement.[3] These data are generally available, at the level of specificity we would need, only from source records. EPA is not able, at this time, to undertake a new data collection effort aimed at assembling actual emissions data for the past 10 years for various emissions units. Currently, most sources are required to keep records on site for a period of five years, adding to the difficulty of obtaining information needed to assess the impact of a ten-year lookback period. We also considered examining only projects that were modifications to existing units and that triggered major NSR, but again, the data needed to establish a 10-year baseline are not typically available. Indeed a source applying for NSR need not supply this sort of applicability data in order to get its permit. Further, it is not always easy from existing permit files to establish whether a particular change is a major

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[2]As discussed earlier, the analysis for the WEPCO rule relied in part on the federal contemporaneous time period in establishing the "any 2-in-5" presumption for a pre-change baseline. The origin of the five year period was described in the preamble to the August 7, 1980 PSD regulations as being selected since "five years is frequently used as the time duration over which corporate expansion planning is conducted." The preamble goes on to state that "EPA has established that each state may set the period of contemporaneity for its own NSR regulations. The state may not however set a period of unreasonable or undefined length." EPA has approved as "reasonable" contemporaneous time periods of 7 years (NC) and 10 years (KY) in State Implementation Plans.

[3]These data may be available in State files that contain netting calculations for particular facilities, but EPA does not typically receive these unless major NSR is also involved. It is likely that the only occasion in which emissions data going back ten years would be included in such files would be when a source has requested an alternative baseline from ten or more years in the past.

modification to an existing unit. A significant new effort would be required to build the needed database to do such an analysis, and there is a high likelihood that even after such an effort there would be insufficient data to estimate, on a national basis, which sources would use a different baseline.

Although we are unable to quantify the effects of the 2-in-10 baseline by looking at individual permits, we are able to assess the overall scale of this effect by following an analytical framework that begins with the entire universe of projects potentially subject to NSR, and then backs out the subset of projects that we can determine will be unaffected by this change. The remainder of this analysis applies this method, and discusses, where possible, the emissions implications along the way.

III. Results

We have determined that the vast majority of sources will not be affected by the change in baseline. This is true for the following reasons:

- *No change for new sources and new units at existing sources*. The baseline changes are only relevant to modifications at existing sources. For new "greenfield" sources, and new units with no operating history, the baseline is, by definition, zero emissions before the source is built, and is therefore unaffected by this provision. This is notable because we believe that the majority of the emissions reduction/prevention benefits from NSR come from new sources and new units. According to recent PSD permitting data, more than 80 percent of the PSD benefits come from these categories.[4] Therefore, as a starting point, less than 20 percent of the total benefits are at issue.

- *No change for electric utility steam generating units.* For electric utility steam generating units, the largest source of SO_2, NO_x, and fine particle emissions in the nation, the final rule will not change the baseline. It will codify a presumption that has been in effect for nearly 10 years.[5] According to EPA's 1999 Trends Report, 73% of the nationwide SO point source emissions and 55% of the nationwide NO_x point source emissions are from this sector alone.

- *No change for sources with recent high levels of emissions.* For sources who have recently emitted at levels that are higher than in the past, the current rules would allow selection of the same baseline as the NSR Improvement rule. The current rules provide that a source may use the two years immediately before the change. For a source whose most recent two years are its highest two years, allowing a 10-year lookback would have

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[4]This figure is based on a review of the permit data EPA collected and reviewed for PSD permits issued from 1997 to 1999, which are the same data that were used to generate overall estimates of the emissions prevention benefits of PSD program. During this time, 57 percent of the benefits were from new greenfield sources, and 25 percent were from new units.

[5]Information supporting the determination that there is no change in utilities is available in the docket for the NSR Reform rulemaking.

no effect. Based on a broad look at EPA's National Emissions Inventory, about a third of the source categories for which data are available have experienced emissions that were higher in 1999 than in 1990. While this is only a crude indicator of what may be happening at individual sources in the inventory, we believe that the aggregate numbers shed light on the relative number of remaining modifications that will be unaffected by the baseline change.

- *No change for sources with recent emissions comparable to the past.* For sources who have recently emitted at levels that are comparable to those in the past, selection of the most recent two years would result in the same baseline as would the comparable levels from the past 10 years.

Considering the above factors together, EPA estimates that projects unaffected by the baseline change likely comprise 90 percent of the overall NSR emissions benefits. However, the remaining 10 percent, from sources where recent emissions are lower than in the past than in recent years warrants a more detailed examination, because such sources could theoretically see different baselines under NSR Improvement than under the current rule. It is important to note that it is certainly not the case that *all* such sources will see a change in baseline, nor is it clear in which direction that change will be. To examine this case further, we must consider two variations on the case. In the first variation, emissions are lower in recent years because the source has recently become subject to control requirements or emissions limitations, while capacity utilization has remained about the same. In the second variation, emissions are lower in recent years because capacity utilization has decreased, perhaps due to decreased product demand or some kind of outage.

As noted above, the EPA is finalizing a baseline provision which allows for the selection of any two year period of utilization, but requires the use of current emission limits that account for enforceable pollution control measures that have been put into place. Thus, in the first variation described above, the source would see an equal – or possibly even a lower – baseline under NSR Improvement than under the current rule. The current rule would have allowed the source to select an emissions baseline based on what was actually emitted during the previous two years, or possibly another more representative period of source operation. If these emissions occurred before the recent installation of controls, they would result in a baseline that is higher under the current rule than what would be allowed under the revised rule, which requires an adjustment downward for those controls.[6]

Although, as noted above, we cannot model baseline effects for individual sources, the EPA has made a rough estimate of the portion of sources seeing declining emissions that are doing so because of pollution reductions occurring at the facility which would need to be incorporated into the baseline. This estimate is conducted on a broad source category level, and assumes that source categories that have seen improvements in emissions per unit of output have done so because of enforceable pollution controls and other measures that would have to be

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[6]The NSR Improvement rule also requires that a 24-month period of emissions be used, whereas shorter periods have been justified under the current rule. This averaging over a longer time period will also result in a lower baseline in those cases.

factored into the baseline under the NSR Improvement rule. We compared emissions data and output data from the early 1990s with data from the late 1990s to establish emissions per unit of output numbers for any source categories for which data were available.[7] Our broad comparison showed that overall, decreases in emissions per unit of output occurred more than 70 percent of the time. For PM-10, 42 percent of the source categories for which data were available showed a decrease in emissions per unit of output. For NO_x, 75 percent of source categories showed a decrease. For SO_2, 81 percent showed a decrease, and for VOC, 88 percent showed a decrease.

To illustrate how a source who has recently installed controls can receive a lower baseline under the NSR Improvement rule, consider an industrial boiler that has fired coal for the past nine years, but has recently switched to natural gas to comply with a pollution control requirement.[8] The boiler had a high utilization in the past, but has recently been experiencing lower utilization. (Recall that under the current rule, the source may be able to go back and demonstrate that the higher past utilization was more representative, but assume that it cannot do this). Under the current rule, the source's baseline is based on a two-year average that includes higher emissions from coal firing. Under the NSR Improvement rule, a source making a change may go back and choose the high utilization rate, but must now estimate its baseline emissions as if the natural gas limitation had been in effect at that time, which will result in a lower baseline. For example, a typical boiler in this situation might emit 270 tpy of NO_x two years before the change, and, after the switch to gas, emit only 70 tpy one year before the change. Its baseline under the current rule would thus be the average of these two years, 170 tpy. Under the new rule, it can go back to the higher utilization period, which, for this example, we assume to be associated with emissions of 370 tpy of NO_x . However, after the switch from coal to gas, the emissions associated with this same period of high utilization, and thus, the baseline emissions under the new rule, are determined to be only 80 tpy – less than half the baseline under the current rule.

The second variation for sources where emissions are lower in recent years than they were 10 years ago represents a case where recent emissions are lower because of some factor other than pollution controls, such as decreased product demand or some kind of outage. Under the NSR Improvement rule, a source could freely go back and choose a two-year period in the previous 10 years where emissions were higher, if such a period is available. Under the current rule, a source may also be able to choose a different two-year period, not only in the previous 10 years, but possibly longer, if the relevant permitting authority determines that the other period is more representative. It is reasonable to assume that a source whose recent emissions were low would request the use of a different baseline. The determination that the requested baseline is more representative would then be a case-by-case decision based on source-specific factors.

[7]The emissions data were from the 1990 and 1999 National Emissions Inventories. The output data were from the 1992 and 1997 Economic Census. We recognize the high level of uncertainty in applying these numbers in the fashion described, but because the purpose of the analysis is to detect broad changes over the decade, and not necessarily to quantify them, this uncertainty is of less importance.

[8]An example of such a requirement may be the upcoming MACT standard for industrial boilers.

Based on our experience, EPA believes that many, but not all, of these sources would have had a credible case to ask for an alternative baseline. However, because such requests are not routinely reported to EPA, it is difficult for us to reliably estimate the likelihood that past or future requests for alternative baselines would or would not be granted by permitting authorities.

Thus for the remaining population or projects, which, again comprises about 10 percent of emissions covered by NSR, it is unclear whether, overall, the affected projects would see a different baseline, and if so, what direction the change would be. We expect that in the case of sources with recently declining emissions due to controls, which, as estimated above, comprise about 70 percent of this remaining population, the baselines are likely to be unchanged or possibly even lower under the NSR improvement rule. For the other 30 percent of the remaining population, baselines may or may not be higher under NSR Improvement rule, depending upon how often case-by-case baselines would be established under the current rule's allowance for more representative periods. For reasons noted above, we cannot quantify this, but believe that many of these projects would have a credible argument that an alternate baseline is justified, and therefore many baselines would not be higher.

IV. Discussion

The above analysis allows us to qualitatively deduce that the number of sources potentially affected by the change in baseline is relatively small, and that the potential effects can go in either direction. Further, we expect that many of the few remaining instances where a higher baseline can result are cases where a facility is experiencing low product demand and is unable under current rules to qualify for a higher baseline on the grounds that the previous two low years do not represent normal operation. For such cases, the current rules can act to "confiscate" the source's productive capacity. Sources at low points in the business cycle who are considering making modifications are often faced with the choice between, on the one hand, undertaking a lengthy and expensive NSR process at a time of business downturn, or, on the other hand, taking a permit limit to avoid NSR, typically by capping production at or near current, low levels (*i.e.*, confiscating capacity). As noted above, the EPA believes that eliminating this capacity confiscation is an economic benefit that we expect to see from the change to emissions baseline.

When a source confiscates capacity to avoid NSR, it may be tempting to consider this an environmental benefit of the program, and to argue that such benefits will be lost if EPA allows the use of a higher baseline from a different time in the business cycle. Taken to its extreme, this type of benefit is maximized when the facility ceases production entirely. However, the EPA does not believe that it is appropriate to claim NSR credit for reductions in emissions that occur simply because economic activity slows down.[9] An alternative and more appropriate approach to the emissions baseline is to consider the business cycle as a natural source of emissions fluctuations – both up and down – and to set these aside for analysis purposes. When looking at

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[9]The NSR regulations do allow sources to increase production without triggering NSR. However, when a physical or operational change occurs at a low point in the business cycle, the emissions from the production increase are nearly always attributed to the change, and NSR is triggered.

a facility at the low point in its cycle, the relevant question then becomes not whether emissions will absolutely increase (because they will as part of the cycle). As explained further in information supporting the NSR Improvement rule, the EPA did consider business cycles for various industries when developing the final rule, and attempted to set a baseline that accommodates them. To quantitatively analyze industry's normal business cycle, EPA contracted for a study of several industries in 1997.[10] The study, entitled "Business Cycles in Major Emitting Source Industries" (September 1997) examined the business fluctuations for nine source categories described as Clean Air Act major emitting sources. Industry business cycles were examined using industry output data for the years 1982 to 1994 inclusive based on the Office of Management and Budget's Standard Industrial Classification (SIC) code for individual industries (OMB, 1987). This study found that business cycles differ markedly by industry, and may vary greatly in both duration and intensity even within a particular industry. EPA concluded from this study that 10 years is reasonable to capture an entire industry cycle and, as a result, we believe that a 10-year baseline is appropriate.

V. Conclusions

The EPA believes that the change in baseline EPA is now finalizing will not result in any significant change to the environmental benefits derived from the NSR program. We do not have sufficient information to ascertain whether emissions benefits will be lost or gained as a result of this rule change, but in either case, the magnitude of the change is likely to be very small. As described above, the rule change will not alter the baseline at all for most sources, including (1) new sources, (2) modifications in the largest-emitting category, coal fired power plants, (3) modifications at any source where emissions have been highest in recent years, and (4) modifications at any source where emissions have been relatively stable.[11] Taken together, these unaffected categories account for an estimated 90 percent of NSR benefits.

Furthermore, for the remaining 10 percent, arising from cases where recent emissions are low compared to the past, a source cannot qualify for a significantly higher baseline emissions level if the present emissions are lower as a result of enforceable controls that have been applied since that time – which is true about 70 percent of the time. Indeed, such sources could face lower baselines under the current rule if controls are applied toward the end of the representative two-year period. This leaves only the case where emissions are lower as a result of decreased utilization due to decreased market demand, some kind of outage, or other circumstance. Even in this case, it is not clear that a different baseline would result, because the source is eligible, under current rules, to request a more representative baseline than the previous two years. It is reasonable to assume that sources facing recent drops in utilization would be able to make credible cases to their permitting authorities that the recent levels were not representative of

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[10]The study is included as an attachment to this analysis, and is also included in the docket for the NSR Rulemaking.

[11]The Improvement rule also does not alter the baseline for sources that do not have sufficient source information from earlier years, because in order to qualify for a different baseline, sufficient information must be available to determine actual emissions from the proposed time period.

normal operation. However, we cannot draw general conclusions about how many sources would or would not receive alternate baselines, nor, it follows, can we estimate what emissions consequences, if any would result. However, because the number of sources receiving different baselines represents a small fraction of the overall NSR permit universe, excludes new sources and coal fired power plants, and because the baseline may shift in either direction, we conclude that the rule change will not result in any significant change in benefits derived from the rule.

ATTACHMENT TO APPENDIX F

BUSINESS CYCLES IN MAJOR EMITTING SOURCE INDUSTRIES (SEPTEMBER 1997)

MEMORANDUM

Date: September 25, 1997
From: David Casanova, ERG
To: John O'Connor, ERG
Subject: Business Cycles in Major Emitting Source Industries

I. Introduction

The term *business cycle* refers to the recurrent ups and downs in the level of economic activity which extend over a period of several years. Business cycles are made up of four separate phases: 1) the peak—output is assumed to be at or near full capacity, 2) the recession—output and employment decline, 3) the trough—output and employment bottom out at their lowest levels, and 4) the recovery—output and employment expand (McConnell, 1984).

Specific business cycles vary greatly in duration and intensity. Some economists prefer to use the term *fluctuations*, rather than *cycles*, since the latter term implies regularity and the former does not (McConnell, 1984). The irregularity of the fluctuations is apparent in the data examined in this memorandum. Due to the inconsistencies of business cycles, there is much difficulty in drawing conclusions about past business cycles or making predictions about future business cycles based on any one business cycle—either for the national economy or for individual industries.

II. Business Cycles in Major Emitting Source Industries

ERG examined several industries which are described as Clean Air Act major emitting sources. Industry business cycles were examined using industry output data for the years 1982 to 1994 inclusive based on the Office of Management and Budget's Standard Industrial Classification (SIC) code for individual industries (OMB, 1987). Output was measured as real gross product originating (GPO) by industry. Data for GPO were obtained from the Bureau of Economic Analysis and converted to 1994 dollars using the

Engineering News Record's Construction Cost Index (BEA, 1996; BEA, 1997; and ENR, 1997). GPO is defined as the contribution of each private industry and government to gross domestic product. An industry's GPO is equal to its gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus its immediate inputs (consumption of goods and services purchased from other industries or imported) (BEA, 1996). Although data were available for years prior to 1982, ERG believes that data from 1982 on present a more accurate picture of the modern economy than would previous data.[1]

It should be noted that peaks in a business cycle are usually defined as the last quarter of growth before at least two quarters of decline and that troughs in a business cycle are usually defined as the last quarter of decline before at least two quarters of growth. These definitions require quarterly data in order to identify business cycle changes. Figures 1 and 2 indicate the slight differences between annual and quarterly data. Figure 1 presents U.S. gross domestic product using annual data; Figure 2 presents U.S. gross domestic product using quarterly data. The annual data provides an picture of an economy with smooth constant growth, except for a brief downturn in 1991. The quarterly data more accurately presents the erratic movement of the U.S. economy through time; the recession of the early 1990s is much more evident when the quarterly data is used. Since only annual data were available at the four-digit SIC level, this analysis provides less precise estimates of business cycle peaks and troughs. It should also be noted that the vertical scales for each of the figures differ by industry and should not be used for inter-industry comparison.

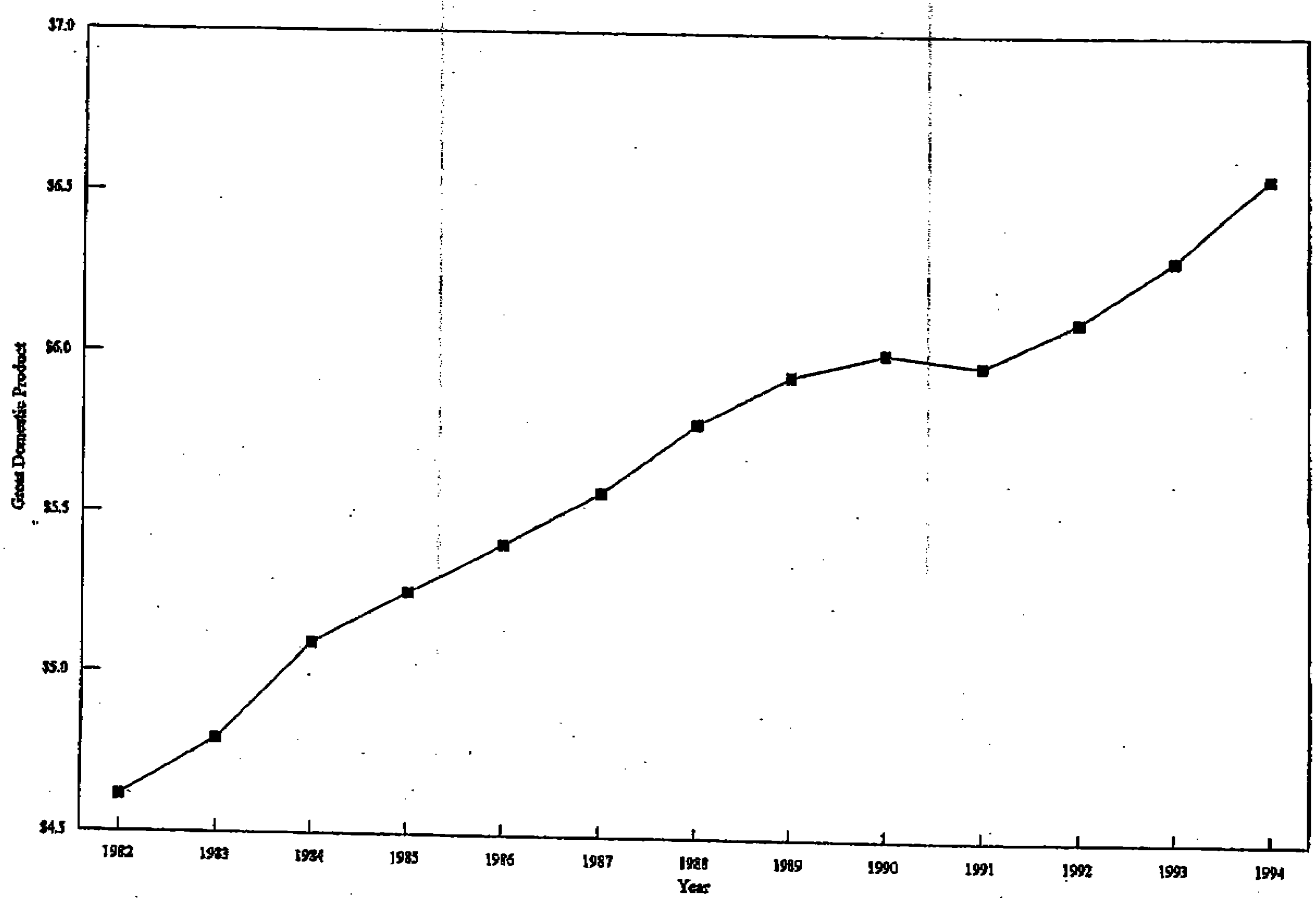
Charcoal Production

Charcoal production (not including activated charcoal) is included in SIC code 2861: Industrial Organic Chemicals—Gum and Wood Chemicals. It should be noted that this SIC code includes the manufacture of numerous other items which could affect the data. Figure 3 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1984 and 1989, while there is a trough in 1987. This suggests a five year cycle peak to peak.

[1]The period from 1972 to 1982 was characterized by double-digit inflation, the oil price shocks of 1973 and 1976, and the monetary policy-induced recession of the early 1980s. This is why the period prior to 1982 is not characteristic of the period since 1982.

Figure 1

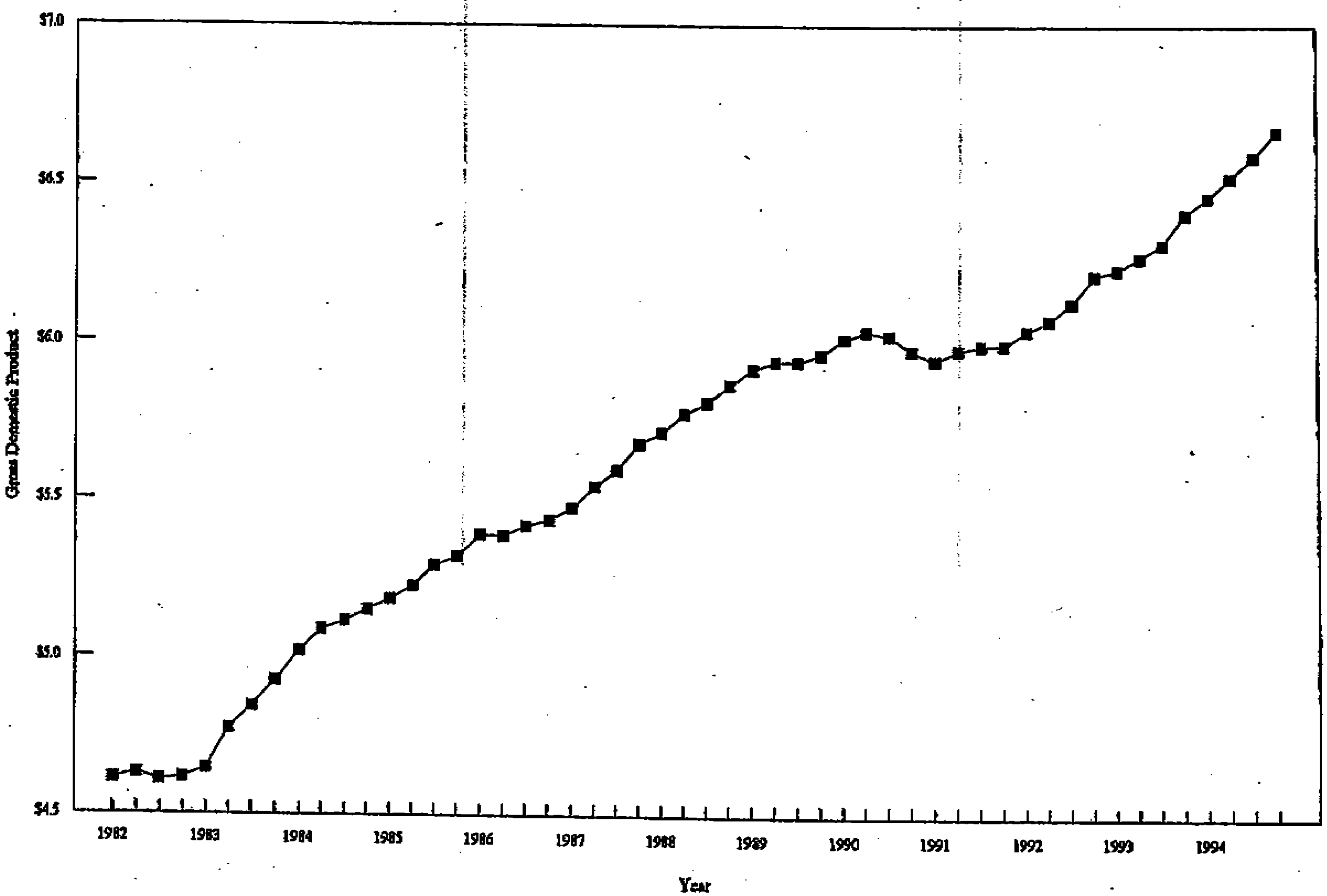
Annual U.S. Gross Domestic Product, 1982-1994
Trillions of 1994 Dollars



Source: Slater, C. M. 1996. Business Statistics of the United States: 1995 Edition. Lanham, MD: Bernan Press.

Figure 2

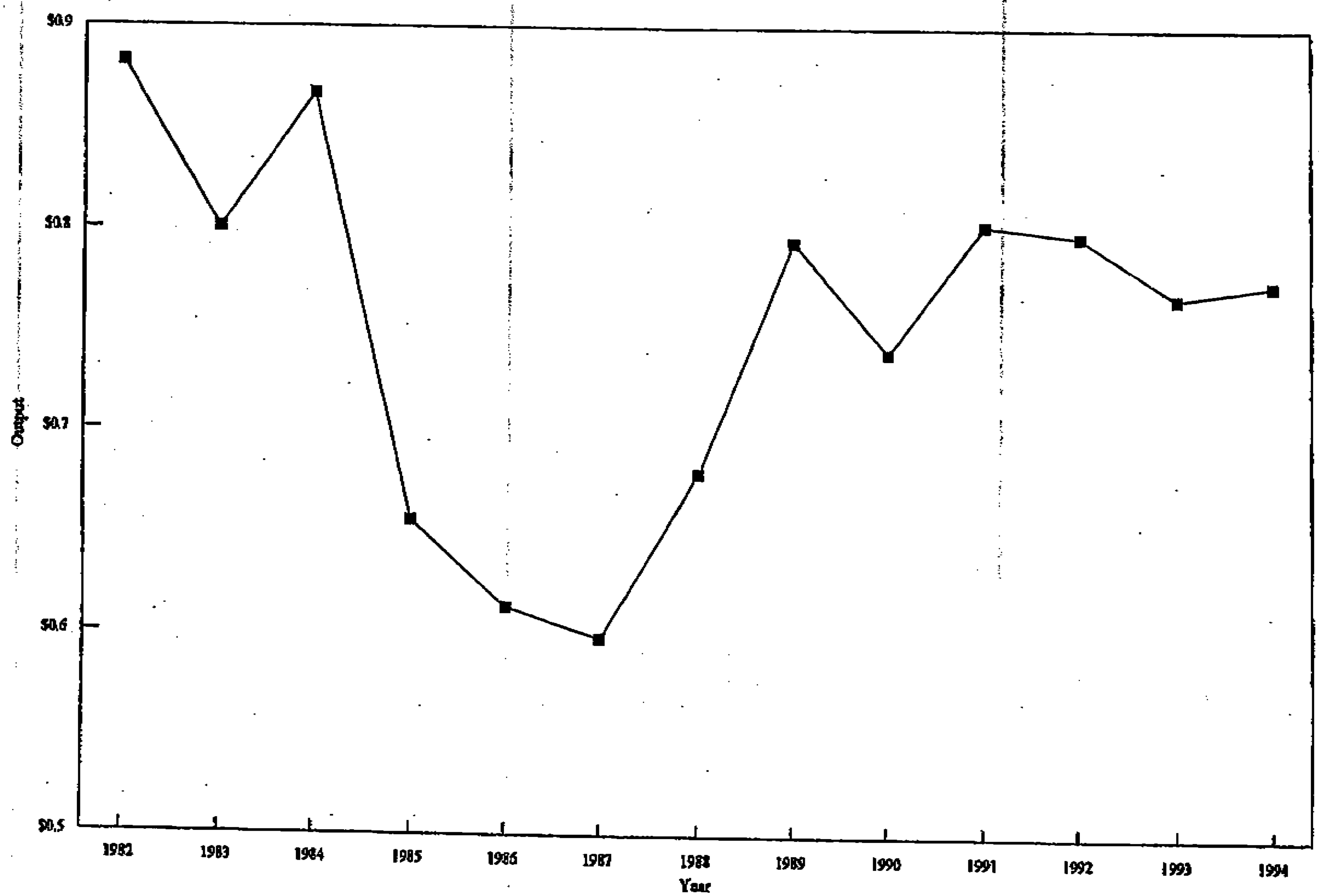
Quarterly U.S. Gross Domestic Product, 1982-1994
Trillions of 1994 Dollars



Source: Slater, C. M. 1996. Business Statistics of the United States: 1995 Edition. Lanham, MD: Beman Press.

Figure 3

Annual Output, 1982-1994: Gum and Wood Chemicals Manufacturing (SIC Code 2861)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Carbon Black Manufacturing

Carbon black manufacturing is included in SIC code 2895: Miscellaneous Chemical Products—Carbon Black. Figure 4 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1984 and 1990, while there are industry troughs in 1983, 1987, and 1992. This suggests a six year cycle peak to peak and four and five year cycles trough to trough.

Portland Cement Manufacturing

Portland cement manufacturing is included in SIC code 3241: Hydraulic Cement. Figure 5 presents the annual GPO of this four-digit SIC code. It should be noted that this SIC code includes the manufacture of numerous other items which could affect the data. There are industry troughs in 1983 and 1991; the only industry peak during this period appears to be in 1984. This suggests an eight year cycle trough to trough.

Lime Manufacturing

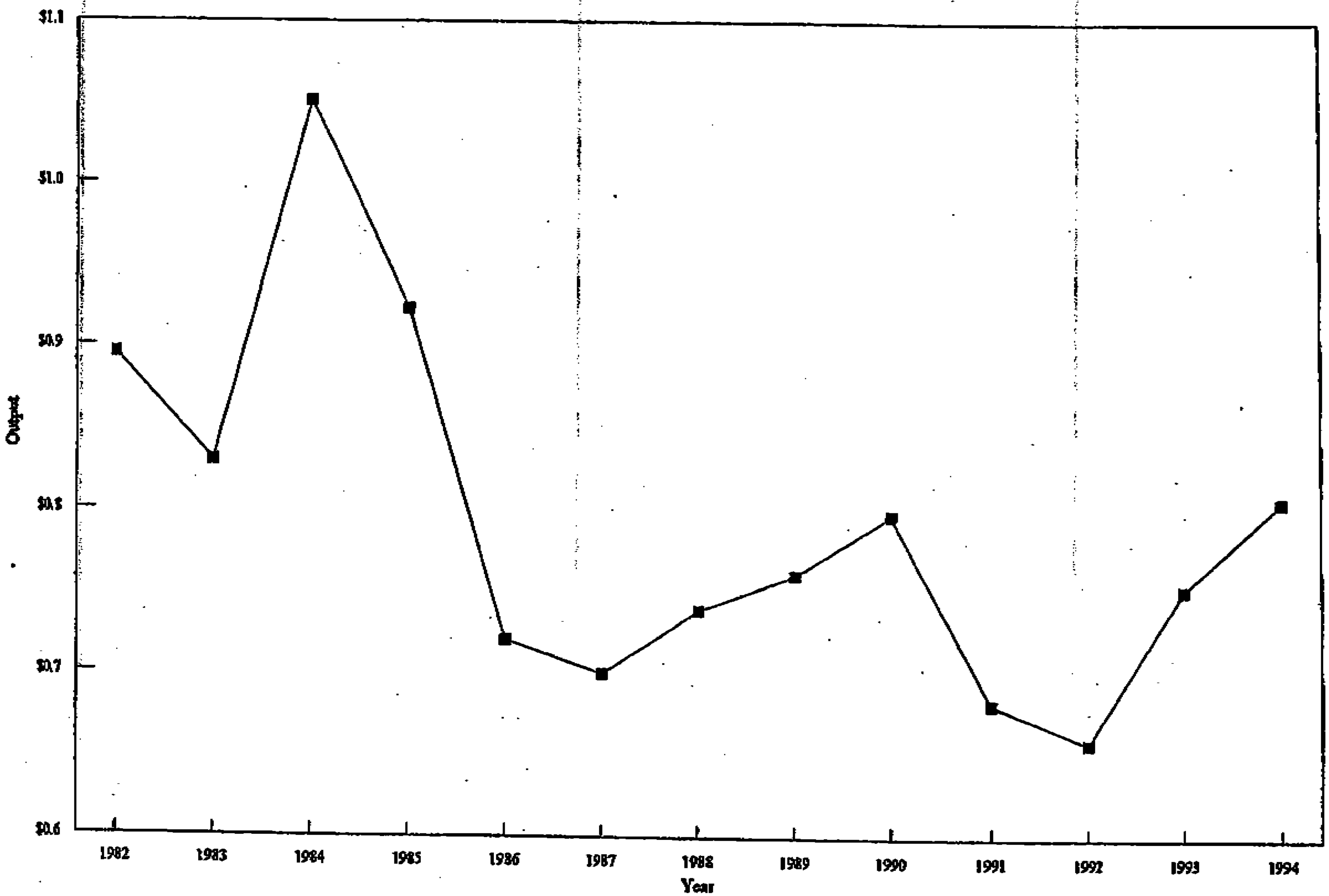
Lime manufacturing is included in SIC code 3274: Concrete, Gypsum, and Plaster Products—Lime. Figure 6 presents the annual GPO of this four-digit SIC code. There are industry troughs in 1983, 1986, and 1991; there are industry peaks in 1985 and 1988. This suggests three and five year cycles trough to trough and a three year cycle peak to peak.

Iron and Steel Manufacturing

Iron and steel manufacturing is included in SIC code 3312: Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills. Figure 7 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1984 and 1988, while there are industry troughs in 1983, 1986, and 1992. This suggests a four year cycle peak to peak and three and six year cycles trough to trough.

Figure 4

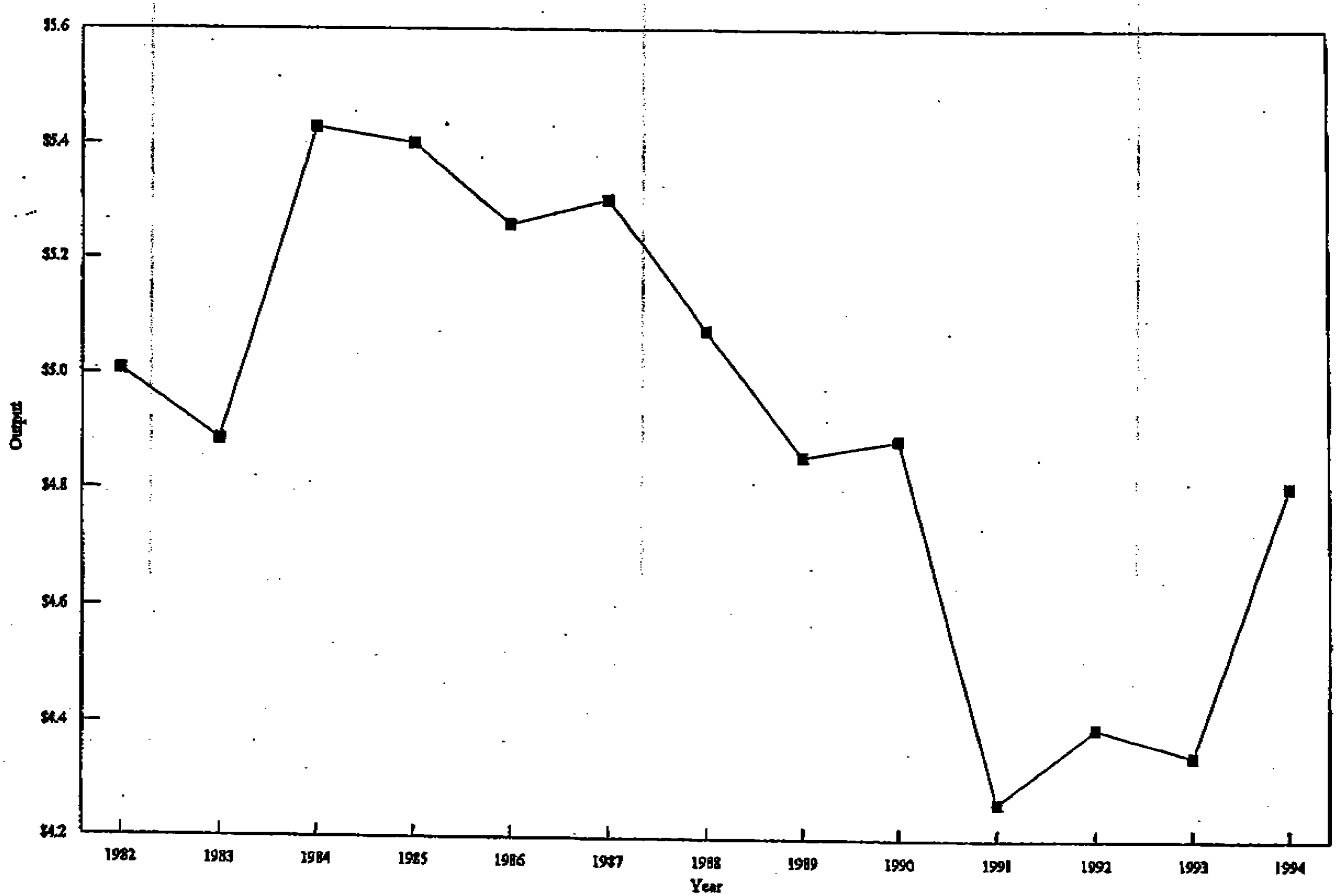
Annual Output, 1982-1994: Carbon Black Manufacturing (SIC Code 2895)
Billions of 199[illegible] Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Figure 5

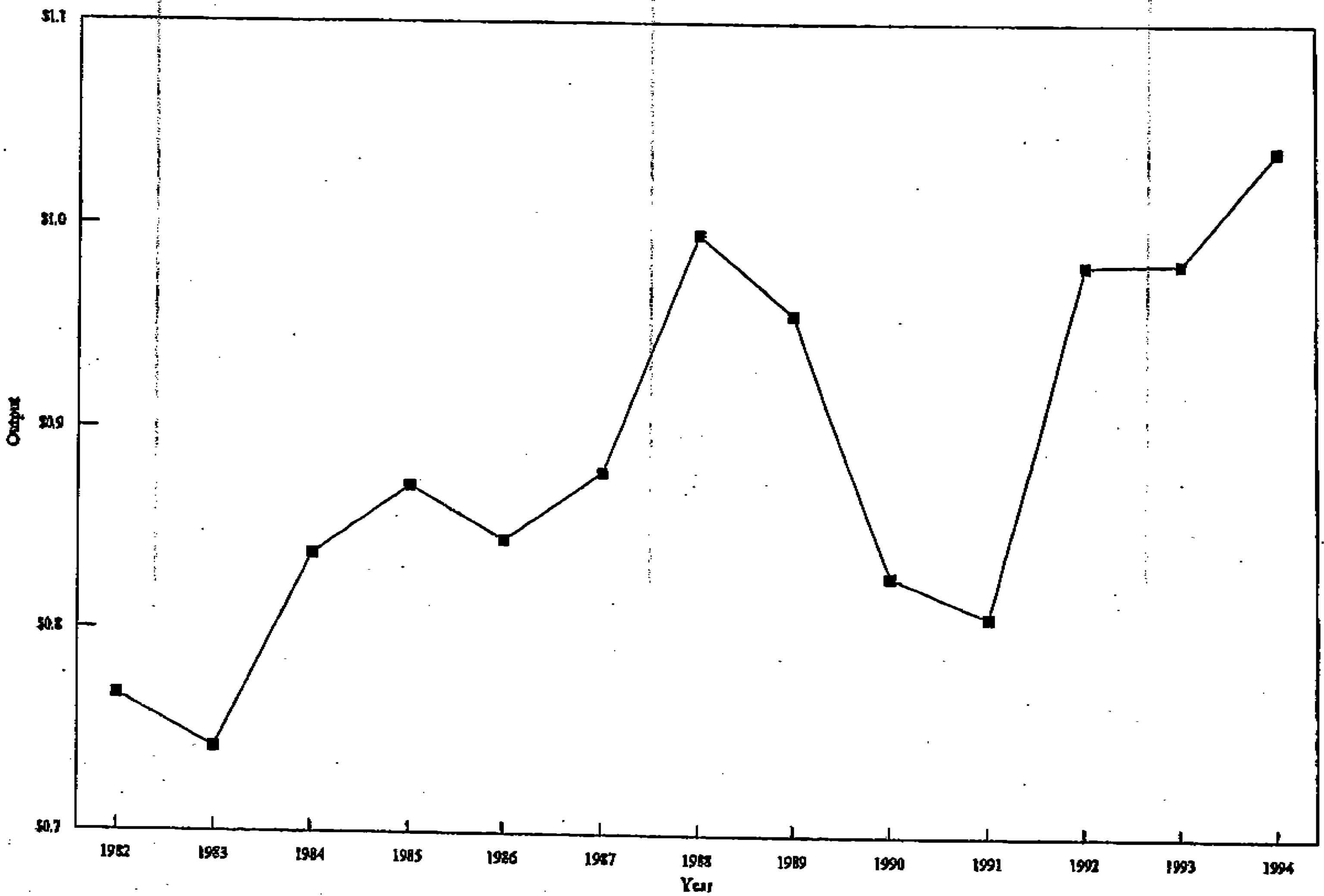
Annual Output, 1982-1994: Hydraulic Cement Manufacturing (SIC Code 3241)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Figure 6

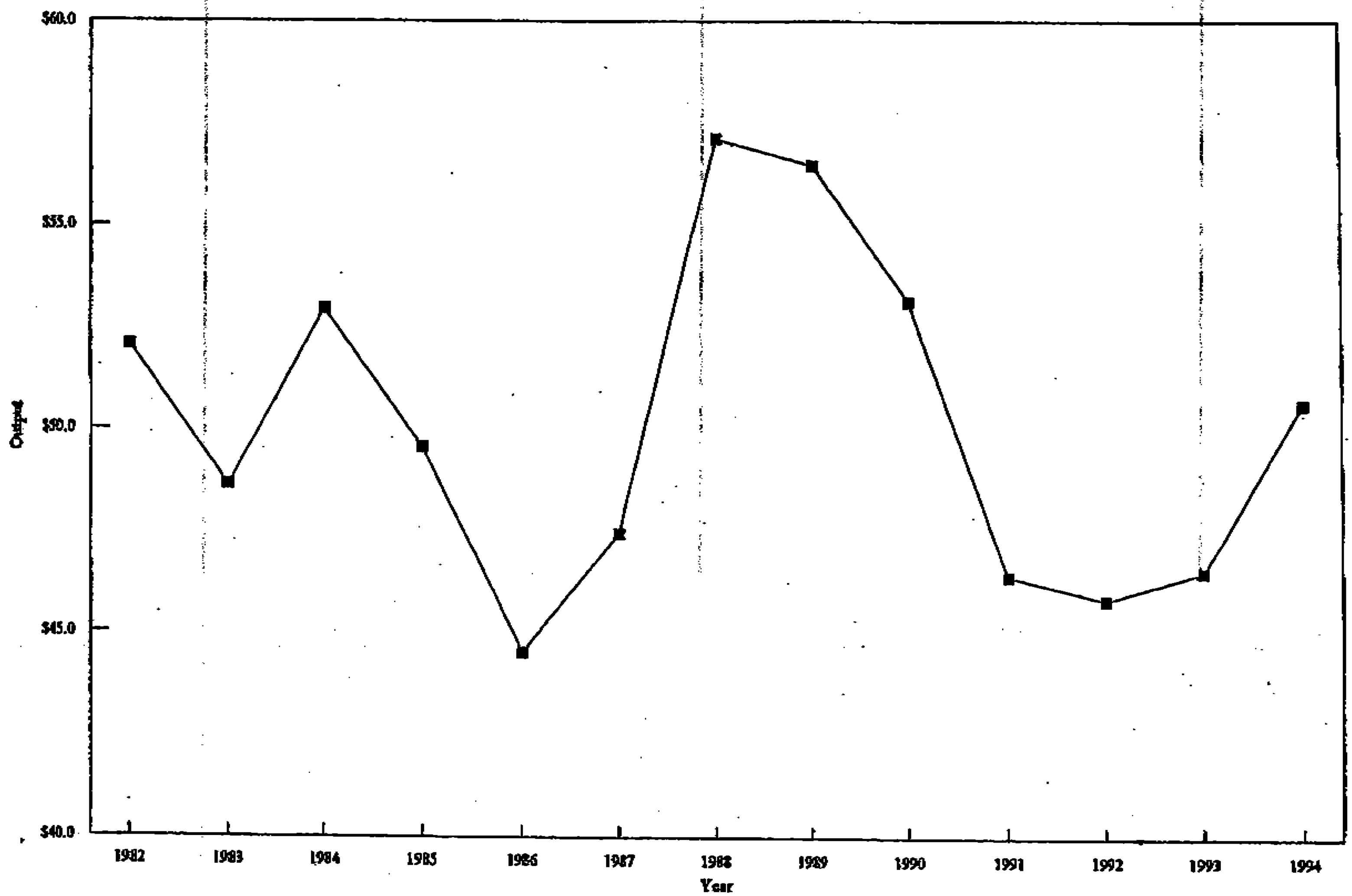
Annual Output, 1982-1994: Lime Manufacturing (SIC Code 3274)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Figure 7

Annual Output, 1982-1994: Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills (SIC Code 3312)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Primary Copper Smelting

Primary copper smelting is included in SIC code 3331: Primary Smelting and Refining of Copper. Figure 8 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1983, 1989, and 1992 while there are industry troughs in 1986 and 1991. This suggests six and three year cycles peak to peak and a five year cycle trough to trough.

Primary Aluminum Production

Primary aluminum production is included in SIC code 3334: Primary Production of Aluminum. Figure 9 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1983 and 1988, while there are industry troughs in 1986 and 1993. This suggests a five year cycle peak to peak and a seven year cycle trough to trough.

Primary Zinc Smelting and Primary Lead Smelting

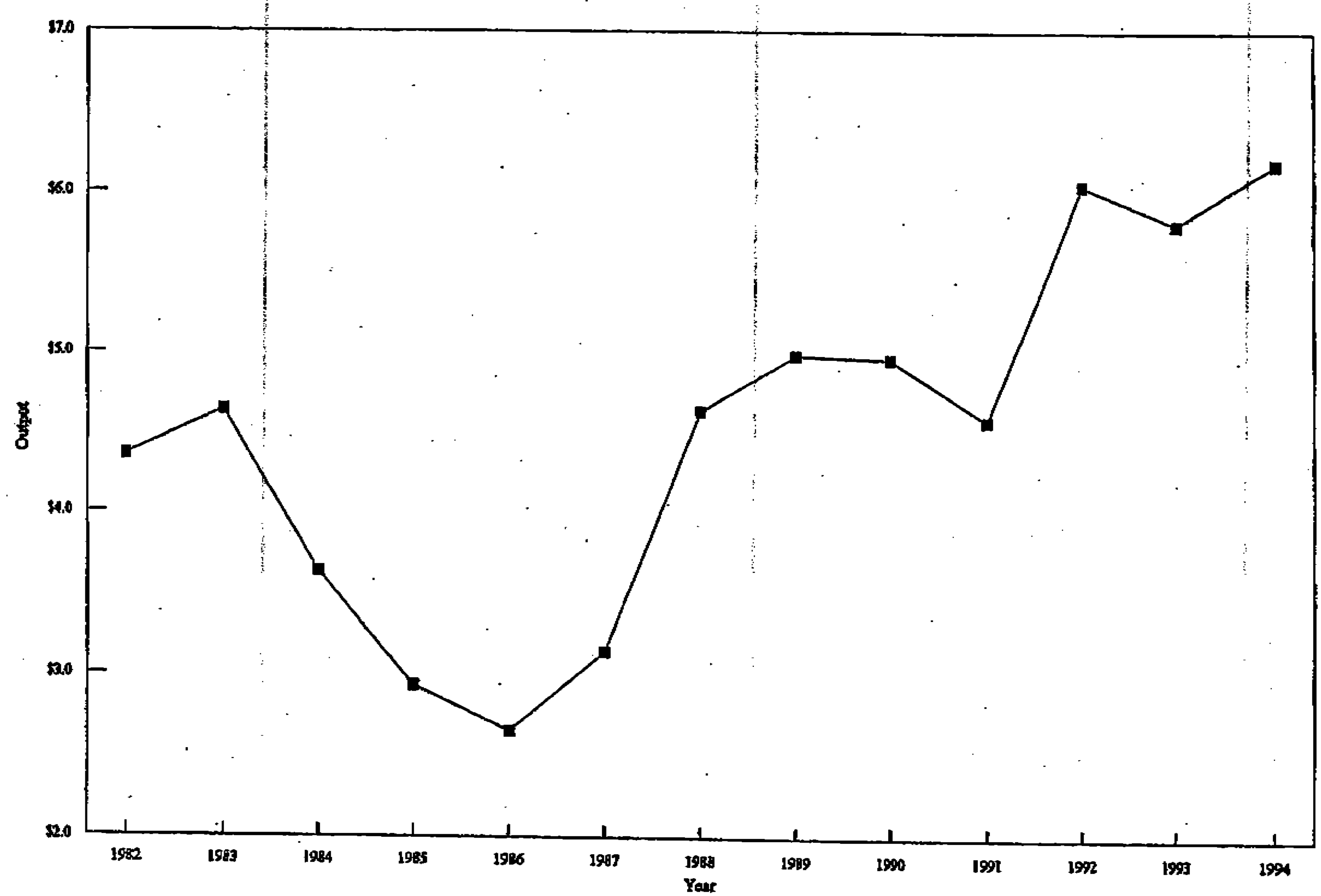
Primary zinc smelting and primary lead smelting are included in SIC code 3339: Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum. It should be noted that this SIC code includes the manufacture of numerous other items which could affect the data. Figure 10 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1983 and 1989, while there are industry troughs in 1986 and 1993. This suggests a six year cycle peak to peak and a seven year cycle trough to trough.

Secondary Metal Production

Secondary metal production is included in SIC code 3341: Secondary Smelting and Refining of Nonferrous Metals. Figure 11 presents the annual GPO of this four-digit SIC code. There are industry peaks in 1984 and 1988, while there are industry troughs in 1986 and 1993. This suggests a four year cycle peak to peak and a seven year cycle trough to trough.

Figure 8

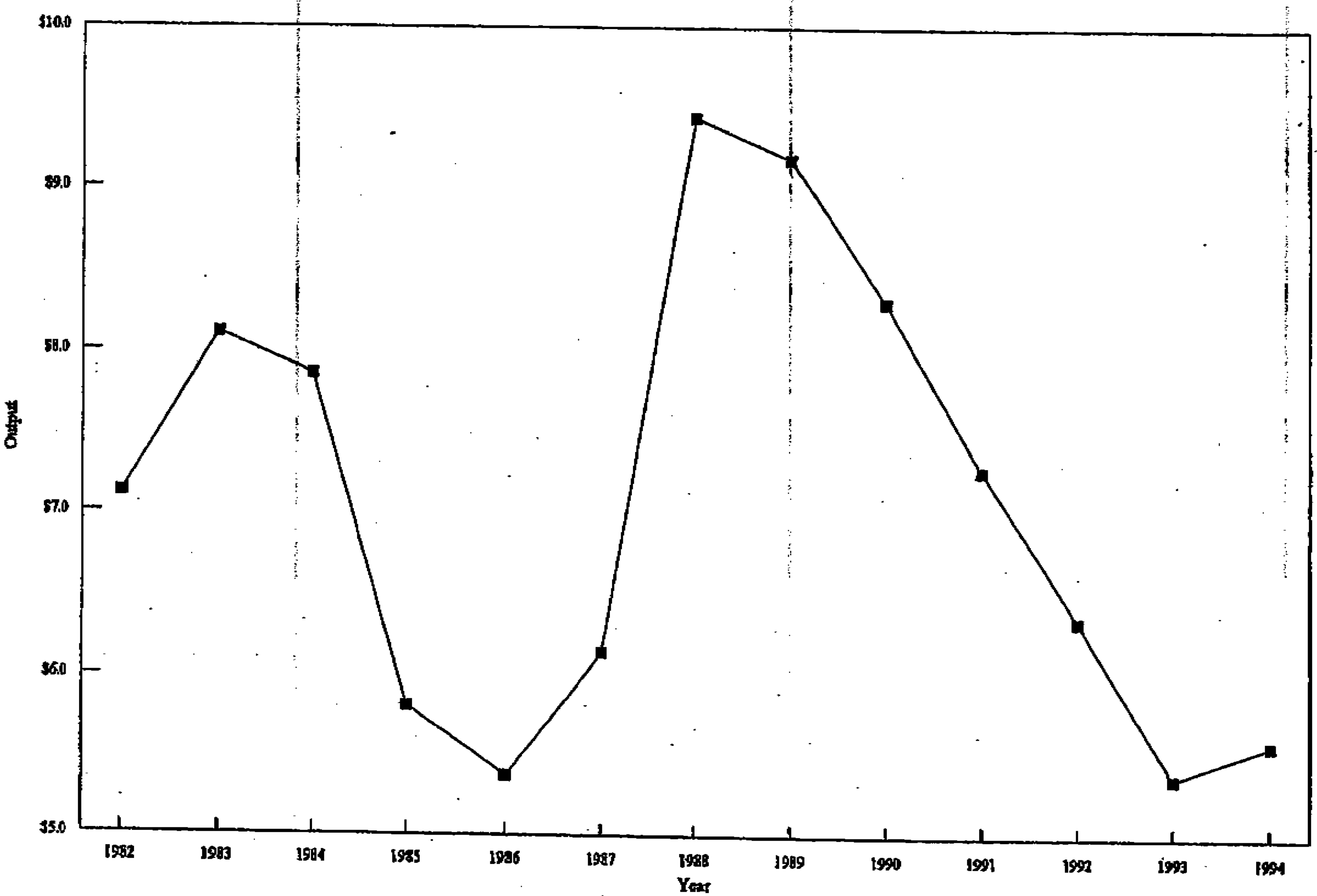
Annual Output, 1982-1994: Primary Smelting and Refining of Copper (SIC Code 3331)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Figure 9

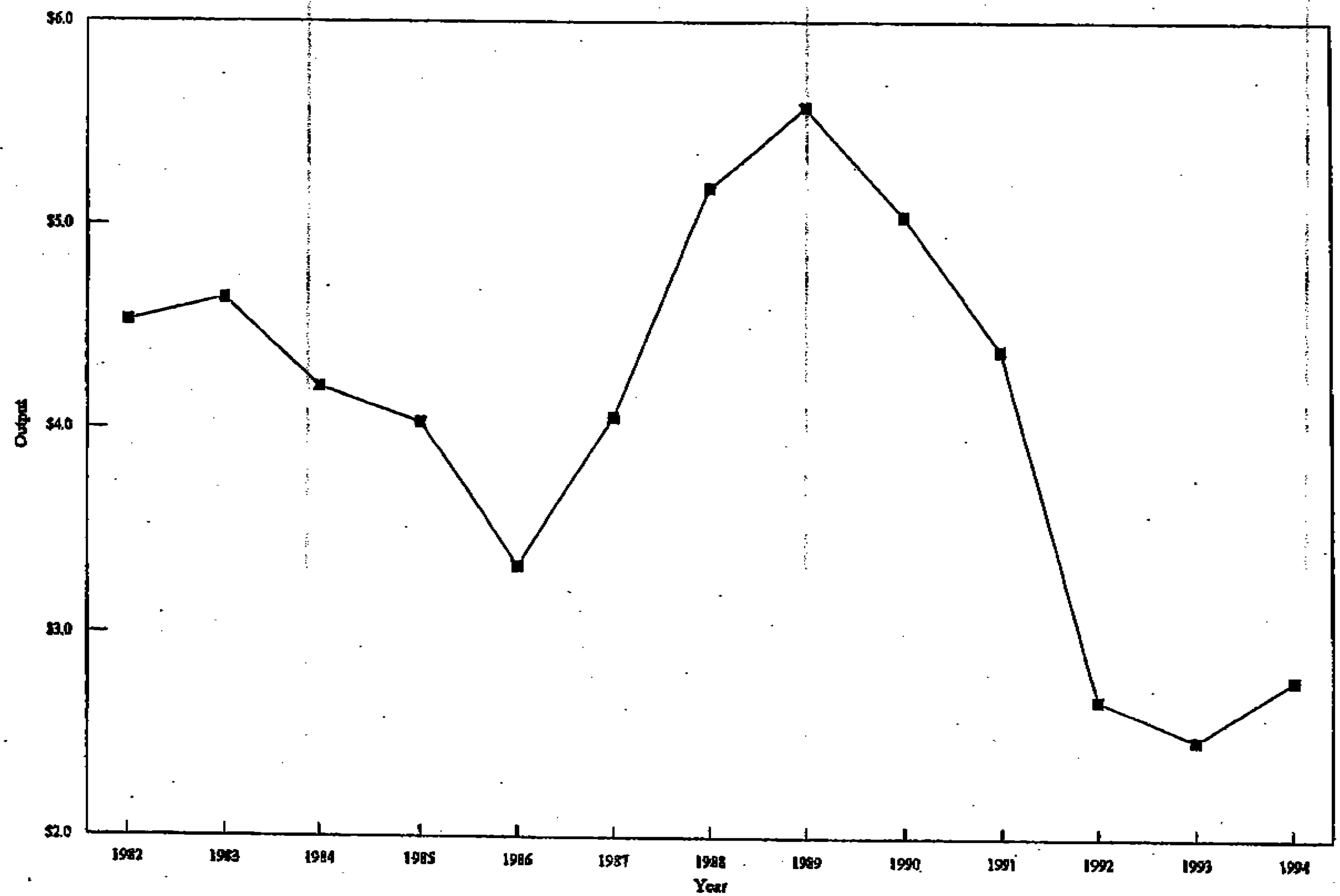
Annual Output, 1982-1994: Primary Production of Aluminum (SIC Code 3334)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Figure 10

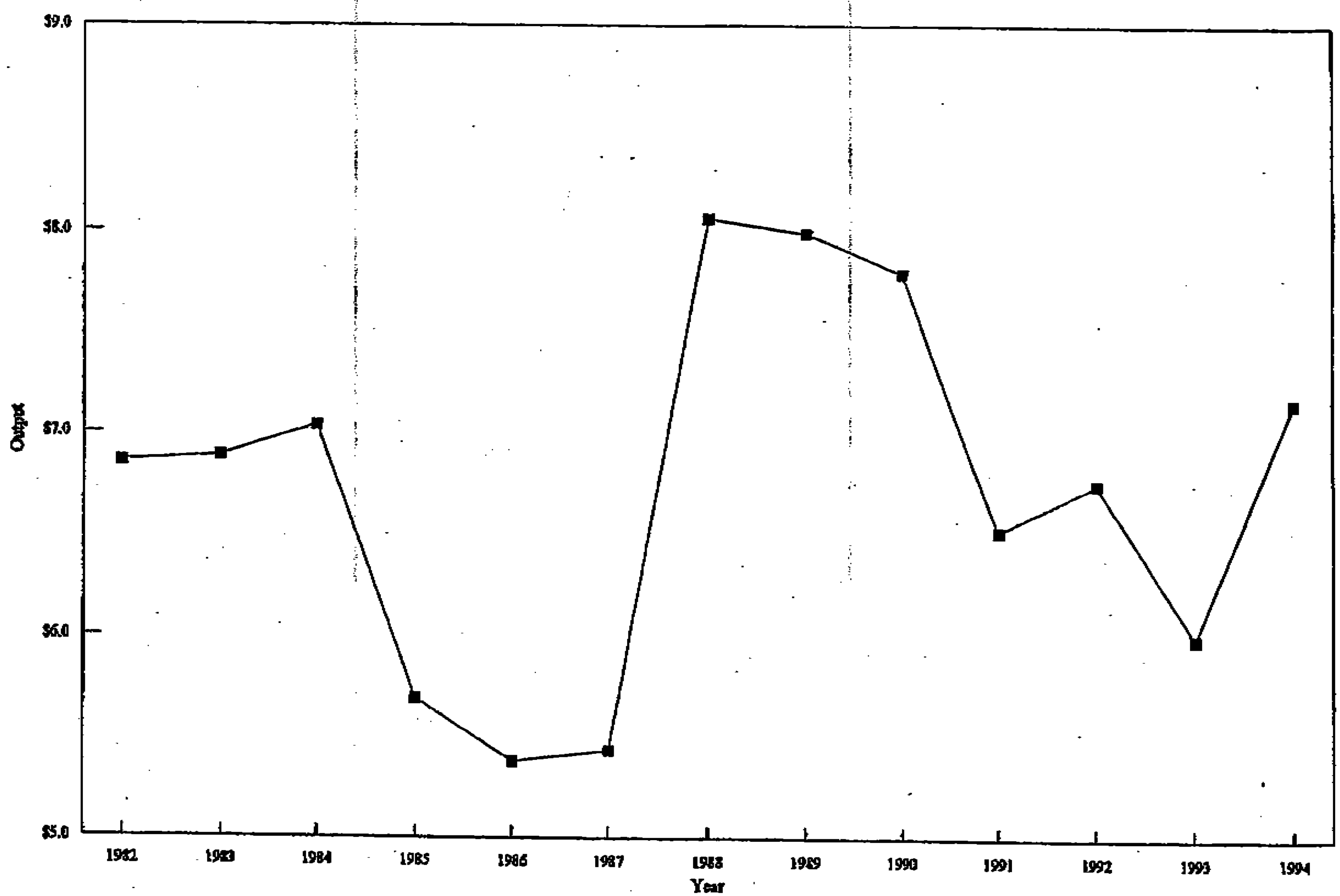
Annual Output, 1982-1994: Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum (SIC Code 3339)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

Figure 11

Annual Output, 1982-1994: Secondary Smelting and Refining of Nonferrous Metals (SIC Code 3341)
Billions of 1994 Dollars



Source: U.S. Department of Commerce, Bureau of Economic Analysis website at http://www.stat-usa.gov/BEN/bea2/national/scbio.html/ves.exe on September 23, 1997.

III. Conclusions

As can be seen in the nine industries analyzed here, business cycles differ markedly by industry. Even in industries in which multiple business cycles were identified, the business cycles were not of the same duration. Peak to peak cycles ranged from three to six years, while trough to trough cycles ranged from three to eight years.

At the national level, an entire business cycle cannot even be identified between 1982 and 1994. The most recent national cycles (determined by the National Bureau of Economic Research and widely used for business cycle analysis) are from July 1981 to July 1990 peak to peak (nine years) and from November 1982 to March 1991 trough to trough (over 8 years) (Slater, 1996). However, it should be noted that the period from November 1982 to July 1990 represents the longest peacetime expansion in U.S. history.

Industry business cycles of five years or more are sufficiently frequent that a five year period would probably be insufficient to provide reasonable certainty that industry fluctuations had been captured. Since the longest business cycle identified among these industries was eight years, a minimum of ten years of data is recommended to capture an entire industry cycle.

IV. References

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APPENDIX G

ANALYSIS OF ACTUAL-TO-PROJECTED-ACTUAL TEST AS COMPARED TO ACTUAL-TO-POTENTIAL TEST

Adoption of Actual-to-Projected-Actual-Test
Characterization of Environmental Impact

I. Introduction

The EPA proposed in 1996, and is now finalizing, a provision in the NSR regulations that provides that a source may project its future actual emissions in determining NSR applicability. Under the current rule, the source must generally compare past actual emissions to future potential emissions, which are the maximum emissions achievable under the source's physical and operational design, adjusted for any permit limitations. Typically sources operate below their potential, so an actual-to-potential test can trigger NSR even if actual emissions do not increase as a result of the change. For reasons explained in the final rule, the EPA believes the more appropriate applicability test is to compare past actual emissions before the change to projected actual emissions after the change. The details of this provision are described in more detail in the final rule. This analysis characterizes the expected changes in emissions benefits that could result from the rule change.

II. Methodology

The starting point of any analysis of the actual-to-projected-actual test must begin from a basic point: that typically whenever actual emissions significantly increase as a result of changes at a source, they will trigger NSR. It is important to note this at the outset; nothing in the actual-to-projected-actual test will lead to real emissions increases from new sources and modifications escaping review. However, because the baseline against which the environmental effects of NSR improvement are being measured is the current policy baseline of an actual-to-potential test, two additional considerations must be brought to light. On the one hand, as explained below, the current actual-to-potential methodology discourages certain environmentally beneficial changes and actually provides an incentive to keep actual emissions high; EPA expects that there will be environmental benefits that result from switching to the actual-to-projected-actual test. On the other hand, there are likely to be cases where, as described below, hypothetical emissions increases or increases that are not attributable to a change may trigger NSR under the actual-to-potential test but not under the projected actual test.

In order to determine the environmental impact of this provision, we first examine the potential environmental benefits that could result from an actual-to-projected-actual test. Then we examine whether adverse environmental impact could occur from sources who may trigger NSR under the actual-to-potential test, but not the actual-to-projected-actual test. In doing so, we first assess the scope of sources likely to be affected by the rule change. As discussed below, affected sources comprise a very small subset of the overall NSR universe. Then we examine which of these sources, if any, would avoid installation of controls under NSR as a result of the change.

III. Results

Many commenters who have addressed NSR over the last 10 years have presented evidence of planned projects that would have decreased actual emissions but would have triggered NSR because of the actual-to-potential test. NSR can be triggered under the actual-to-potential test virtually any time a source is currently operating below capacity and makes a physical change or change in its method of operation. When this happens, current actual emissions are generally well below the maximum potential emissions at the source, and the comparison of actual-to-potential emissions is greater than the NSR significance level (*i.e.*, the increase is not an actual increase, it is a hypothetical one). Sources in such a situation are faced with the choice of a potentially time-consuming and expensive NSR process, or accepting a permit limit that imposes operational restrictions on the source (*e.g.*, capping production at its current level). Sometimes the cost of either of these options is so high that the project is simply cancelled.

As just noted, this circumstance results virtually any time a source is currently operating below capacity. Even if the project is expected to reduce actual emissions, it is likely to trigger NSR under the actual-to-potential test, because even a *reduced* emissions rate looks like an *increase* if the source is assumed to operate at its full capacity, using worst case assumptions, after it makes the change. Therefore, unless the source is able to restrict its operations (*i.e.*, by taking a permit limiting its production/fuel use, its emissions, or both) it is likely to cancel an emissions reduction project rather than go through NSR, and the emissions reduction benefit would be lost.[1]

One recent example raised by commenters[2] concerned the installation of a heat exchanger on a boiler flue gas stream. The heat exchanger would use the hot flue gas to preheat water for later use, meaning less fuel would need to be consumed to heat that water. Currently, without the heat exchanger, the heat in the flue gas is just wasted. The reduced fuel consumption, estimated to be about a 7.6 percent reduction, would result in decreased boiler emissions projected to be about 5 tpy of NO_x, 4 tpy of CO, and lesser amounts of SO_2, particulate matter, and VOC.[3] However because the boiler has permitted (potential) emissions much higher than current actuals, the change would trigger NSR, which would introduce delays and control

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[1]The Pollution Control Project Exclusion allows for an NSR exemption for some kinds of environmentally beneficial projects, but the range of projects that may decrease actual emissions is generally broader than the range of projects that would qualify under the Pollution Control Project Exclusion.

[2]See *e.g.*, comments of NEDA/CARP, docket A-2001-19, comment number II-D-272.

[3]It is also important to recognize that the source realizes economic benefits from this change due to improved efficiency and decreased fuel expenses. Ultimately the source reported that the project resulted in fuel savings of $800,000 per year.

requirements that make the project cost-prohibitive. To avoid NSR, the source could agree to lower these permitted emissions to actual levels, but this is also cost-prohibitive, because in order to do so, it determined that would have to surrender its ability, currently authorized by the permit, to use oil as a backup fuel. Because neither the NSR option nor the permit allowable option was viable, the project was in jeopardy of being cancelled altogether.

A similar example[4] concerns an auto assembly plant who wanted to make physical changes that would increase production capability by two units per hour. By doing this, it could meet demand by operating just one shift each day instead of two. Again, the change would actually result in a decrease in reduced fuel consumption, estimated at 30 percent, and an attendant decrease in air-emissions.[5] However, the physical changes to the line would trigger NSR because of the actual-to-potential test because even though the facility intends to operate only one shift per day, it has the potential to operate two, and is permitted to do so by its air permit. By triggering NSR, the facility projects 12 months to get its NSR permit, and projects significant investment in add-on controls (at a time when demand is low). The alternative, taking operational limits, would require capping emissions at levels that are well below the full two-shift capacity, meaning that the source could no longer operate at permitted capacity, either now, or later when demand improves (unless it goes through NSR to raise its limit). Because of the undesirable outcome resulting from NSR application, the facility did not increase its line speed, and the fuel savings and emissions reductions were not realized.

In addition to the barriers to environmentally beneficial projects imposed by the actual-to-potential test, this test also creates an incentive to keep emissions higher than a source otherwise would, all other things being equal. If a source lowers its emissions, it is increasing the difference between its actual emissions and its potential (*i.e.*, allowable) emissions, which only increases the likelihood that a physical change will trigger NSR under the actual-to-potential test. Conversely, if it maintains actual emissions close to potential (*i.e.*, allowable) levels, it may be able to avoid NSR if the difference between the two is below the significance levels. As an example, during consideration of the heat exchanger project described above, the source in question had the option to switch from natural gas to fuel oil under its permit without triggering NSR. Had this happened, the actual emissions increases would have been 45 tons/year of NO_x, 23 tons/year of SO_2 and 3 tons/year of PM. Although, in the EPA's judgment, the aggregate emissions consequences from this incentive are less than those from the barriers to projects that reduce actual emissions, they can be well in excess of NSR significance levels in some individual cases.

There are also cases where the actual-to-potential test could trigger NSR for changes that do not affect actual emissions, or that only increase it by an amount that is below NSR significance levels. These projects may be intended to improve efficiency or cut costs. The

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[4]See *e.g.*, comments of NEDA/CARP, docket A-2001-19, comment number II-D-272.

[5]The cost savings from reduced natural gas usage would be more than $2 million annually. The cost savings from reduced electrical consumption would be $700,000 annually.

same industry concerns apply for the actual-to-potential test in these cases: NSR may be triggered under the actual-to-potential test, and the costs or delays of NSR result in project cancellation. Because these changes do not significantly affect actual emissions, they are not discussed further in this analysis. However, it is important to note that, although the change in actual emissions is negligible, the loss of economic benefits is potentially significant. Nonetheless, because the focus of this analysis is on environmental impacts, further discussion of these non-environmental benefits is beyond the scope of this analysis.

Thus, it is clear that environmental benefits are lost under the actual-to-potential test that may be realized under the actual-to-projected actual test. Although there is evidence of the existence of such benefits, it is not possible to synthesize this evidence into a national estimate of the volume of these types of changes and the associated emissions reduction benefits.

While the actual-to-projected-actual test would likely result in emissions benefits (compared to the actual-to-potential test) by removing barriers to projects that reduce emissions, it might also lead to a loss in benefits that occur when hypothetical increases are regulated under NSR. In an effort to understand these benefits qualitatively, we isolate the instances in which they are likely to arise. There are a number of instances where we believe that the change to an actual-to-projected-actual test will result in no change in NSR applicability. These include:

I. *New units*. New units must continue to base post-change emissions on potential-to emit.

II. *Electric utility steam generating units.* As promulgated in the WEPCO rule, these units may already base post-change emissions on a projection of future actual emissions.

III. *Any unit that actually increases emissions as a result of a change.* As noted at the outset of this analysis, whenever a unit will actually increase emissions as a result of a change, it will be covered by NSR under either test.

Thus the only instances where sources could be affected by the change to an actual-to-projected-actual test are existing, non-WEPCO units which are making changes that are *not* projected to result in actual emissions increases, but would show an increase using the actual-to-potential methodology. Setting aside policy questions about whether it is appropriate for these changes to be covered by NSR – questions which are addressed extensively in the record supporting the final rule – this analysis attempts to further assess what effect the change in emissions test has for this subset of NSR changes.

In order to make this assessment, we split the remaining case into the two different results that can occur. The first result is that when an actual-to-potential test shows an increase, the source does not go through NSR, but instead agrees to a permit limit to restrict its operations in some fashion so that the allowable emissions after the change are no more than the actual emissions before the change (plus the significance level). The two most common kinds of agreements are (1) limitations on throughput, hours of operation, fuel use, etc., and (2) installation of a pollution control device. Under the actual-to-projected-actual test, sources would no longer need to obtain these permit limits. However, they would still need to effectively limit their emissions in essentially the same fashion, and would still need to track these emissions to assure that an emissions increase has not resulted. In other words, a source facing NSR because of the actual-to-potential test, but not planning to actually increase its emissions, can, under the current rule, agree to a permit limitation on throughput, for example, to assure that its actual emissions do not increase after the change. Under the NSR Improvement rule, this source would not need to agree to the permit limitation, but would still need to effectively adhere to its projection that actual emissions do not increase after the change. Likewise, the source could, under the current rule, take an enforceable permit limitation requiring the source to operate a control device after the change in order to assure that its actual emissions do not increase. Under the NSR Improvement rule, this source would not need to take the permit limitation, but would still have to operate the control device to make good on its projection[6]. Thus, the same kinds of actions the source would be required to take under the current system of accepting permit limitations would still be taken by the source under the actual-to-projected-actual test. The EPA does not have data on the individual actions sources take to obtain and comply with existing minor source permit limits, or the environmental benefit of such actions. However, for reasons just described, we expect that there would be no significant change in the real environmental results of such actions. At the same time, we expect significant administrative savings from the reduced permitting load as fewer sources request permit limits to avoid NSR.

The second result is that when the actual-to-potential test shows an increase, but an actual increase is not projected, the source cannot take a cap, and instead goes through NSR. This could be the case, for example, when a source is anticipating an increase in utilization that is coincident with a potential NSR-triggering change[7] and is therefore unwilling to cap production at current levels. Based upon EPA judgment, this is an extremely rare case, and we are unaware of examples of this. Typically, the costs and delays of NSR are so great that sources facing this situation will generally defer making the change. Note that the source can generally increase its utilization, and its emissions, within permit limits as long as it does not make a physical or operational change, and will do so, deferring the physical change as long as it can, then capping emissions at the new higher utilization level to avoid NSR. Alternatively, the source could show that the emissions increase is unrelated to the change, in which case it could avoid NSR altogether under the current rule. Therefore, we believe that there are few or no sources now

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[6]Indeed, the main practical difference is that the permit limits last indefinitely, while the projection need only be maintained for 5 years, or 10 years for certain changes. For reasons explained in the rule, this practical difference does not result in any increased likelihood that changes that result in actual emissions increases will escape NSR requirements.

[7]Remember that if the increase in utilization is related to the change, it will be covered under NSR Improvement, just as it is under the current rule.

going through full NSR who would escape review because of the change to the actual-to-projected-actual test.[8]

IV. Conclusions

The EPA has determined that there will be environmental benefits that result from switching to the actual-to-projected-actual test, but it is very difficult to model the behavior of individual sources in sufficient detail to quantify these benefits nationally. On the other hand, there are likely to be cases where hypothetical emissions increases could trigger NSR under the actual-to-potential test but not under the projected actual test. The EPA has determined that, under the current rule, these changes virtually always take permit limits to avoid NSR. In such cases, the rule is environmentally neutral. While the actual-to-projected-actual test would reduce the number of sources who would need to take permit limits, we find that the environmental benefit of these permit limits is effectively preserved because any source projecting no actual increase must stay within that projection or face NSR.

For these reasons, we believe that the environmental impacts of the switch to the actual-to-projected actual test are likely to be environmentally beneficial. However, as with the change to the baseline, we believe the vast majority of sources, including new sources, new units, electric utility steam generating units, and units that actually increase emissions as a result of a change, will be unaffected by this change. Thus, the overall impacts of the NSR changes are likely to be very small.

[8]In order to definitively prove that no cases exist, we would need to be able to review each major modification to an existing unit, ascertain the source's business plans regarding capacity utilization, and determine that they could have not been carried out absent the modification in question. For reasons described elsewhere in this report, such an analysis is impossible. However, it is EPA's judgment that the number of such cases is trivial or zero.