United States Environmental Protection Agency

**EPA**

Office of Air and Radiation
Office of Air Quality Planning and Standards
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# REGULATORY IMPACT ANALYSIS FOR THE ESTABLISHMENT OF A DEFINITION OF ROUTINE MAINTENANCE, REPAIR AND REPLACEMENT FOR THE NEW SOURCE REVIEW PROGRAM

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## Executive Summary

Currently, the EPA interprets and applies its major New Source Review (NSR) exclusion for sources performing routine maintenance, repair and replacement (RMR&R) on a case-by-case basis. This rulemaking provides a formal definition of what constitutes RMR&R and describes two approaches through which sources of pollution may perform routine maintenance, repair and replacement activities without triggering major source NSR permit determinations and applications. These approaches establish a maximum cost "allowance" for exempted maintenance and repair activities; with one approach using a case-by-case basis and the other using a unit-wide aggregate cost basis.

While this analysis discusses two alternative approaches, the Agency is proposing a single RMR&R approach that combines elements of both alternatives. However, the exact nature of that combined approach has not been fully defined at this time. Consequently, the Agency had to make an important limiting assumption with regard to this analysis by assuming the two approaches are mutually exclusive and that one or the other of the approaches - but not both - will be present in the final rule. Furthermore, in considering each alternative separately, the conclusions of the analysis cannot be considered to be upper or lower bounds on the benefits or costs that may accrue to affected entities because the Agency will select the best of both alternatives when designing its hybrid program and, therefore, believes the sum will be greater than its parts, expanding benefits beyond either program individually and reducing costs below those reported for either alternative.

The activity cost test will be designed to work like the test used for New Source Performance Standards (NSPS). This new definition of RMR&R activities will exempt participating sources from costly and unnecessary major NSR determinations and permits for RMR&R-related activities and provide greater levels of certainty to industry when making permitting-related decisions. The new definition also limits the applicability of the current case-by-case determination approach for potentially major NSR actions.

Sources incur the most annual cost (about $1.3 million for all affected sources) under the proposed new RMR&R definition, but that cost is an artifact of the large number of sources affected, because sources also incur the lowest per-entity cost each year (about $900). Reviewing Authorities (RAs) will have the second lowest cost per entity ($5 thousand), and the Federal government will incur the highest cost per year at over $100 thousand. For RAs and the Federal government, these are costs in addition to those reported in the current Information Collection Request (ICR), but for sources, the reported cost is to a large (and presently unmeasurable) extent, the same burden for the same activities under the current system, with no more than perhaps five or ten percent of the total burden and cost being new. Tables E-1 displays the results of this ICR for all respondents.

This rulemaking provides opportunities for industry to improve its responsiveness to changing economic conditions while performing critical

repair, replacement and maintenance activities. These improvements derive from the RMR&R program's primary goals - the reduction of uncertainty and regulatory delay related to the performance of such activities. While valuable, the decrease in uncertainty and regulatory delay are not quantifiable in the traditional sense. Instead, the Agency's assertion that its proposed definition of RMR&R provides regulatory relief depends on a simple concept, the Le Chetalier Principle in its economic application: reducing the restrictions on industry decreases costs. Consequently, while the measurable portion of the proposed RMR&R definition displays increases in burden and cost, the program *in toto* should be beneficial.

The Agency believes that the benefits from the RMR&R program outweigh the cost of that program, whether the Agency can quantify that net benefit or not. Under this assertion, "costs" and "benefits" include economic elements other than monetary measures. Consequently, the Administrator asserts that the components of the major source permit exemption process is beneficial to sources.

**Table E-1 Bottom Line Effects for All Respondents**

| Entity / Activity | Number of Respondents | Hours per Year per Respondent | Total Annual Hours (All Respondents) | Annual Cost per Respondent [1] | Total Annual Cost (All Respondent)[1] |
|---|---|---|---|---|---|
| Process Units (Sources) | 1,450 | 12 | 17,400 | $900 | $1,305,000 |
| Permitting Authorities | 112 | 140 | 15,680 | $5,180 | $580,160 |
| US Environmental Protection Agency | 1 | 23 | 2,906 | $851 | $107,522 |
| Total Expected Cost | | | | | $1,992,682 |

1 All costs are in 2002 dollars

# 1 Introduction

## 1.1 Purpose

The purpose of this document is to provide information on the potential costs and benefits of the proposed modifications to the NSR routine maintenance, repair and replacement program. EPA has a long record supporting the need for NSR improvement, and, consistent with standard rulemaking processes, fully explains the legal and policy basis for its actions in the public record. EPA's 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.

New Source Review is one of many programs created by the Clean Air Act to control or reduce emissions of criteria air pollutants 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 NOx "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 that are independent of the NSR Improvements rule.

While the programs discussed above play the dominant role in reducing emissions of air pollution, the NSR program assures that when the construction of new sources of pollution or modifications at existing sources occur, the emissions that result from that construction or modification are well-controlled and are permitted consistent with these programs.

This document supports the Agency's requirements under the various Acts and Executive Orders governing the analysis of regulations, including (but not limited to) the requirements discussed below in section 2 of this analysis with regards to determining the regulatory burden associated with the proposed change to the preconstruction permitting program to provide a clear category of activities that will be considered routine maintenance, repair, and replacement under the New Source Review (NSR) program.

## 1.2 Introduction

Currently, the Agency interprets and applies its major New Source Review (NSR) exclusion for sources performing routine maintenance, repair and replacement (RMR&R) on a case-by-case basis. This rulemaking provides a formal definition of what constitutes RMR&R and describes two alternatives through which sources of pollution may participate: an annual

maintenance cost process that establishes an upper limit or "allowance" for exempted maintenance and repair activities, and a second process that identifies major source NSR projects on a case-by-case basis, employing a project cost test similar to that used for New Source Performance Standards (NSPS). These programs would exempt participating sources from costly and unnecessary major NSR determinations and permits for RMR&R-related activities and provide greater levels of certainty to industry when making permitting-related decisions. These alternative rulemaking options also limit the applicability of the previous case-by-case approach to determining which activities at a source constitute or do not constitute a major NSR action.

This paper presents an overview of the impacts of the proposed definition of routine maintenance, repair, and replacement (RMR&R) within the framework of the NSR preconstruction permit program. To perform this analysis, the Agency relied heavily upon existing reports on file for various aspects of the major NSR program, including the June 2002 NSR Report to the President,[1] the NSR 90-Day Review Background Paper,[2] the current major NSR Information Collection Request (ICR),[3] the ICRs submitted in May and June for revisions to the NSR applicability requirements and the proposed RMR&R program,[4, 5] and their associated Federal Register notices and other public announcements.

## 1.3 The Current NSR Program

The NSR program is a combination of air quality planning and air pollution control technology program requirements for new and modified stationary sources of air pollution. Section 109 of the Clean Air Act Amendments of 1990 (CAAA) requires EPA to promulgate primary National Ambient Air Quality Standards (NAAQS) to protect public

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1 U.S. EPA, 2002, "New Source Review: Report To the President," http://www.epa.gov/air/nsr-review/background.html

2 U.S. EPA, 2001, "NSR 90-Day Review Background Paper," Docket A-2001-19, Document Number II-A-01, http://www.epa.gov/air/nsr-review/background.html

3 U.S. EPA, 2001, "Information Collection Request for 40 CFR Part 51 and 52 Prevention of Significant Deterioration and Nonattainment New Source Review," OMB Control Number 2060-0003; EPA Form Number 1230.09.

4 U.S. EPA, 2002, "Information Collection Request for Changes to the 40 CFR Parts 51 and 52 PSD and NSR Applicability Requirements for Modifications to Existing Sources," EPA Form Number 2074.01.

5 U.S. EPA, 2002, "Information Collection Request for the Establishment of a Definition of Routine Maintenance, Repair and Replacement for the New Source Review Program," EPA Form Number 1713.04.

health and secondary NAAQS to protect public welfare. Once EPA has set these standards, states must develop a State Implementation Plan (SIP) which contains emission limitations and other control measures to attain and maintain the NAAQS and to meet the other requirements of section 110(a) of the Act. The state's NSR program is a part of that SIP.

The program commonly called the "major NSR" derives its authority from parts C and D of Title I of the Act and is a preconstruction review and permitting program applicable to new or modified major stationary sources of air pollutants. In areas not meeting the NAAQS and in the ozone transport regions (OTR), the program is the "nonattainment" NSR program, implemented under the requirements of part D of title I of the Act. In attainment areas (areas meeting NAAQS) or in areas where there is insufficient information to determine whether they meet the NAAQS ("unclassifiable" areas), the Agency implements major NSR as the Prevention of Significant Deterioration (PSD) program under the requirements of part C of Title I of the Act. Applicability of the major NSR program must be determined in advance of construction and is pollutant-specific. When a source triggers major NSR in attainment areas, it must install best available control technology (BACT) and conduct modeling and monitoring as necessary. If the source is located in a nonattainment area, it must install technology that meets the lowest achievable emission rate (LAER), secure emission reductions to offset any increases above baseline emission levels, and perform other analysis.

One key attribute of the major NSR program in general is that sources with major modifications may "net" out of review by coupling the proposed emissions increases at the source with contemporaneous emissions reductions. In other words, a source can modify, or even completely replace, or add, emissions units without obtaining a major NSR permit as long as its "actual emissions" do not increase over baseline levels at the plant as a whole by a significant amount.

Existing regulations define baseline actual emissions as "the average rate, in tpy, at which the unit actually emitted the pollutant during a 2-year period which precedes the particular date and which is representative of normal source operation." The permitting authorities will ordinarily allow use of a different time period "upon a determination that it is more representative of normal source operation." States have historically used the 2 years immediately preceding the proposed change to establish the baseline. However, in some cases the Agency has allowed use of an earlier period.

EPA defines a "net emissions increase" as the increase in "actual emissions" from the particular physical or operational change (taking into

account the use of emissions control technology and restrictions on hours of operation or rates of production where such controls and restrictions are federally enforceable), together with the source's other contemporaneous increases or decreases in actual emissions.

Each source seeking an NSR permit must predict whether or not the proposed change will result in a significant net increase in the source's actual emissions. Currently, when a source unit (other than an electric utility steam generating unit)[6] "has not begun normal operations," that unit's post-change actual emissions are equal the units Potential To Emit (PTE). This is referred to as the "actual-to-potential" test. Sources may avoid this presumption by agreeing to limit the unit's PTE through the use of practically enforceable restrictions. The net result of this process lets sources ensure no increase in their actual emissions above baseline levels following the change.

## 1.4 Elements of New Source Review Reform

In response to comments, discussions, and recommendations from the public and stakeholders, the EPA is revising regulations governing numerous provisions of the major NSR program. These revisions include:.[7, 8]

- a new method for determining baseline emissions,
- a new actual-to-projected-actual determination for whether a major modification will occur,
- a new applicability provisions for emission units designated as Clean Units or that participate in pollution control projects (PCPs),
- changes to let major stationary sources manage facility wide air emissions through a Plant-wide Applicability Limit (PAL) without requiring a preconstruction major NSR permit
- a rule section that directs how a major modification is determined under the various new major NSR applicability options (baseline emissions, actual-to-projected-actual methodology, PALs, and Clean Units) and clarifies where to find the provisions in the revised rules, and
- codifying EPA policy: that determining whether a major modification has occurred is a two-step process involving an assessment of

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6 The regulations define electric utility steam generating units (EUSGUs), which have special rules for physical and operational changes that employ an actual-to-projected-actual methodology for all changes (but not replacement) at an existing electric utility steam generating units.

7 These provisions also let States make similar changes in their major NSR programs.

8 This analysis uses the terms "process unit" and "source" as synonyms for the same entity.

whether:(1) a significant emissions increase of a regulated pollutant occurred from a combination of one or more emissions units following the physical or operational change; and (2) a significant net emissions increase of that pollutant occurred from the major stationary source over the contemporaneous period.

Further efforts are also under way at this time to develop a formal definition of what constitutes RMR&R and describe a program through which sources of pollution may voluntarily participate and potentially avoid costly and unnecessary major NSR determinations and permits, based upon the reasonableness of the projects undertaken and offering relief from the regulatory uncertainty associated with permit-related decisions.

## 1.5 RMR&R - Background

The modification provisions of the NSR program in parts C and D are based on the definition in section 111(a)(4) of the Act:

> ". . . ['modification' means] . . . any physical change in, or change in the method of operation of, a stationary source which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted."

That definition involves a two-step test for determining whether source activities constitute a modification subject to major NSR requirements: the source determines whether a physical or operational change will occur and then determines whether the change will result in (1) a significant emissions increase of a regulated pollutant from a combination of one or more emissions units following the physical or operational change; and (2) a significant net emissions increase of that pollutant from the major stationary source over the contemporaneous period.

The Agency, industry, and environmental groups have debated for years as to the types of projects or activities that qualify as RMR&R. The reference to "any physical change . . . or change in the method of operation" could mean that even the repair or replacement of a single leaky pipe could meet the requirements for a major NSR modification. However, the EPA has previously adopted several exclusions from the "physical or operational change" component of the definition to recognize that routine maintenance, repair and replacement (RMR&R), and changes in hours of operation or in the production rate are not by themselves considered a physical change or change in the method of operation within the definition of major modification. The Agency also limited the scope of the second step of the statutory definition of modification by excluding all changes that do not result in an emissions increase at a major source above a "significant" level. Taken together, these regulatory limitations restrict

the application of the major NSR program to only "major modifications" at existing major stationary sources. Currently, the RMR&R exclusion is interpreted and applied on a case-by-case basis. The current process still "imposes significant burdens on the utility practices necessary to maintain the safety, availability, efficiency and reliability of the electricity supply at existing sources. . .[and] the current NSR program has actively discouraged efficiency improvement projects . . ."[9] [10] For example, the 2001 NSR 90-Day Report cites the following anecdotal evidence:

> ". . .past blade maintenance and replacement of only the deteriorated blades at Detroit Edison has never increased efficiency over the original design. Yet because [blade upgrade] would result in substantially improved efficiency compared to the original design, EPA considered it a physical change under its NSR regulations, and [therefore] subject to NSR. . ." [11]

Another major problem inherent in the current major NSR system is regulatory delay. Since 1997, the average time needed to obtain a major NSR or PSD permit, across all industries, is about seven months. [12] The average time needed to make a maintenance-related NSR determination is between thirty and sixty days. The National Petroleum Council reported in June 2000 that the lengthy process for obtaining permits can limit a refinery's ability to respond quickly to changing market conditions, offering the following list of average regulatory delays, based upon surveys of its members:

- 3-6 months to prepare a permit application
- 1-3 months for the permitting authority to deem the application complete
- 3-6 months for the development and negotiation of a draft permit
- An unstated period for public notice and the opportunity to receive public comments on the draft permit
- An unstated period of time for the permitting authority to respond to public comments and take final action on the permit [13]

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9 U.S. EPA 2002, "New Source Review: Report To the President," p 8.

10 The discussion applies equally to industrial sources.

11 U.S. EPA, 2001, "NSR 90-Day Review Background Paper," p 28.

12 Ibid. p 7.

13 Ibid. p 44.

Note that these examples do not address only routine maintenance. In the Detroit Edison example, they decided against replacing its turbine blades with one with a better design to avoid NSR. But the deliberate improvement of a unit during routine maintenance is an integral part of a plant's operations and the upgrade would have made a significant improvement in energy consumption without affecting the environment. Relying on the results of the NPC survey, the entire process of merely getting approval to make a routine modification would require a minimum of year. Obviously, if such a routine change is warranted in response to changing market conditions, then a year's worth of delay would deeply threaten a company's ability to operate effectively in the market. Clearly, the formalized process through which a source reports its routine activities should not prevent such case-by-case decisions. One of the goals of the proposed new definition for routine maintenance, repair and replacement is to allow for this sort of flexibility.

Under the current case-by-case approach, if a source needed to perform maintenance and repair at some unit, and it is not clear whether that repair is subject to the major NSR process, that source would have to postpone making the repair until an NSR applicability determination could be made. During that lag period, the unrepaired unit would continue to emit above-permitted levels of pollutants (or part of the source's productive capacity would have to be shut down to await the NSR determination). Then, if the determination indicated the activity required major NSR permitting, the source would have to wait once more for its permit to be approved before beginning the repair. In other words, a source may have to wait for up to eighteen months to be able to make a repair because it triggers major NSR permitting.

EPA proposes modifying the RMR&R exemption to explicitly include activities with total costs below an annual maintenance, repair, and replacement allowance for a unit. The annual maintenance, repair, and replacement allowance and the rules for calculation and summation of projects under the allowance would be defined in new provisions at 40 CFR 51.165 (a) (1) (xxvi), 40 CFR 51.166 (b) (38), 40 CFR 52.21 (b) (39), and 40 CFR 52.24 (f) (25). Under EPA's first approach a maintenance, repair, and replacement allowance would be established for each facility for each pre-defined year (typically a calendar year or fiscal year). The costs of projects on which construction commences during the calendar year would be summed across all units regardless of the pollutant it emits from least expensive to most expensive to get a total yearly cost for a unit. Facilities with total RMR&R-related costs below the annual maintenance, repair, and replacement allowance would be considered to have undertake only routine maintenance, repair and replacement activities for those projects in its annual report. When a facility's total

yearly reported cost exceeds the annual maintenance, repair, and replacement allowance, the activities would be reviewed as follows:

- The owner/operator shall subtract projects from the total yearly cost, starting with the most expensive project, until the remainder is less than or equal to the annual maintenance, repair, and replacement allowance.
- Projects that were removed from the total yearly cost would be evaluated according to the 4-step case-by-case basis in accordance with current EPA policy.
- Any removed project found to require major source NSR permitting through the *ex post* case-by-case review would be subject to the requirements of NSR, including any potential enforcement-related requirements from its failure to apply for an NSR permit before beginning the modification.

The Agency would establish the annual maintenance, repair, and replacement allowance equal to the product of the replacement cost of the unit and a specified maintenance percentage established in the proposed rule, where replacement cost is defined as the total capital investment necessary for the complete replacement of the unit, calculated according to the EPA's cost methodology, set out in the EPA Air Pollution Control Cost Manual, (excluding the costs for installing and maintaining pollution control equipment). [14] When a stationary source uses the annual maintenance, repair, and replacement allowance to determine RMR&R activities, all projects must be included in the annual cost calculations.

Under the first approach, facilities must submit an annual report, aggregated across all units at the facility, to the appropriate Permitting Authority (RA) within 60 days of the end of the year over which project costs have been summed. Each report must provide a summary of the estimated replacement value of each unit, the aggregated annual maintenance, repair, and replacement allowance for the facility, a description of all changes made to each unit, and the costs associated with those projects. If the sum of the cost of the projects at a facility exceed the annual maintenance, repair, and replacement allowance for the unit, the outcome of the 4-step case-by-case review of all projects selected in accordance with the steps outlined above must also be included in the unit's report.

Depending on the Agency's decisions in the post-proposal stage, a possible outcome to this rule is that the current interpretation of RMR&R

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14 The EPA Air Pollution Control Cost Manual, 6th Edition, Daniel Mussatti, ed., January 2002, EPA #452-B-02-001, Section 1, Chapter 2.

would be broaden, particularly if we focus on a single factor such as cost. To minimize the chances that the cost of an activity could broaden its interpretation of RMR&R activities, EPA's recommended approach will also contain safeguards to help ensure that projects that should be considered a major modification under the regulations are ineligible for exclusion from NSR under the annual maintenance, repair, and replacement allowance. EPA proposes excluding from use of the annual maintenance, repair, and replacement allowance:

1. **The installation of a new process unit.** The types of activities eligible for an automatic RMR&R exemption should be limited to maintenance of existing equipment at a stationary source in order to ensure continued safe and reliable operation. The addition of new process units that did not previously exist should receive greater scrutiny before a determination of routineness is made.
2. **The replacement of an entire process unit.** The replacement of an entire process unit should be automatically considered routine since a variety of operating parameters could change. Therefore, a wholesale exchange of a process unit should be subject to greater scrutiny under the NSR program.
3. **Any change that would result in an increase in short term emission rates of any regulated pollutant, or in the emission of any regulated pollutant not previously emitted.** Any activity that will result in a higher emission rate or the emission of a new pollutant should not be automatically excluded from the NSR program as these increases may result in a significant net emissions increase or may have a significant impact on the environment.

Concomitant with the proposed annual maintenance, repair, and replacement allowance approach, the Agency developed a second approach to the management of RMR&R activities that focuses on clarifying when the replacement of existing equipment with equipment that serves the same function and that does not alter the basic design parameters of a unit would be considered RMR&R. Under this approach, EPA would establish a percentage (yet to be determined) of the replacement value of an emissions unit (yet to be defined) as a per-project threshold for applying the RMR&R exclusion in a fashion similar to that employed for New Source Performance Standards (NSPS) purposes. This approach would let sources determine more readily what large-scale replacement activities would or would not trigger major NSR permitting. The equipment replacement approach would apply to the replacement of existing equipment with either identical new equipment or with improved, functionally equivalent equipment.

While the annual maintenance provisions described above will improve implementation of the RMR&R exclusion, the allowance applies primarily to lower cost, short turn-around activities. For large scale projects that should qualify for an RMR&R exemption, the current case-by-case approach and the proposed annual maintenance, repair, and replacement allowance approach (first approach, described above) may not provide sufficient relief. The current approach has too much uncertainty with regard to whether or not proposed projects (the same projects that would not meet the annual maintenance, repair, and replacement allowance criteria) constitute RMR&R. Affected sources must choose between proceeding without a permit (with all of the potential liabilities of noncompliance) or seeking an applicability determination, which delays major source NSR project implementation by a minimum of six months. Given such a choice, it is not surprising that the Agency has amassed anecdotal evidence there have been cases in which the uncertainty about the exemption for routine activities has resulted in expensive delays or even the cancellation of beneficial projects. Such regulatory discouragement results in lost productive capacity, as well as lost opportunities to improve energy efficiency and reduce air pollution.

Sources are not the only entities that incur undue costs from such determinations. State and local permitting authorities must devote scarce resources to make complex determinations, consult with other agencies to ensure their determinations are consistent with decisions made for similar circumstances in other jurisdictions (and the EPA), and confer with other regulators to ensure consistency among the RA's conclusions.

## 1.6 Analytical Considerations

While the Agency proposes a single RMR&R approach that combines elements of both alternatives, the exact nature of that combined approach cannot be determined at this time. Consequently, the Agency had to make an important limiting assumption with regard to this analysis by assuming the two approaches are mutually exclusive and that one or the other of the approaches - but not both - will be present in the final rule. Furthermore, in considering each alternative separately, the conclusions of the analysis cannot be considered to be upper or lower bounds on the benefits or costs that may accrue to affected entities because the Agency will select the best of both alternatives when designing its hybrid program and, therefore, believes the sum will be greater than its parts, expanding benefits beyond either program individually and reducing costs below those reported for either alternative.

The results of the EPA's analysis are found below.

# 2 Needs and Consequences

This part of the qualitative analysis summarizes the statutory requirements affecting the development of a Federal NSR program and describes the nature of the problem. The need for regulatory action and the consequences of the regulation in terms of improving the functioning of the market are also discussed.

## 2.1 Nature of the Problem

In the absence of government regulation, market-oriented economic systems typically fail to prevent elevated levels of pollution in the environment because the environment is a public good. More specifically, individual sources treat the assimilative capacity of the environment as a "free good" resource to dispose of unused byproduct emissions. Under these conditions, emitters of pollutants and pollutant precursors do not internalize the cost of damages created by their own emissions. These damages occur to society as a whole, rather than to specific members of society. This is because pollution emissions are non-market goods -- goods not bought or sold in the marketplace -- and the atmosphere carries with it no property rights. The damages of pollution include increased morbidity and mortality; property damage from soiling, staining, and corrosion; and productive loss due to decreased worker efficiency, crop and livestock damage, and increased wear and tear on capital stocks. All of these damages are measurable. In addition, there are damages caused by pollution that are much harder, if not impossible, to quantify. These damages include habitat loss, diminished biodiversity, reductions in aesthetic quality, option values, and existence values.

The divergence between the private cost of production and the social cost of production occur because the source does not bear the full cost of its activities (market costs plus damages). The outcome of the cost divergence is market failure, where as described in this case, the level of output is such that marginal social benefits are not equal to marginal social cost. The result is economic inefficiency, or a mis-allocation of society's resources; the polluting activity (e.g., the release of ozone precursors) occurs at too high a level in comparison to the optimally efficient situation, thus reducing the potential total benefits to society. Regulatory strategies attempt to correct for the divergence between social and private costs. Using regulatory strategies to internalize the negative externality may not, however, result in zero air pollution. Economic efficiency calls for abatement up to the point where additional abatement would cost more than the additional benefits would be worth to society.

In addition to government regulation, other potential mechanisms may be used to correct for the negative externality brought about by air pollution. Negotiations or litigation under tort and common law, in

theory, could result in compensation to persons for the damages that they incur. However, two major obstacles block the correction by the private market for pollution-based inefficiencies and inequities. The first obstacle is high transaction costs when millions of persons are affected by millions of pollution sources. Transaction costs of compensating those adversely affected arise and accumulate because the current and future injury to each individual must be appraised, the injury must be apportioned to each precursor source, and damage suits or negotiations must be conducted. In an unregulated market, each source of precursor emissions and each affected person would have to litigate or negotiate. The transaction costs would be so high as to probably exceed the benefits of reduced air emissions. These obstacles strongly suggest that another mechanism is desirable for solving air pollution problems.

The second obstacle discouraging resolution by the private sector is due to the public good nature of air resource. That is, after emission reductions have been achieved, the benefits of cleaner air can be enjoyed by additional persons at no additional cost. This results in the classic "free rider" problem. Everyone would have an incentive to be the last to contribute resources for litigation or negotiation, thinking that he or she would freely benefit from the efforts of others. While regulatory intervention can mitigate the impacts of the types of market failures discussed above, they generally do not occur without imposing their own costs. Typically, these costs include administration, enforcement, and the redistribution of resources at all levels. However, secondary impacts on social and economic sub-groups of the economy can also be affected in a disproportionate manner. The purpose of this report is to analyze, identify, and mitigate these regulatory costs.

## 2.2 Legislative Requirements

This section describes various legislative and executive requirements that govern the analytical requirements for Federal rulemakings, and describes how each analytical requirement is addressed in this RIA.

### 2.2.1 Executive Order 12866

Executive Order 12866, "Regulatory Planning and Review" (FR, 1993), supercedes Executive Order 12291 "Federal Regulation" of 1981. It requires EPA to provide the Office of Information and Regulatory Affairs of the Office of Management and Budget (OIRA, OMB) with an assessment of the costs and benefits of significant regulatory actions. A "significant regulatory action" is defined as "any regulatory action that is likely to result in a rule that may:

- 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 health or safety, or State, local, or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order" (FR, 1993).

For any such regulatory action, the Agency must provide a statement of the need for the proposed action, must examine alternative approaches, and estimate social benefits and costs.

EPA has determined that the proposed definition of RMR&R activities does not constitute a significant regulatory action because only minor new regulatory requirements will be imposed. However, the Agency recognizes the importance of the NSR program and its effort to streamline and simplify its processes. Consequently, this RIA has been prepared to provide updated economic cost and benefits information required by E.O. 12866 for a significant regulatory action.

### 2.2.2 Executive Order 12898

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to consider the impact of programs, policies, and activities on minority populations and low-income populations. Disproportionate adverse impacts on these populations should be avoided. According to EPA guidance, agencies are to assess whether minority or low-income populations face risk or a rate of exposure to hazards that is significant (as defined by the National Environmental Policy Act) and that "appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group." (EPA, 1996b) This guidance outlines EPA's Environmental Justice Strategy and discusses environmental justice issues, concerns, and goals identified by EPA and environmental justice advocates in relation to regulatory actions.

In general, the potential for disproportionate effects on minority and low-income populations in the NSR program come from siting issues. However, by definition, the RMR&R component of the NSR program deals exclusively with existing facilities. Therefore, while the Agency has conducted only a general analysis of the potential changes in exposure to harmful air pollutants because of the RMR&R program. These findings are presented in this RIA.

### 2.2.3 Executive Order 13045

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," directs Federal agencies developing health and safety standards to include an evaluation of the health and safety effects of the regulations on children. Regulatory actions covered under the Executive Order include rulemakings that are economically significant under Executive Order 12866, and that concern an environmental health risk or safety risk that the Agency has reason to believe may disproportionately affect children. EPA has developed internal guidelines for implementing the E.O. 13045. (EPA, 1998b) This rule is not subject to Executive Order 13045, because it is not economically significant under E.O. 12866 and the Agency does not have reason to believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children.

### 2.2.4 Executive Order 13132

Executive Order 13132, entitled Federalism (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. "Policies that have federalism implications" is defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government." Under Executive Order 13132, EPA may not issue a regulation that has federalism implications, imposes substantial direct compliance costs, or that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation preempts State law unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

If EPA complies by consulting States and local governments, Executive Order 13132 requires EPA to provide to OMB, in a separately identified section of the preamble to the rule, a federalism summary impact statement (FSIS). The FSIS must include a description of the extent of EPA's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met. Also, when EPA transmits a draft final rule with federalism implications to OMB for review pursuant to Executive Order 12866, EPA must include a certification from the Agency's Federalism Official stating that EPA has met the requirements of Executive Order 13132 in a meaningful and timely manner.

The proposed definition for RMR&R activities under the NSR program will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. As discussed above, this rule imposes only minimal compliance burdens beyond those already included in the NSR program. Thus, the requirements of section 6 of the Executive Order do not apply to this rule.

### 2.2.5 Executive Order 13084

Under Executive Order 13084, "Consultation with Tribal Governments," EPA may not issue a regulation not required by statute that significantly or uniquely affects the communities of Indian tribal governments, or that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA consults with those governments. If EPA complies by consulting these governments, Executive Order 13084 requires EPA to provide to OMB in a separately identified section of the preamble to the rule, a description of the extent of EPA's prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires EPA to develop an effective process permitting elected and other representatives of Indian tribal governments "to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities."

This proposed change in the NSR program does not significantly or uniquely affect the communities of Indian tribal governments. As discussed above, this rule imposes only minimal new compliance burdens beyond those already required by the NSR program. Moreover, the final Section 126 rule will not impose substantial direct compliance costs on such communities. Consequently, the requirements of section 3(b) of Executive Order 13084 do not apply.

### 2.2.6 Regulatory Flexibility Act and the Small Business Regulatory Fairness Act of 1996

The Regulatory Flexibility Act (RFA) of 1980 (PL 96-354) requires agencies to conduct a screening analysis to determine whether a regulation will have a significant impact on a substantial number of small entities, including small businesses, governments and organizations. If a regulation will have such an impact, agencies must prepare a Regulatory Flexibility Analysis, and comply with a number of procedural requirements to solicit and consider flexible regulatory options that minimize adverse economic impacts on small entities. The RFA's analytical and procedural requirements were strengthened by the Small

Business Regulatory Enforcement Fairness Act (SBREFA) of 1996. The RFA and SBREFA require use of definitions of "small entities", including small businesses, governments and non-profits, published by the Small Business Administration (SBA).[15] It is EPA's position that because the proposed new definition for RMR&R activities is a subset of the NSR program, and since the NSR program has already asserted it has no significant impact on a substantial number of small entities, the RFA as amended by SBREFA does apply to this proposal.

### 2.2.7 Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act (UMRA) of 1995 (PL 104-4) was enacted to focus attention on federal mandates that require other governments and private parties to expend resources without federal funding, to ensure that Congress considers those costs before imposing mandates, and to encourage federal financial assistance for intergovernmental mandates. The Act establishes a number of procedural requirements. The Congressional Budget Office is required to inform Congressional committees about the presence of federal mandates in legislation, and must estimate the total direct costs of mandates in a bill in any of the first five years of a mandate, if the total exceeds $50 million for intergovernmental mandates and $100 million for private-sector mandates.

Section 202 of UMRA directs agencies to provide a qualitative and quantitative assessment of the anticipated costs and benefits of a Federal mandate that results in annual expenditures of $100 million or more. The assessment should include costs and benefits to State, local, and tribal governments and the private sector, and identify any disproportionate budgetary impacts. Section 205 of the Act requires agencies to identify and consider alternatives, including the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule.

Since the total expected new cost of this proposed definition of RMR&R activities is less than $2 million per year, EPA has determined that UMRA does not affirmatively apply to this regulatory action. However, this RIA includes a cost analysis of administrative requirements for State and local governments associated with revising SIPs and collecting and reporting data to EPA. It also includes the compliance and administrative costs to emissions sources owned by government entities.

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15 Where appropriate, agencies can propose and justify alternative definitions of "small entity." This RIA relies on the SBA definitions.

### 2.2.8 Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (PRA) requires Federal agencies to be responsible and publicly accountable for reducing the burden of Federal paperwork on the public. EPA has submitted an Information Collection Request (ICR) to the Office of Management and Budget (OMB) for this proposed definition of RMR&R activities in compliance with the PRA. The ICR explains the need for additional information collection requirements and provides respondent burden estimates for additional paperwork requirements to State and local governments.

For the proposed rulemaking, EPA estimated the burden and cost of all new recordkeeping, monitoring, and reporting activities and reported them in the May 2002 ICR. These estimates of administrative burden costs are contained in the docket for this action.

Burden means the total time, effort, and financial resources expended by persons to generate, maintain, retain, and disclose or provide information to or for a federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, processing, maintaining and disclosing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An agency may not conduct or sponsor, and nor is a person required, to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR part 9 and 48 CFR Chapter 15.

# 3 Consideration of Alternative Approaches

Because the proposed definition for RMR&R under the major NSR program has been subject to an extensive stakeholder outreach program, it has been subjected to discussions of numerous alternative approaches. These discussions included participants from the regulated community, State and local air pollution control agencies, environmental organizations, and other Federal agencies. Consequently, the proposed definition for RMR&R constitutes a well reasoned compromise to the specific interests of each of those groups.

## 3.1 No Regulation

The consideration of alternative approaches must include a determination of the feasibility of the Federal government taking no action. Title I of the Act mandates the NSR process. Consequently, "No Regulation" is not a viable option for this analysis.

## 3.2 Alternative Effective Dates

The purpose of the proposed rulemaking is to provide clarity and regulatory relief to sources. Consequently, the Agency gave this package the earliest possible effective date. Consideration of alternative effective dates would, in effect, result in additional costs and burden to sources.

## 3.3 Economic Incentive Alternatives

While economic incentives can be considered a part of the NSR process, the nature of the activities included within the definition of RMR&R does not contain elements that are a part of the economic incentive process.

# 4 Description of Affected Entities

There are two types of sources potentially affected by the proposed approaches to routine maintenance, repair, and replacement within the framework of the Agency's NSR preconstruction permit program: electricity generating units and non-utility large industrial boilers, (including combustion turbines, and other units). The following discussion includes brief descriptions of each type of unit. The Agency made this differentiation based upon existing air quality reports and regulatory analyses: the Ozone Transport Assessment Group's (OTAG's) 1990 data base; the Operating Permits data base of respondents; and the data base developed by the RACT/BACT/LAER Clearinghouse (RBLC).

## 4.1 Electricity Generating Units

In 1990, approximately 2.8 trillion kilowatt hours (kWh) of electricity were generated in the United States. By 2005, EPA projects this total to increase to about 3.6 trillion kWh. [16] More than 95 percent of the nation's generating capacity is owned by electric utilities and a significant portion of the nation's electricity generating industry is in the region affected by the final Section 126 rule. [17] EPA estimates 842 electrical generating units of less than 25 MW will be operating in this region in the year 2000. In addition to electric utility power units that produce only electricity, this number includes units owned by independent power producers (IPPs) and units that co-generate electricity and steam (co-generators), whether owned by utilities or IPPs.

EPA evaluated the potential impact that changes in NSR related to the routine maintenance provisions might have on the power generation sector. This evaluation was performed using the Integrated Planning Model (IPM), a model that EPA has used to evaluate many power sector emission reduction regulations including the Phase II Acid Rain Nitrogen Oxide (NOx) regulations and the NOx SIP Call. EPA modeled an NSR base-case scenario in which the performance of power generation units

16 EPA's generation requirement projections are based on an extension of the electric demand forecast of the North American Electric Reliability Council, adjusted for the impact of the Climate Change Action Plan.

17 The final Section 126 region consists of whole or parts of Delaware, District of Columbia, Indiana, Kentucky, Maryland, Michigan, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Virginia, and West Virginia. The petitions filed with EPA only name parts of Indiana, Michigan, Kentucky, and New York while naming the whole of the other jurisdictions.

deteriorated over time [18]. In this scenario EPA assumed that heat rate of coal plants increased (e.g. efficiency decreased) and that capacity of existing coal plants also decreased. EPA also modeled a number of possible scenarios intended to represent what might happen if power generation companies were provided additional flexibility to perform maintenance under the routine maintenance requirements of NSR. In these scenarios, EPA assumed that coal plants had some combination of increase in heat rate (e.g increase in efficiency), increase in capacity and increase in maximum possible availability.

EPA's analysis suggests that changes in emissions under the different scenarios are dependent upon several factors. First, if a pollutant is capped (e.g. $SO_2$ under Title IV) total emissions of that pollutant do not change over the entire time period considered. However, because sources can bank allowances, there may be some change in when the $SO_2$ emissions are emitted. For NOx which is not capped, there can be changes in emissions. Over the time period considered (2005 to 2020), NOx emissions varied between 1.9% (81,000 tons) and 2.7% (118,000 tons). The factor that lead to the biggest change in NOx emissions was changes in maximum availability. If one assumed that the existing routine maintenance provisions decreased maximum availability of coal plants, those plants would be able to operate less. This would lead to an increase in gas-fired generation. Since gas-fired power plants emit less NOx, this would lead to decreases in NOx emissions. Conversely if maximum availability of coal plants increased, those plants would be able to operate more and emissions could increase. Improving heat rates and capacity in tandem resulted in a decrease in NOx emissions. This is because coal plants generated more electricity while generating the same amount of NOx. Less efficient coal plants and gas-fired units were operated less, generating less NOx from these sources and less NOx overall. Thus if increased flexibility to perform routine maintenance increased efficiency (decreased heat rate) and capacity, it would result in small reductions in NOx. If on the other hand it increased availability of coal-fired units it would result in small increases in NOx. Not revising the requirements with regard to routine maintenance could increase NOx if it led to decreases in capacity and efficiency without also decreasing availability. Conversely, decreasing availability at the same time that capacity and efficiency decreased could lead to small decreases in NOx emissions. A more complete description of the analysis and results can be found in the docket.

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18 EPA has found that companies perform limited maintenance on coal plants because of concerns about NSR

The Department of Energy also attempted to analyze quantitatively the possible emissions consequences of the range of different approaches to the RMR&R exclusion described above. Using the National Energy Modeling System (NEMS), DOE evaluated a variety of changes in energy efficiency and availability, as well as the effect on emissions resulting from these changes. This analysis concluded that efficiency improvements resulting from increased maintenance are expected to decrease emissions, whereas availability improvements are expected to increase emissions. In the cases represented in this analysis, the impacts of the assumed reductions in heat rates tend to dominate the corresponding effects of the assumed availability increases. A copy of that analysis is included in Appendix B of this report. A more complete description of the analysis and its results can be found in the docket.

## 4.2 Non-Utility Potentially Affected Sources

There are about 14,500 sources subject to Title I operating permits requirements in the EPA's Operating Permits Database, encompassing all industry classifications in 34 states and the District of Columbia. EPA believes this database represents the majority of the universe of potentially affected sources for the NSR program. Table 1 below is in the current NSR ICR and in the ICR for the direct-to-final set of changes to the NSR program dealing with applicability. Table 1 displays the industry classifications most commonly affected by NSR permitting requirements.[19]

**Table 1 Most Commonly Affected Entities**

| Industry Group | SIC | NAICS |
|---|---|---|
| Pulp and Paper Mills | 261 | 32211, 322121, 322122, 32213 |
| Paper Mills | 262 | 322121, 322122 |
| Chemical Processes | 281 | 325181, 32512, 325131, 325182, 211112, 325998, 331311, 325188 |
| Pharmaceuticals | 283 | 325411, 325412, 325413, 325414 |
| Petroleum Refining | 291 | 32411 |
| Automobile Manufacturing | 371 | 336111, 336112, 336712, 336211, 336992, 336322, 336312, 33633, 33634, 33635, 336399, 336212, 336213 |
| Electric Services | 491 | 221111, 221112, 221113, 221119, 221121, 221122 |
| Natural Gas Transport | 492 | 48621, 22121 |

19 Information Collection Request for 40 CFR Part 51 and 52 Prevention of Significant Deterioration and Nonattainment New Source Review, Office of Management and Budget (OMB) Control Number 2060-0003; EPA Form Number 1230.09.

# 5 Assessing Benefits and Costs

The Agency believes all sources potentially subject to major NSR permitting will use the RMR&R approach promulgated by EPA. In the past, maintenance and repair activities at a process unit were screened by the facility according to a case-by-case rule for determining whether or not the activity could trigger major NSR. The facility would apply for an NSR determination for all activities it believed may trigger major NSR permitting and those activities for which a case-by-case determination was inconclusive. Based upon the results of this determination, the facility would respond accordingly, applying for a major NSR permit when necessary. Under the proposed definition of the RMR&R program, EPA has developed an objective test to reduce the uncertainty associated with determining whether a source is eligible for routine maintenance exclusion and streamlined the major source permit determination process to remove uncertainty and decrease regulatory delays. EPA anticipates sources will almost unanimously choose to participate in the new RMR&R program because of the increased regulatory certainty and decreased burden and delay offered by the program.

## 5.1 Benefits

"Benefits" refers to any and all outcomes of a regulation that contribute to an enhanced level of social welfare. The two primary types of benefits that can be attributed to the RMR&R definition are *temporal* health-related benefits and benefits from *avoided costs*. Eliminating the regulatory lag in the RMR&R process can reduce short-term exposures to pollutants and would also lead to *de minimis* improvements *vis a vis* the cumulative effect of some pollutants. Furthermore, stimulating the firm's incentive for making technological improvements while performing RMR&R tasks could lead to permanent decreases in emissions (and improvements in energy consumption and production) that were not anticipated by the underlying air quality standard. The concomitant decrease in pollution control costs (by reducing the need for further controls at other sources) and increased health-related benefits offer opportunities for yet unrealized economic improvements through the proposed RMR&R program.

The Agency believes most of the benefits from the proposed definition of RMR&R activities will be derived from cost savings, of which this report identifies two primary types: improved flexibility and reaction time, and avoided NSR costs. Bureaucratic delays due to processing time and review limit industry's ability to react quickly in a changing economic environment. For many source categories, this is not a big problem because they undertake NSR-related activities on an infrequent basis. However, for a number of industries, the Agency has identified as many as three or four changes take place each year that could prompt an Operating

Permit revision and, potentially, a major NSR permit, as well.[20] When such changes occur, permitting lags can significantly impact the profitability of the source by preventing timely changes in processes that improve competitiveness and protect market share. For EGUs and other boiler applications, the failure to perform timely repairs and maintenance can reduce boiler efficiency and thereby reduce electricity generating capacity. Even a one percent change in the heat rate of a boiler (*ceteris paribus*) can impose a half a million dollar change in net revenues for a 500 MWe coal-fired boiler.[21] Allowing sources to respond to maintenance-related problems in a revenue maximizing fashion will unambiguously increase revenues (and profits) and reduce operating costs for industry.

The net effect of these cost savings could be substantial. In tangible cost savings, the ability to address larger routine maintenance and repair problems quickly can conceivably result in tens of millions of dollars in savings through more efficient electricity generation alone. That, combined with the potential for improved national and international competitiveness and market share due to RMR&R flexibility improvements could potentially result in job savings, job creation, and other macro-economic improvements. Unfortunately, there is no way to determine a realistic value for these improvements. Consequently, this report invites the public and other stakeholders to offer their input into this assessment toward future refinement of this analysis.

## 5.2 Source Costs

EPA believes costs will be insignificant for most of the sources participating in the RMR&R program under either approach. For instance, the first annual task at each participating facility will be to estimate the replacement costs of all of its process units. Since these data are readily available to the applicant through financial records (such as insurance forms) it should take no more than 4 hours per process unit (source) for each facility to inventory all of its units. Following the estimation of replacement cost for each process unit, the facility must create an annual report for each source, detailing all of the RMR&R-related costs and activities at that unit. For most units, this will be a relatively short report, again probably no more than 4 hours per report to gather and record each unit's RMR&R-related activities into the facility's annual report.

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20 U.S. EPA, 1994, "Economic Analysis, Regulatory Flexibility Act Screening Analysis, and Paperwork Reduction Act Information Collection Request Analysis for Proposed Revisions to Part 70 Operating Permits Regulations," by Daniel Charles Mussatti, pp 33-48.

21 http://ildpower.com/fossil02.html

As stated in the preamble to the proposed RMR&R definition, sources must report activities aggregated by costs across all appropriate process units, rather than aggregating the cost of activities across pollutants. While this limitation necessarily increases the burden and cost to industry, EPA believes the cost of that additional burden is minimal. Table 2 displays the expected long-term annual burden and cost of this rulemaking to sources for the maximum scope of this proposed rulemaking.

**Table 2 Expected Annual Marginal Burden and Cost to Process Units (Sources) for the Annual Maintenance, Repair, and Replacement Allowance Approach**

| Entity / Activity | Respondents | Hours Per Respondent per Year | Total Annual Hours (All Respondents) | Annual Cost per Respondent [1] | Total Annual Cost (All Respondent)[1] |
|---|---|---|---|---|---|
| Sources | | | | | |
| Rule Assimilation, Development of Strategy[2] | 1,450 | 4 | 5,800 | $300 | $435,000 |
| Assessment of Replacement Value | 1,450 | 4 | 5,800 | $300 | $435,000 |
| Preparation of Annual RMR&R Report | 1,450 | 4 | 5,800 | $300 | $435,000 |
| Total Source Burden and Cost | 1,450 | 12 | 17,400 | $900 | $1,305,000 |

1 All costs are in 2002 dollars
2 One-time items have been averaged over the three year life of this ICR.

There are approximately 14,500 sources of air pollution potentially subject to NSR permitting.[22] Each of these sources will have to undertake the tasks listed in Table 2, resulting in an increased burden to all potentially affected sources of about $900 per year ($1.3 million annually for all sources) under the annual maintenance, repair, and replacement allowance approach. Because there are so many sources that are potentially affected and will need to perform the minimal annual tasks of inventory and reporting, the increase in burden dominates the expected effects of the RMR&R program. However, through the potential for reduced uncertainty and improved flexibility and competitiveness found in the RMR&R program, the Agency believes that although not measurable, for those sources subject to major source NSR under the current case-by-case process, the overall benefit to sources able to avoid major NSR permitting through the RMR&R program outweighs the *de minimis* increase in burden and costs imposed upon the entire universe of potentially affected sources. Consequently, the Administrator asserts that while not estimable in the traditional sense, the proposed RMR&R approaches provide regulatory relief to those sources currently subject to major source NSR under the current routine maintenance provisions.

22 Most sources contain more than one pollution creating unit, but this report does not need to differentiate by pollutant for the purposes of this analysis.

**Table 3 Expected Annual Marginal Burden and Cost to Process Units (Sources) for the Equipment Replacement Approach**

| Entity / Activity | Respondents | Hours Per Respondent per Year | Total Annual Hours (All Respondents) | Annual Cost per Respondent [1] | Total Annual Cost (All Respondent)[1] |
|---|---|---|---|---|---|
| Sources | | | | | |
| Rule Assimilation, Development of Strategy[2] | 1,450 | 4 | 5,800 | $300 | $435,000 |
| Assessment of Replacement Value | 1,450 | 4 | 5,800 | $300 | $435,000 |
| Total Source Burden and Cost | 1,450 | 8 | 11,600 | $600 | $870,000 |

1 All costs are in 2002 dollars
2 One-time items have been averaged over the three year life of this ICR.

The 14,500 sources of air pollution potentially subject to NSR permitting under the proposed equipment replacement approach will have to undertake the tasks listed in Table 3, above. There is no reason to believe the number of affected sources or the burden differs between the two proposed approaches. The primary difference between the two proposed approaches is that the equipment replacement approach does not have an associated annual reporting requirement. Consequently, the number of affected sources and the burden associated with each of the tasks in Table 3 has the same value as its analog in Table 2 for the annual maintenance, repair, and replacement allowance approach. Each affected source will expend about 8 additional hours in regulatory-related activities, relative to the *status quo*, for a total additional cost of about $870 thousand per year. As with the annual maintenance, repair, and replacement allowance approach, the Administrator asserts that the reduction in uncertainty and improved flexibility and competitiveness available through the equipment replacement RMR&R approach also provides regulatory relief to industry.

## 5.3 Reviewing Authority Costs

Permitting authorities seeking to implement the new RMR&R provisions will incur the costs outline in this section. RAs, however, do not have to adopt any particular provision as long as they can show that their version of the program is at least as stringent as ours. RAs who do not want to implement the new provisions will incur costs associated with demonstrating the adequacy of their existing programs. Each participating RA will have to learn the rule and incorporate it into its SIP. The Agency identified five tasks that each RA must perform for the incorporation of the RMR&R program into its SIP and two annual tasks it will have to perform to maintain the RMR&R program. Table 4 displays the expected annual burden and cost of this rulemaking to RAs for the maximum scope of this analysis. Each RA can expect to incur an additional 1,400 hours of activity per year

**Table 4 Expected Marginal Burden and Cost to Permitting Authorities**

| Entity / Activity | Respondents | Hours Per Activity | Total Annual Hours (All Respondents) | Annual Cost per Respondent [1] | Total Annual Cost (All Respondent)[1] |
|---|---|---|---|---|---|
| Rule Familiarization[2] | 112 | 20 | 2,240 | $740 | $82,880 |
| Applicability Determinations[2] | 112 | 10 | 1,120 | $370 | $41,440 |
| SIP Revision[2] | 112 | 40 | 4,480 | $1,480 | $165,760 |
| Public Hearing and SIP Modification[2] | 112 | 30 | 3,360 | $1,110 | $124,320 |
| Legislative Coordination[2] | 112 | 40 | 4,480 | $1,480 | $165,760 |
| Annual Report Review[3] | 112 | 8 | 116,480 | $38,480 | $4,309,760 |
| NSR Determination[3,4] | 112 | 10 | 7,280 | $2,405 | $269,360 |
| Total One-Time RA Burden and Cost[1] | 112 | | 15,680 | $5,180 | $580,160 |
| Total Annual Burden and Cost [1] | 112 | | 123,760 | | $4,579,120 |

1 All costs are in 2002 dollars
2 One-time items have been averaged over the three year life of this ICR.
3 Annual items have been estimated at 130 sources per RA per year..
4 Assumes 1 determination for every 20 sources.

## 5.4 Federal Costs

The Federal government incurs a moderate long-run burden from the promulgation of this rule, but the Agency believes the burden and cost of the RMR&R program to be justified. Furthermore, the Agency believes the slight increase in burden will be somewhat offset by the reduction in oversight and enforcement activities that will result from fewer major source modifications occurring each year. For the RMR&R program, EPA will be responsible for two one-time activities, SIP revision support (at least 10 hours of guidance per year, or 3,360 hours over the three years of expected SIP revision), and SIP review and approval (about one day per SIP, or a total of 299 hours per year). Annually, the EPA will have two tasks to perform: management of the RMR&R program to those sources where it has authority (about 10 hours per year, or 1,450 hours per year per Federally managed source), and oversight of RA report review and NSR determinations, which will take about half as long for the Federal government to review each form, relative to the RA's burden for each task. The Agency typically provides Permitting Authority oversight to one source determination in ten. Table 5, below, displays the average annual expected burden and cost to the Federal government for the RMR&R program.

## 5.5 Bottom Line Impacts

The proposed annual maintenance, repair, and replacement allowance approach to RMR&R activities will add about $13 million annually to the cost of the NSR program. However, the effect of small costs accrued by large numbers of sources makes this total misleading. About 61 percent of

that cost applies to the annual cost of the RMR&R program to sources - most of which is attributable to the *de minimis* cost of additional reporting that is spread across 14,500 sources (at an annual cost of less than a thousand dollars per source). If that *de minimis* cost is removed from total, the annual cost of the annual maintenance, repair, and replacement allowance RMR&R program is less than $200,000. The equipment replacement approach costs somewhat less than the annual maintenance, repair, and replacement allowance approach, since it does not have an annual reporting requirement. Consequently, the equipment replacement approach will cost sources $870 thousand per year, or about $600 per source per year.

**Table 5 Expected Yearly Marginal Burden and Cost to The Federal Government**

| Entity / Activity | Number of Respondents Served | Hours per Year Per Respondent | Total Annual Hours | Average Annual Cost per Respondent [1] | Total Annual Cost (All Respondent)[1] |
|---|---|---|---|---|---|
| Coordination with RAs [2] | 112 | 10 | 1,120 | $41,440 | $41,440 |
| Review of SIPS [2] | 112 | 8 | 896 | $11,063 | $11,063 |
| Management of Federal Program [3] | 145 | 10 | 1,450 | $370 | $53,650 |
| Annual Report Review [3] | 13,050 | 4 | 5,220 | $4 | $193,140 |
| NSR Determination [3,4] | 13,050 | 10 | 13,050 | $6 | $482,850 |
| TOTAL One-Time Federal Burden and Costs [1] | | 13 | 1,456 | $52,503 | $52,503 |
| TOTAL Annual Federal Burden and Costs [1] | | | | | $502,190 |

1 All costs are in 2002 dollars
2 One-time items have been averaged over the three year life of this ICR.
3 Annual items have been estimated at 130 sources per RA per year..
4 Assumes 1 determination for every 20 sources.

Under both approaches, the Agency has provided opportunities for industry to improve its responsiveness to changing economic conditions while performing critical repair, replacement and maintenance activities. These improvements derive from the RMR&R program's primary goals - the reduction of uncertainty and regulatory delay related to the performance of such activities. While valuable, the decrease in uncertainty and regulatory delay are not quantifiable in the traditional sense. Instead, the Agency's assertion that the two alternative approaches to RMR&R provide regulatory relief depends on a simple concept, the Le Chetalier Principle in its economic application: reducing the restrictions on industry reduces costs. Consequently, while the measurable portion of the proposed approaches indicate increases in burden and cost, the program *in toto* should be beneficial.

## Table 6 Bottom Line One-Time and Annual Burden and Costs[1]

| Entity / Activity | Number of Respondents | Hours per Year per Respondent | Total Annual Hours (All Respondents) | Annual Cost per Respondent [1] | Total Annual Cost (All Respondent)[1] |
|---|---|---|---|---|---|
| Process Units (Sources) Annual Maintenance, Repair, and Replacement Allowance Approach | 1,450 | 12 | 17,400 | $900 | $1,305,000 |
| Process Units (Sources) Equipment Replacement Approach | 1,450 | 8 | 11,600 | $600 | $870,000 |
| Permitting Authorities (Both Approaches) | 112 | 140 | 15,680 | $5,180 | $580,160 |
| US Environmental Protection Agency (Both Approaches) | 1 | 23 | 2,906 | $851 | $107,522 |
| Total Expected Cost (Annual Maintenance, Repair, and Replacement Allowance Approach) | | | | | $1,992,682 |
| Total Expected Cost ( Equipment Replacement Approach) | | | | | $1,557,682 |

1 All costs are in 2002 dollars

## 5.6 Caveats

The analysis is based upon the best data available to the Agency at this time. However, inconsistencies in RA reporting techniques, incomplete data sets, and sampling limitations imposed upon the Agency by the Paperwork Reduction Act necessitated a certain amount of extrapolation and "best-guess" estimations by RAs and Agency experts. Consequently, the reader should not consider the conclusions to be an exact representation of the level of burden or cost that will occur. Instead, this report should be considered a directionally correct assessment of the impact the programmatic changes included in this rulemaking.

Furthermore, because the final version of this rulemaking has not been determined, the EPA cannot make a fair estimate *ex ante* of the impact on number of permits that will be affected by this rulemaking. However, in the context of what has been done for over ten years for NSR, the Agency can be relatively confident that the DIRECTION and the MAGNITUDE of the expected changes due to the new RMR&R program reported in this analysis are representative of what will be observe *ex post.*

For most analyses, the Agency relies upon a Bayesian approach to predicting the future impacts of its regulations: it relies upon past information of a similar nature as the best predictor of the future. However, for the determination of the number of potentially affected sources in this analysis involves the assessment of counterfactual data. In other words, the Agency had to predict how many sources would *not* perform specific actions or, for whatever reason, were not reporting on specific actions undertaken. Clearly, no data source can supply such information. Therefore, the estimates in this analysis are based to a much greater extent upon the experiences and expertise of the Agency's staff and consultants, as well as industry representatives.

# APPENDIX A

# EMISSIONS IMPACTS OF HIGHER EFFICIENCIES AND AVAILABILITIES FOR COAL-FIRED GENERATING UNITS

## EMISSIONS IMPACTS OF HIGHER EFFICIENCIES AND AVAILABILITIES FOR COAL-FIRED GENERATING UNITS

**Description**: Utilizing assumptions provided by the Office of Fossil Energy, this analysis considers the effects of potential improvements in coal power plant heat rates and availabilities. The Office of Fossil Energy believes that these improvements might occur if they could be accomplished without triggering the New Source Review (NSR) requirements. Specifically, heat rates for coal-fired plants are assumed to decrease by 5, 10, and 15 percent by 2010. Each of these cases are also combined with assumed increases in availability for coal capacity of 2 and 5 percentage points by 2010. The resulting impacts on fuel use and emissions (sulfur dioxide, nitrogen oxide, mercury, and carbon dioxide) are examined.

**Methodology**: Using the National Energy Modeling System (NEMS), the assumed changes in heat rates and availabilities are analyzed by modifying the AEO2002 Reference Case. The improvements are phased in through 2010. Although the potential to improve heat rates and availabilities could vary among coal units, this analysis assumes that the same rate of change occurs to all of this capacity. Although these improvements could require increases in maintenance costs, no change in these costs is incorporated. Potential improvements to oil- and gas-fired capacity are also not included.

**Analysis**: Improvements in heat rates (i.e., increased operating efficiency) result in lower coal consumption and emissions, although sulfur dioxide emissions nationally are unaffected since there is a cap on total emissions. Compared to the AEO2002 Reference Case, a 5-percent decrease in heat rates reduces carbon and nitrogen oxide emissions by about 4 percent each and mercury emissions by 2 percent in 2010 (Table 1). In 2020, the respective emissions reductions are 3 percent, 4 percent, and 2 percent. Not surprisingly, higher assumed efficiency improvements result in greater emissions reductions. A 10-percent decrease in heat rates reduces carbon and nitrogen oxide emissions by about 8 percent each and mercury emissions by 5 percent in 2010 (Table 2). In 2020, the respective emissions reductions are 7 percent, 8 percent, and 4 percent. A 15-percent decrease in heat rates reduces carbon, nitrogen oxide, and mercury emissions in 2010 by about 12 percent, 13 percent, and 9 percent, respectively (Table 3). In 2020, the corresponding reductions are 10 percent, 12 percent, and 8 percent.

Increasing the availability of coal-fired capacity leads to increases in coal generation, consumption and emissions. However, these increases in emissions are not enough to offset the reductions that result from the efficiency improvements, except when the lowest assumed efficiency

improvement (5 percent) is combined with the highest assumed availability increase (5 percentage points). Compared to the Reference Case, mercury emissions in this case are about 1 percent higher in 2010 and 2020 (Table 1). Carbon emissions are 2 percent lower in 2010 and 1 percent lower in 2020. Nitrogen oxide emissions are slightly lower in 2010 but slightly higher in 2020. If a 5-percent decrease in heat rates is combined with the lesser availability increase of 2-percentage points, carbon and nitrogen oxide emissions in 2010 are each 3 percent lower than in the Reference case and mercury emissions are 1 percent lower. In 2020, the reductions are about 2 percent each for carbon and nitrogen oxide and 1 percent for mercury.

Compared to the AEO2002 Reference Case, both the 10-percent and 15-percent efficiency improvement cases are projected to lower emissions when combined with both of the assumed availability increases. Assuming a 10-percent decrease in heat rates and a 2-percentage point increase in availability lowers carbon and nitrogen oxide emissions in 2010 by 7 percent each and mercury emissions by 5 percent (Table 2). A 5-percentage point increase in availability results in further increases in coal use, so the emissions reductions resulting from the 10-percent heat rate improvements are further offset by the availability increases. In this case, carbon, nitrogen oxide, and mercury emissions in 2010 are 6 percent, 5 percent, and 2 percent lower than in the AEO2002 Reference Case, respectively. A 15-percent decrease in heat rates combined with a 2-percentage point increase in availability lowers carbon and nitrogen oxide emissions in 2010 by 11 percent each and mercury emissions by 8 percent (Table 3). A 15-percent decrease in heat rates combined with a 5-percentage point increase in availability lowers carbon emissions by 10 percent, nitrogen oxide emissions by 9 percent, and mercury emissions by 6 percent in 2010. In 2020, the emissions reductions in the combined heat rate/availability improvement cases are typically about 1 to 2 percentage points lower than the corresponding results in 2010.

In conclusion, efficiency improvements resulting from increased maintenance are expected to decrease emissions, whereas availability improvements are expected to increase emissions. In the cases represented in this study, the impacts of the assumed reductions in heat rates tend to dominate the corresponding effects of the assumed availability increases. However, the some of the assumed heat rate improvements could be difficult to achieve. In 2000, the average heat rate for coal capacity was about 10,250 btu per kilowatthour, so a 10-percent reduction by 2010 would lower the average heat rate to about 9,200 btu per kilowatthour. This heat rate would be almost as good as the heat rate assumed for new coal units. A 15-percent decrease would reduce the heat rate to a level below the heat rate for new units. Even if the assumed heat rate improvements are feasible, they may not be economic. The required

increase in maintenance costs, which is not represented in these cases, may be higher than the resulting savings in fuel costs.

Since the assumed efficiency improvements result in lower fuel consumption, it may also be possible to increase output at coal-fired units without resulting in a net increase in coal consumption and triggering NSR. The assumed increases in availability represent one option for increasing generation. Another way to increase generation would be to increase capacity, but this option is not considered in this analysis.

# APPENDIX B

# EVALUATION OF ROUTINE MAINTENANCE MODEL SCENARIO FOR POWER PLANTS

## EVALUATION OF ROUTINE MAINTENANCE MODEL SCENARIO FOR POWER PLANTS

**Purpose:** This analysis uses model scenarios to evaluate the impact that the changes to the routine maintenance provisions of NSR are likely have on emissions from the power generation sector.

**Methodology:** In order to evaluate the impact of the routine maintenance provisions, EPA considered a scenario under which NSR regulations remained in place and a range of scenarios that could occur if NSR did not exist. The first scenario is intended to represent the existing program, which the EPA has found impedes or results in cancellation of projects that maintain and improve reliability, availability, and efficiency at existing power plants. [23] The second range of scenarios represents companies receive flexibility under the NSR program that removes many of these impediments . As part of this analysis, EPA reviewed three key variables: change in SO2 emissions, change in NOx emissions and change in cost.

In the future, when a final rule is issued on treatment of routine maintenance under NSR, there will already be in place final rules governing the use of plantwide applicability limits (PALs), and Clean Units. Some sources with in the electric utility generation industry may take advantage of these changes. However, any such decision will be based on case specific information related to their past operating levels, current levels of control and company's specific strategies for complying with NSR. Therefore, we can not make estimates on how many sources may take advantage of PALs and Clean Units. To the extent they are used within the industry, they will dampen the effects shown in this analysis (i.e., estimated decreases and increases will not be as large.

This analysis was performed using the Integrated Planning Model (IPM). IPM is a linear programming model that EPA uses to analyze the effect of various environmental policies on the power sector. It provides forecasts of least-cost capacity expansion, electricity dispatch and emission control strategies for meeting energy demand and environmental, transmission, dispatch and reliability constraints. EPA has used it to analyze many environmental policies including the Phase II Acid Rain Nitrogen Oxide regulations and the Nitrogen Oxide SIP Call. Analysis can be performed varying multiple constraints such as availability of various types of power plants (e.g. coal-fired, nuclear, gas-fired combined cycle units), heat rates of various types of power plants, environmental constraints (e.g. caps on emissions, emission rate limitations). More detail regarding IPM can be

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23 This finding is described in detail in EPA's June 13, 2002 New Source Review Report to the President.

found in the document titled "Documentation of EPA Modeling Application (V.2.1) Using the Integrated Planning Model, which can be found at: http://www.epa.gov/airmarkets/epa-ipm/index.html.

**Assumptions:** The first scenario, referred to as the NSR base cases approximates utility behavior under the current program, where the EPA has found that companies perform limited maintenance on coal plants because of concerns about NSR. In this scenario, it was assumed that the performance of coal units would deteriorate, resulting in higher heat rates and lower capacities. EPA did not assume that reduced maintenance resulted in a change in maximum potential unit availability. This is because over the last 20 years, availability of coal-fired plants has increased even as the plants have aged. This is due in large part to improved maintenance practices. For instance tests to inspect boiler tubes have been continually improving (see "Preventing Boiler Tube Failures with EMAT's", S.P. Clark et al, "EPRI International Conference on Boiler Tube Failures and HRSG Tube Failures and Inspects", November 6-8, 2001). These improved preventive maintenance practices allow companies to replace components during regularly scheduled outages before they fail rather than causing unscheduled outages after they fail. The second range of scenarios, referred to as increased maintenance cases #1 - #5 , looks at a range of scenario for what might happen in the utility sector if companies were provided with increased flexibility under NSR to perform maintenance. This would result in lower heat rates, higher capacities and/or higher unit availabilities for these units. Finally EPA looked at one case (standard base case) in which heat rate, capacity and unit availability did not change.

It is important to note several limitations to this analysis. First this analysis only considered emission regulations that are currently in effect (e.g. the NOx SIP Call and the Title IV Acid Rain Provisions). Future environmental regulations such as emission reduction requirements necessary to meet the fine particulate matter standards or emission reductions under multi-pollutant regulations could significantly change this analysis. Second, the analysis assumed the operating and maintenance costs of coal-fired units was the same for units performing limited maintenance and for units performing increased maintenance.. Since the most significant cost associated with running an existing power plant is the cost of fuel, this impact is probably fairly small.

**Table 1: Key modeling assumptions in routine maintenance analysis**

| | Winter Availability | Summer Availability | Heat Rate Change | Capacity Change |
|---|---|---|---|---|
| NSR Base-case | 81.6% | 89.8% | +0.1% per year | -0.1% per year |
| Increased Maintenance Case #1 | 85.0% | 92.0% | -0.1% per year | +0.1% per year |
| Increased Maintenance Case #2 | 81.6% | 89.8% | -0.1% per year | +0.1% per year |
| Increased Maintenance Case #3 | 85.0% | 92.0% | -1.6% in year 2005 and beyond | +1.6% in year 2005 and beyond |
| Increased Maintenance Case #4 | 85.0% | 92.0% | -3.2% in year 2005 and beyond | +3.2% in year 2005 and beyond |
| Increased Maintenance #5 | 81.6% | 89.8% | -1.6% in year 2005 and beyond | +1.6% in year 2005 and beyond |
| Standard Base Case | 81.6% | 89.8% | No change | No change |

**Results:**

Changes in SO2 Emissions, NOx emissions and cost are summarized in tables 2, 3 and 4 below.

**Table 2: Changes in SO2 emissions in scenarios considered in routine maintenance analysis.**

| | 2005 SO2 Emissions (tons) | 2010 SO2 Emissions (tons) | 2015 SO2 Emissions (tons) | 2020 SO2 Emissions (tons) |
|---|---|---|---|---|
| NSR Base-case | 10,168,230 | 9,713,684 | 9,101,622 | 9,103,275 |
| Increased Maintenance Case #1 | 10,135,120 | 9,739,029 | 9,104,121 | 9,102,688 |
| Increased Maintenance Case #2 | 10,186,660 | 9,701,112 | 9,099,363 | 9,099,271 |
| Increased Maintenance Case #3 | 10,075,060 | 9,773,242 | 9,104,836 | 9,103,779 |
| Increased Maintenance Case #4 | 10,009,250 | 9,813,664 | 9,105,429 | 9,104,396 |
| Increased Maintenance #5 | 10,079,510 | 9,764,971 | 9,099,923 | 9,100,361 |
| Standard Base Case | 10,168,520 | 9,712,499 | 9,100,264 | 9,100,680 |

As shown in table 2, there is very little change in SO2 emissions over the entire time period studied under the two scenarios. This is because SO2 emissions are already capped nationally under the Title IV Acid Rain Provisions. Therefore if a unit decreases its emissions to make room under its PAL, it could instead sell excess allowances to another unit. However because emissions can also be shifted temporally by banking emission allowances to be used in a future year there can be significant changes in emissions for a specific year. While temporal distribution of emissions did not change much over time in the NSR cases considered, there was more temporal distribution of emissions in the increased maintenance scenarios considered.

Increasing capacity (under the increased maintenance cases) leads to increases in NOx emissions. When comparing increased maintenance cases #1 and #2 (which had the same increases in efficiency, but different changes in maximum availability, NOx emissions increase by an average of almost 92,000 tons per year over the time period analyzed.

**Table 3: Changes in NOx emissions in scenarios considered under routine maintenance scenarios.**

| | 2005 NOx Emissions (tons) | 2010 NOx Emissions (tons) | 2015 NOx Emissions (tons) | 2020 NOx Emissions (tons) |
|---|---|---|---|---|
| NSR Base-case | **4,279,362** | **4,285,400** | **4,338,461** | **4,375,486** |
| Increased Maintenance Case #1 | **4,340,166** | **4,362,948** | **4,442,881** | **4,471,499** |
| Increased Maintenance Case #2 | **4,276,550** | **4,283,081** | **4,327,979** | **4,362,859** |
| Increased Maintenance Case #3 | **4,307,796** | **4,350,737** | **4,423,141** | **4,472,706** |
| Increased Maintenance Case #4 | **4,276,172** | **4,334,671** | **4,412,340** | **4,460,041** |
| Increased Maintenance #5 | **4,259,170** | **4,271,294** | **4,324,992** | **4,363,930** |
| Standard Base Case | **4,277,407** | **4,285,423** | **4,332,209** | **4,360,044** |

It appears that changing heat rates and capacities has the opposite affect on emissions.. NOx emissions actually decrease when flexibility under NSR allows power generation companies to improve efficiency by performing increased maintenance if maximum availability of these units does not change at the same time. For instance if one compares two scenarios with the same maximum capacities: NSR Base-case , increased maintenance case #2 and the standard base case, average emissions are about 7000 tons per year higher over the time period analyzed in NSR Base-case where heat rates are higher and capacities are lower. Looking

at increased maintenance cases #3 and #4 shows the same trend. In these two cases maximum availability remains constant, but heat rates are lower and capacities are higher in increased maintenance case #4. These lower heat rates and higher capacities lead to emissions that are on average nearly 18000 tons per year less in increased maintenance case #4 than in increased maintenance case #5.
Another point to note is that EPA also looked at the speed in which the improvements to the units were made. For example by 2020, the heat rate decrease and the capacity increase was the same in both increased maintenance case #2 and increased maintenance case #5 were the same. However in case #5, those changes happened in one step in 2005, in case #2, the changes happened gradually. When the changes occurred all at emissions were lower in the early years. In the later years, when the total magnitude of the changes was more similar in both cases, the NOx emissions were also more similar.

This analysis suggests that the affect that changing the requirements of NSR with regards to routine maintenance will have on emissions is dependent upon the affect that it will have on maximum unit availabilities. If the routine maintenance changes increase efficiency and plant capacity without increasing maximum unit availability, this analysis suggests that the changes could decrease emissions. The amount of that emission decrease would depend both on how much heat rate decreased and capacity increased and how quickly these changes occurred. The greater the heat rate decrease and capacity increase and the more quickly the changes occurred, the greater the emission reductions. If on the other hand, the new provisions increase maximum unit availabilities this analysis suggests that the changes could increase emissions.

Changes in cost are summarized in table 4 below. Note that this analysis does not consider changes in maintenance costs, it only assumes changes in fuel costs and changes in capital costs associated with new generating units and new emission control equipment. Therefore it probably understates the cost of the increased maintenance scenarios and understates the cost of the NSR Base-case.

**Table 4: Total cost of scenarios considered (in 1999 dollars)**

| | 2005 Total Cost (million 1999 dollars) | 2010 Total Cost (million 1999 dollars) | 2015 Total Cost (million 1999 dollars) | 2020 Cost (million 1999 dollars) |
|---|---|---|---|---|
| NSR Base-case | **76,187** | **80,934** | **88,921** | **95,819** |
| Increased Maintenance Case #1 | **75,432** | **79,819** | **87,306** | **92,817** |
| Increased Maintenance Case #2 | **76,088** | **80,290** | **87,861** | **93,781** |
| Increased Maintenance Case #3 | **74,422** | **79,309** | **86,715** | **92,788** |
| Increased Maintenance Case #4 | **73,740** | **78,250** | **85,898** | **91,932** |
| Increased Maintenance #5 | **75,164** | **79,782** | **87,600** | **93,784** |
| Standard Base Case | **76,149** | **80,572** | **88,404** | **94,588** |

For more detailed results, see the attached I'M run summaries. The runs are listed in table 5 below.

**Table 5: I'M Runs used in this analysis**

| Scenario | I'M Run # |
|---|---|
| NSR Base-case | NSR-13 |
| Increased Maintenance Case #1 | NSR-8 |
| Increased Maintenance Case #2 | NSR-11 |
| Increased Maintenance Case #3 | NSR-14 |
| Increased Maintenance Case #4 | NSR-15 |
| Increased Maintenance #5 | NSR-16 |
| Standard Base Case | IPM2000s100d |