Regulatory Report

Long Overdue:
EPA and Nitric Acid Plant Regulation

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Executive Summary

Forty years have passed since EPA last revised its performance standards for nitric acid plants. A lot has happened during those four decades: technological advances have made reducing pollution cheaper and more effective; scientific understanding of the harms of one major pollutant, nitrogen oxides (NO_x), has grown more accurate; scientific consensus has emerged on the perils of failing to reduce greenhouse gases, including the nitrous oxide (N_2O) that these plants emit; the statutory authority for the standards has been amended, with Congress authorizing more flexible approaches to emissions controls; and at least three statutory deadlines for review have passed without any agency action.

Recently, EPA agreed by consent decree to finally review standards for emissions from nitric acid plants and, in a few months, to issue a new proposed rulemaking. The agency should take this additional time to incorporate three changes into the standards. First, the new regulation should establish a NO_X emissions level that maximizes benefits by engaging in a cost-benefit analysis as part of the rule's review and revision. In particular, EPA should consider the full range of benefits, including the public health gains from NO_x reductions and the ancillary benefits of N_2O reductions, and should develop cost estimates that reflect the ability of industry to adapt and innovate to bring down costs over time. Ideally, EPA should set NO_x requirements at sufficient levels so that the marginal abatement costs for nitric acid plants equalize the marginal abatement costs set for other industrial sectors (for example, for utilities under the Transport Rule).

Second, EPA should include nitrous oxide as a regulated pollutant in the new NSPS. Regardless of whether this result is mandated by statute, EPA should at least exercise its discretion to regulate nitrous oxides because the benefits will vastly outweigh the costs. In fact, EPA has already found that the costs of reducing these greenhouse gases from nitric acid plants may be as low as $2.32 per ton (of carbon-dioxide equivalent units), while the benefits could be as high as $64.90 per ton (of carbon-dioxide equivalent units). Issuing standards for N_2O at the same time as EPA revises the standards for NO_x will best take advantage of cost-saving interactions between these two requirements.

Finally, EPA should consider implementing a flexible compliance program when regulating nitrous oxide. Together, EPA and the states should have sufficient authority to adopt flexible compliance approaches for both new and existing sources of N_2O. For example, EPA and the states could set nationwide and state-specific emissions budgets and allow exchanges between regulated sources, or they could implement flexible performance rate requirements that would permit trading for those plants that over-comply. Especially given that EPA will be developing greenhouse gas performance standards for other industrial sectors (notably, for utilities and refineries), it makes sense for the agency to begin thinking about the best way to build flexible, harmonious standards for the whole economy that can keep compliance costs low without sacrificing any ultimate environmental goals. Nitric acid plants offer EPA an excellent opportunity to begin constructing what could become a flexible, interconnected compliance program for greenhouse gases.

By applying cost-benefit analysis, the latest scientific and technological understandings, and new, flexible compliance approaches, EPA can bring nitric acid performance standards into the twenty-first century.

Analysis

Background

Congress passed the Clean Air Act in 1963 and amended it in 1970 to include an NSPS program for categories of sources that significantly contribute to air pollution that endangers public health or welfare.[1] In 1971, EPA listed nitric acid plants as a category of sources requiring regulation under 42 U.S.C. § 7411, and promulgated such "standards of performance" for nitrogen oxide ("NO_X") air pollutants.[2] The current nitric acid NSPS regulations are applicable to any plant constructed or modified after August 17, 1971.[3]

Under the statute, EPA must review and, if necessary, revise the NSPS every eight years.[4] EPA has not reviewed the standards of performance for nitric acid plants since 1984,[5] and has not revised or otherwise updated the substantive emissions standard for NO_X since the initial promulgation of the NSPS in 1971, nearly forty years ago. This lack of action recently prompted the Sierra Club and the Environmental Integrity Project to sue to compel EPA to revise the NSPS. Ultimately, the parties entered into a consent decree, which stipulates that EPA will revise the NSPS for nitric acid plants or make a determination under Clean Air Act Section 111(b)(1)(B) that no such revision is necessary.[6] EPA has indicated that it will issue a Notice of Proposed Rulemaking ("NPRM") by October 2011.[7]

The Administrator should take this additional time to incorporate three changes into the standards. First, the new regulation should establish a NO_X emissions level that maximizes benefits by engaging in a cost-benefit analysis as part of the rule's review and revision. Second, EPA should include nitrous oxide ("N_2O") as a regulated pollutant in the new NSPS. Finally, EPA should consider implementing a flexible emissions standard program when regulating nitrous oxide.

EPA Should Revise the Existing NO_X Performance Standard

Revision Should Be Based on an Appropriate Cost-Benefit Analysis

White House policy instructs agencies to base their significant regulations on an evaluation of costs and benefits, unless prohibited by statute.[8] Section 111 of the Clean Air Act does not prohibit—and, in fact, encourages—careful consideration of the benefits and costs of performance standards.[9] Section 111(a)(1) defines the term "standard of performance" as "a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the *best system* of emission reduction which (*taking into account the cost* . . .) the Administrator determines has been adequately demonstrated."[10] This definition explicitly directs EPA to balance emissions reduction goals (i.e., "achiev[e] . . . the best system of emission reduction") with costs (i.e., "tak[e] into account the costs"). While courts have determined that this language does not *mandate* that EPA ultimately base its determination on a formal cost-benefit analysis, they have stated, "because Congress did not assign the specific weight the Administrator should accord each of these factors, the Administrator is free to exercise his discretion in this area."[11] Given EPA discretion, statutory instructions, and executive orders, the agency should use a cost-benefit analysis to develop its nitric acid performance standards.

Moreover, the use of cost-benefit analysis advances general policy goals. Regulation should maximize social welfare, and cost-benefit analysis is the best tool that agencies can use to achieve that end.[12] Cost-benefit analysis also increases agency accessibility, since it demands a level of transparency in regulatory decisionmaking that allows the public to more fully understand the policy choices of agency actors.

Any revisions to the NSPS can and should be done based on a cost-benefit analysis that takes into account the costs of implementing the newest and best technologies for NO_X emissions as well as the benefits of continued reduction and regulation of NO_X pollutants.

Benefits of a Stricter Standard Almost Certainly Justify the Costs

Benefits

The primary benefit of the current new source performance standard is the reduction in harm caused by NO_X air pollution. Since EPA promulgated the 1971 standard, science has increased its understanding of the adverse health effects that result from particulate matter and ground-level ozone, formed by pollutants including NO_X.[13] The "benefits" side of EPA's NO_X emissions reduction analysis should include these developments. That is, because it is now known that the potential for harm resulting from NO_X emissions is greater, there is a correspondingly greater benefit to EPA regulation of such emissions.

There are also crucial ancillary benefits from revising the NSPS standard for NO_X: namely, stricter standards for NO_x could have a beneficial impact on the abatement of nitrous oxide (N_2O) as well. Several technologies currently available would reduce the emissions of both pollutants simultaneously (such as nonselective catalytic reduction).[14] Even if EPA does not issue separate performance standards to directly control nitrous oxide emissions from nitric acid plants—and it should, see *infra* Part II—the agency still must consider the potential effects on nitrous oxide emissions when setting its NO_x standards. This approach is consistent with executive orders, statutory instructions,[15] and good policy.

Costs

The primary costs of a stricter standard are the technology upgrades and process changes required for industry to comply. When estimating costs, it is important for EPA to accurately assess the baseline and to account for the potential for technological growth. Since the 1971 standards were originally issued, research has developed many newer, cheaper, and more effective means to reduce NO_X emissions.[16] In fact, many plants have already voluntarily implemented technologies that reduce NO_X emissions below the level articulated in the current NSPS.[17] EPA's analysis should take these current practices into account in order to determine the burden on the industry of using newer technologies to achieve emissions reductions.[18] Additionally, this history should remind EPA of the potential for industry to adapt to regulatory requirements by finding cheaper, more effective ways to comply; in other words, technology can bring down compliance costs over time.

EPA Should Use Data from Trading Programs to Inform the Revised NO_X Standard

The NO_X Budget Trading Program (or "NO_X SIP Call") could assist EPA in setting an emissions standard for nitric acid plants that is cost-benefit justified. Despite the fact that this program was superseded by the Clean Air Interstate Rule's ("CAIR") NO_X ozone season program[19] (which is likely to be replaced by the new Transport Rule),[20] data from the NO_X Budget Trading Program reports in 2008 could provide insight into the quantified benefits of NO_X emissions reductions. As of the close of 2008, the cost of a NO_X permit was $592 per ton.[21] Under a market system like the NO_x SIP Call, if the emissions budget is set efficiently, the permit price will equal the marginal cost of abatement, which should also equal the marginal benefits of reducing emissions. In short, the benefit of reducing NO_x emissions from sources within the trading program is roughly $592 per ton.

Using this figure as a benchmark, EPA can approximate the benefits of reducing NO_x emissions from nitric acid plants,[22] and should design its nitric acid performance standards so that marginal costs equal marginal benefits. Therefore, EPA should set the emissions standard such that nitric acid plants spend the necessary amount to comply with the regulation, up to the cost of the SIP Call permit price.

EPA should also consider ways to harmonize NO_x regulations of utilities under the Transport Rule with those for nitric acid plants. Assuming the benefits of NO_x reductions are comparable regardless of source and geography, it would be most efficient to prioritize NO_x reductions in the sectors with the lowest compliance costs. For example, if the cost to nitric acid plants is significantly lower than the cost to utilities, EPA could achieve the same total emissions reductions more efficiently by increasing the budget for NO_X emissions under the Transport Rule and instead prioritizing greater reductions under the NSPS program. EPA should take advantage of potential lower-cost abatement opportunities in the nitric acid industry by increasing the performance standard requirements until the marginal cost of compliance equalizes the price of a NO_x permit under the Transport Rule trading program (at which point the marginal abatement cost across all sectors will be equal).

EPA Should Set an N_2O Performance Standard for Nitric Acid Plants

In addition to emitting NO_X air pollutants, the process of producing nitric acid also releases significant quantities of nitrous oxide (N_2O).[23] In 2009, nitric acid production emitted 88% of all industrial N_2O emissions[24]—the equivalent of the annual greenhouse gas ("GHG") emissions from 2.6 million cars.[25]

Nitrous oxide is a potent greenhouse gas—310 times more potent than carbon dioxide, in fact.[26] Therefore, even when emitted in small quantities, this gas can pose a significant threat to public health and welfare. While NO_X has been included in the NSPS program since nitric acid plants were listed as a category in 1971, nitrous oxide has never been included. EPA should (and in fact may be required to) utilize the opportunity of the delayed NSPS review to regulate nitrous oxide emissions from nitric acid plants.

EPA Should Exercise Its Discretion To Regulate Nitrous Oxide for New Nitric Acid Plants

Regulate air pollutants to maximize net benefits

While EPA is required to "establish Federal standards of performance for new sources within such category,"[27] the Clean Air Act does not explicitly lay out a decisionmaking framework by which EPA must determine which pollutants get standards of performance and which do not. EPA should use its discretion to target pollutants where analysis indicates benefits will justify costs.[28]

The Clean Air Act does provide some limits to EPA's discretion under Section 111. Specifically, standards of performance only apply to "air pollutants."[29] However, both the Supreme Court, in *Massachusetts v. EPA,*[30] and EPA, in its "tailoring rule,"[31] have determined that nitrous oxide is an air pollutant. Section 111 also provides a decisionmaking framework for listing categories of sources that will be subject to standards of performance: any category which, in EPA's judgment "significantly contributes to air pollution that endangers public health or welfare"[32] should be included. Determining which of the pollutants emitted by sources in already-listed categories should receive standards, however, need not be based on a finding of "significant contribution" and "endangerment."[33] As EPA has stated in its guidance for establishing NSPS:

> An endangerment finding would be a prerequisite for listing additional source categories under section 111(b), but is not required to regulate GHGs from source categories that have already been listed, such as EGU's at power plants and refineries.[34]

Because nitric acid plants have been listed as a category since March 1971,[35] EPA need not determine that nitrous oxide from nitric acid plants significantly contributes to air pollution that endangers public health or welfare in order to set a standard of performance for that pollutant.

Finally, while the definition of standard of performance specifies a particular *level* of the emissions standard (i.e., "best," "cost," "demonstrated"),[36] it does not specify *when* a standard must apply to a particular pollutant.

In past rulemakings, EPA has acknowledged that the agency may have broad discretion as to when to promulgate a standard of performance for any particular pollutant.[37] While it is not clear that EPA in fact has this level of discretion,[38] even under this interpretation, a cost-benefit framework would be appropriate. Consistent with the requirements of executive orders, EPA should assess the costs and benefits of setting standards of performance for each potential pollutant, and then target those pollutants where regulation would maximize net benefits.

Strong Evidence Indicates the Benefits of Regulating Nitrous Oxide Will Justify the Costs

The benefits of regulating any pollutant primarily consist of the mitigation of harm otherwise caused by its emission. For nitrous oxide, the benefit of regulation is predominantly the reduction of the negative impacts of global climate change. As EPA has previously determined, nitrous oxide, a greenhouse gas, poses a danger to public health and welfare.[39] EPA has quantified the harm of a marginal unit of the most common greenhouse gas, carbon dioxide, as the "social cost of carbon" ("SCC").[40] Though it must be done carefully, the SCC can also be used to approximate the benefits of reducing nitrous oxides, once nitrous oxide pollution has been translated into carbon-dioxide equivalent units (based on the relative global warming potential of the two pollutants).[41] Because of scientific and economic uncertainty, EPA has not prescribed a single monetized number for the SCC; instead it uses four different quantifications, ranging from $4.70 to $64.90 per ton.[42] Many reasons support using values on the higher end of that spectrum.[43] However, even using all but the lowest possible values, NSPS for nitrous oxide will likely produce benefits that exceed costs. Using the central value of $21 would produce benefits that far exceed the costs.

Specifically, those costs would include the technological upgrades and process changes that new and modified plants must implement to comply with regulation.[44] EPA has recently conducted a thorough review of current and emerging technologies that reduce nitrous oxide.[45] This study indicates that the costs of reduction are relatively low. Utilizing technology "*demonstrated in practice,*" nitric acid plants can reduce over 80% of their nitrous oxide emissions at a cost of $2.32 - $6.49 for every ton of carbon-dioxide equivalent reduced.[46] (Note that this estimate could be further reduced if EPA adopts the flexibility mechanisms outlined below.[47])

Considering Interactive Effects Can Increase Benefits and Lower Costs

As outlined above, in conducting its cost-benefit analysis, EPA should also consider the interactive effects that controlling nitrous oxide will have on the reduction of NO_X, and vice versa.[48] The costs and benefits of additional NO_X reductions should then be included in any cost-benefit analysis that EPA conducts with regard to nitrous oxide.

Considering the interactive effects justifies setting a nitrous oxide standard at the same time EPA revises the NO_X standard. By setting concurrent standards, EPA can maximize net benefits across both pollutants. If EPA waits to set nitrous oxide standards at a later date, these standards could increase the overall cost of compliance while producing no additional benefit. In most cases, it is more cost effective for plants to design emissions reductions as part of the initial construction rather than adding them to existing plants. Therefore, as new or modified plants are faced with added capital expenditures to meet a more stringent NO_X standard, it would be cost-effective for them to simultaneously meet a nitrous oxide standard.

In fact, EPA already considers joint review of standards to be a cost-effective form of regulation. EPA strives, whenever possible, to utilize a sector-based approach to regulation. These integrated assessments consider the interactive effects of different regulatory measures for multiple pollutants to determine the "optimum strategies, considering feasibility, costs, and benefits across the different pollutant types while streamlining administrative and compliance complexities and reducing conflicting and redundant requirements, resulting in added certainty and easier implementation of control strategies for the sector under consideration."[49]

For these reasons, considering the costs and benefits of regulating nitrous oxide as an additional pollutant at the same time that EPA revises the NO_X standard is a sensible strategy that will lead to more efficient overall levels of regulation.

EPA Discretion May Be Limited, and Nitrous Oxide Standards May Be Required

While EPA may have some discretion to set standards of performance for particular air pollutants under NSPS, it is also possible that EPA's discretion is limited. In considering any future revisions, EPA should remain cognizant of the legal constraints that may affect its regulatory choices.

The Arbitrary and Capricious Limitation

To the extent EPA does have discretion to select which pollutants to regulate, it must exercise that discretion in a non-arbitrary way.[50] A cost-benefit framework provides a clear and rational basis for choosing the standards of performance for any given pollutant—and in this case, for making the decision to set them for nitrous oxide emissions from nitric plants. Conversely, if EPA were to rely on some of its prior justifications for not regulating, the agency could open itself up to a potential arbitrary and capricious challenge.[51]

Under the previous Administration, EPA primarily argued that any regulation of greenhouse gases under Section 111 would trigger other sections of the Act, resulting in rushed regulation without sufficient time to effectively understand the complexities of the greenhouse gas pollution problem. Such justifications do not apply to nitrous oxide at this time. Concerns about triggering sections of the Clean Air Act (such as New Source Review and the Prevention of Significant Deterioration) have been made moot by EPA's proactive decision to regulate greenhouse gases under those very provisions.[52] Similarly, the argument that greenhouse gas regulation through the NSPS program requires an extended and deliberative process[53] has been satisfied, since the agency has engaged in such deliberations and studies.[54]

The current Administration has also asserted that it has the power to choose which pollutants to regulate, citing past examples where EPA has refused to include a new pollutant when promulgating an NSPS standard.[55] First, EPA pointed to a 1984 rulemaking for natural gas processing which included SO_2 and VOCs, but not a number of other pollutants. They justified this decision by arguing that the unregulated pollutants were effectively reduced by the technology that would be implemented to control SO_2.[56] That is not the case for nitrous oxide. While N_2O *can* be controlled by some of the same technology that limits NO_X emissions, without a specific standard such technology will not be widely implemented.[57]

EPA has also cited to a 1987 rulemaking for various manufacturing processes, where the agency decided to regulate only the pollutant that was emitted in the greatest quantity.[58] However, because quantity of emissions does not necessarily correlate to the cost of emissions reductions or the relative net benefits of pollutant reduction, basing the decision on the quantity emitted could be considered unreasonable. Lastly, EPA has looked to *Nat'l Lime Ass'n v. EPA*[59] to support its argument in favor of discretion; however, in that case, the agency cites cost and the unavailability of adequate technology as reasons for not regulating certain pollutants. Neither of those justifications is applicable to nitrous oxide at nitric acid plants.

Given its efforts to begin to regulate greenhouse gases in other sectors and the state of current technology, an EPA decision not to regulate nitrous oxide emissions from nitric acid plants could invite an arbitrary and capricious challenge. Therefore, in order to avoid such a challenge, the agency should utilize the additional time it has for its NSPS review to establish standards of performance for nitrous oxide in nitric acid production.

Potential Statutory Limitations

Finally, there is some reason to believe that the text of the Clean Air Act prevents EPA from exercising unlimited discretion in promulgating standards of performance. Though the text is silent as to the definition of "standard of performance" and despite the fact that there exists discretionary language in Section 111(b)(1)(B), the act does not clearly confer power for the agency to choose which particular pollutants to regulate.

EPA has argued that because the phrase "emission of air pollutants" does not include the word "any," it has discretion over which air pollutants it sets standards for. However, the statutory structure and legislative history of Section 111 indicates that EPA may not have such discretion. The use of the term "air pollutant" in other parts of Section 111 demonstrates that Congress intended to limit EPA's discretion. While "any" is not included as a modifier for "air pollutant" in Section 111(a)(1)'s definition of "standard of performance," it *is* included in the definitions of the term "modification."[60] Under Section 111(b), NSPS standards apply to facilities constructed or modified after standards have been set.[61] In other words, if an existing facility undergoes a modification—a physical change that increases the emission of "*any*" air pollutant—it is a structure now subject to NSPS. Reading Section 111 to allow for unlimited agency discretion on which pollutants require performance standards could lead to the absurd result where a facility could become subject to NSPS regulation by increasing its emissions of a pollutant for which EPA has chosen not to set standards. A clearer reading, limiting EPA discretion, would easily avoid such absurdity.

Moreover, the fact that Section 111(a) does not include the word "any" may be explained by legislative history. In order to remove a scheme whereby different fuels were subject to different definitions of "standard of performance," Congress consolidated the definition in the 1990 Amendments to the Clean Air Act. This change was not intended to give EPA complete discretion over which pollutants it could regulate under NSPS, but instead to *consolidate* the definition to apply to all sources broadly.[62]

Finally, as detailed above, Section 111(b)(1)(A) requires EPA to list categories of sources that cause or contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare. EPA's prior reading of Section 111(a)(1) would allow it to decline to set standards of performance for the very pollutants that cause the category of sources to be listed in the first place. Any reading of "standard of performance" should thus, at the very least, create a non-discretionary duty to set standards of performance for any air pollutants which would sufficiently endanger public health and welfare. Nitrous oxide meets this standard.[63] Nitrous oxide emissions, which significantly endangers public health and welfare as determined *by EPA*, would be sufficient to render nitric acid plants a listed category under Section 111(b)(1)(A). It would make little sense, then, for EPA to not be required to set standards of performance for that pollutant.

EPA has also argued[64] that it has discretion over which pollutants to regulate because of language in Section 111(b)(1)(B) directing the Administrator to "promulgate within one year of [] publication, such standards with such modifications *as he deems appropriate*."[65] A more clear reading of this section would indicate that "as he deems appropriate" qualifies "with such modifications." The language simply means that EPA is not required to adopt all modifications suggested by commenters or considered by the agency. It does not provide unlimited discretion for EPA to promulgate "such standards." The inconsistent use of "as appropriate" in the Clean Air Act lends further support to this reading.[66]

If EPA has discretion under the statute, it should use that discretion to set standards of performance for pollutants for which the benefits of regulating will justify the costs. Choosing *not* to regulate nitrous oxide fails to maximize social welfare, is inconsistent with Administration and current EPA policy, and could create the possibility of an arbitrary and capricious challenge. It is also possible that EPA is required to include nitrous oxide under NSPS. In either case, the outcome is the same: EPA should take advantage of the current plan to delay its revision of the current NSPS standards for nitric acid plants, and set a standard of performance for nitrous oxide.

Regulation of Nitrous Oxide for New Sources Triggers Regulation for Existing Sources

Section 111(d) provides direction for regulating existing sources within the NSPS framework. That section stipulates that EPA shall guide the states on the issuing of performance standards for those air pollutants not included in Section 108 (National Ambient Air Quality Standard program) or 112 (Hazardous Air Pollutant program), and that would otherwise be regulated under the NSPS program if they were emitted by new sources.[67] Section 111(d) explains that states should develop plans for the implementation and enforcement of the performance standards.[68]

Should EPA decide to regulate GHGs for new sources under Section 111(b), states would need to submit plans to control these pollutants at designated existing facilities.[69] In the absence of regulation of GHGs under either section 108 or 112, regulation under 111(b) automatically triggers regulation under 111(d).

Because EPA has indicated that it will not regulate GHGs through either Section 108 or 112, Section 111(d) provides a useful alternative method. First, use of Section 111(d) avoids the grandfathering problem inherent in the sole use of Section 111(b). Section 111(b) applies only to new and modified sources, which means that if the cost of regulating N_2O is high enough, there may be a disincentive to build new, more environmentally friendly sources, or modify existing sources that fall below the emissions standards set by the NSPS. Section 111(d)'s application to existing sources provides a ready solution for this problem. Second, by regulating GHGs through both Section 111(d) and 111(b), there are increased net benefits to be gained: more nitrous oxide emissions will be reduced if both avenues of regulation are used.

While there may be increased costs associated with regulating existing sources, it is unclear that these costs would be so great as to preclude regulation under Section 111(d). As discussed *supra*, there are relatively inexpensive technologies that can be readily implemented by existing sources to reduce N_2O emissions. Additionally, Section 111(d) provides for significant flexibility in regulating pollutants otherwise regulated under the NSPS for new and modified sources.

Under the current regulations governing the use of 111(d), EPA is required to first publish a guideline document "containing information pertinent to control of the designated pollutant from designated facilities."[70] Subsequently, each state must submit a plan for the control of the designated pollutant. These plans must specify emissions standards, which can take the form of either "an allowance system or prescri[ption of] allowable rates of emissions."[71] As argued *infra*, in order to maximize net benefits, EPA should utilize the allowance provisions of this guidance document to implement a flexible, market-based regulatory program under Section 111(d).

EPA Should Create a Flexible System to Regulate Nitrous Oxide Emissions

The Benefits of Flexibility

Allowing firms to meet set environmental goals with flexible tools can greatly reduce the cost of compliance. In many situations—including the control of air pollutants like greenhouse gases—command-and-control regulations are less efficient than market-based controls:

> Market-based regulation can attain aggregate emission reductions equivalent to those produced by a command-and-control regime, while at the same time giving companies the flexibility to follow least-cost abatement strategies. As Professor Robert Stavins has observed, market-based instruments induce firms to choose control levels, for each source, at which their marginal abatement costs are the same, thus minimizing overall pollution abatement costs. He explains: "Because the costs of controlling pollution vary greatly among and within firms, any given aggregate pollution control level can be met at minimum aggregate control cost only if pollution

> sources control at the same marginal cost, as opposed to the same emission level. Indeed, depending on the age and location of emission sources and available technologies, the cost of controlling a unit of a given pollutant may vary by a factor of one hundred or more among sources."[72]

Current NSPS mechanisms lie somewhere between command-and-control and market-based flexibility on the efficiency spectrum. Standards of performance do not generally mandate particular plant *design* for reducing emissions. Instead, they mandate performance standards by allowing firms to choose *how* to meet the standard.[73] While performance standards are preferable to design standards, they still fall short of achieving optimal efficiency. Innovative firms that could reduce their emissions at lower marginal cost than the average firm have no incentive to pursue reductions beyond the emissions standard. Firms that have particularly high marginal costs of reduction are still forced to make those reductions. While there is flexibility *within* plants for choosing the most efficient reduction methods, there is currently no flexibility *between* plants for making the cheapest reductions first.

As global pollutants, greenhouse gases such as nitrous oxide are ideal candidates for flexibility *between* plants.[74] Emissions in one part of the country (or world) will have the same impact on warming as emissions in any other part of the world. Conversely, reductions from one plant will have the same environmental and public health benefits as reductions from any other plant. By introducing market-based flexibility mechanisms, EPA can further bring down the costs of compliance for the nitric acid industry without sacrificing environmental and environmental justice obligations.[75]

Statutory Authority to Implement a Flexible NSPS Regime

Section 111 provides EPA with significant discretion for implementing flexible emissions regulation for nitrous oxide from nitric acid plants, at the federal level, state level, or some combination thereof. As outlined above, EPA has the obligation to set performance standards for new and modified sources under Section 111(b), and set guidelines for mandatory state regulation of existing sources of pollutants under Section 111(d). States must then submit plans for regulating greenhouse gas emissions from existing sources within the state, subject to approval by EPA.[76]

Flexibility for Existing Sources

The Clean Air Act stipulates that the procedure for submission and approval of state plans under Section 111(d) should mirror the process established by EPA to review the State Implementation Plans (SIPs) under Section 110.[77] Section 110 authorizes states to "include enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights) . . . ."[78] This indicates that Congress intended the states to have wide latitude in establishing methods for controlling emissions under Section 111(d). Similarly, states are allowed to consider "other factors" in implementing and enforcing performance standards for existing sources.[79] EPA has previously agreed with an interpretation that allows for significant flexibility among the states. In regulations established pursuant to Section 111(d), for instance, emissions standards can "either be based on an allowance system or prescribe allowable rates of emissions."[80] An "allowance system" is defined as

> a control program under which the owner or operator of each designated facility is required to hold an authorization for each specified unit of a designated pollutant emitted from that facility during a specified period and which limits the total amount of such authorizations available to be held for a designated pollutant for a specified period and allows the transfer of such authorizations not used to meet the authorization-holding requirement.[81]

EPA's implementation of the Clean Air Mercury Rule ("CAMR") further provides precedent for market-based programs under Section 111(d). In response to a challenge to CAMR, EPA proffered three arguments in support of the flexible regime imagined by the rule.[82] First, EPA noted that the phrase "any existing source" in Section 111(d) means all sources within a particular category, and does not simply mean that each unit within a particular category must be subject to the same emissions rate. Thus a market-based emissions reduction program could satisfy Section 111(d)(1)(A).[83] Second, the "system of emission reduction" envisioned by Section 111(a)'s definition of a "standard of performance" could encompass a flexible emissions reduction program and is not limited to a technological system that will achieve a particular emissions rate-based standard.[84] In fact, Congress specifically amended the definition of standard of performance from the narrow "technological system of continuous emissions reduction" to the more flexible "best system of emissions reduction" in 1990.[85] Third, EPA asserted that the petitioners' reliance on *Asarco, Inc. v. EPA*[86] was misplaced because that case "did not address whether the term 'standard of performance' could include a cap-and-trade program that applies to each source and that allows emissions trading among sources (as opposed to netting of emissions among individual units within a source to avoid application of a standard of performance)."[87]

Additionally, if EPA determines that a state's plan does not satisfactorily meet its guidance, or if a state chooses not to regulate, the Agency can "prescribe a plan for the state."[88] In that case, EPA has the same authority it would if implementing a Federal Implementation Plan (FIP) under Section 110(c).[89] Given that EPA has the same authority in issuing a FIP that states do in issuing SIPS,[90] in the case that EPA regulated existing sources under Section 111(d)(2), it would also have discretion to utilize flexible market-based regulatory tools.

The statutory support for a flexible regime under Section 111(d), combined with legislative history and EPA's own interpretations, strongly suggest that a market-based system is viable under Section 111(d).

Flexibility for New Sources

A similar flexibility mechanism could apply to new sources under Sections 111(b) or (c). As discussed above with regards to the term "standard of performance," there is a strong argument to be made that this phrase provides for non-technological as well as technological systems of emissions reduction. Thus, the federal government could conceivably prescribe a flexible system under Section 111(b). Similarly, if a market-based flexible emissions standard is viable under the Act's definition of "standard of performance," then state and regional programs could be implemented for new sources pursuant to Section 111(c) along with existing sources under Section 111(d). Under Section 111(c), states may petition EPA to "implement[ ] and enforc[e] standards of performance for new sources located in such State."[91] Section 111(c) thus provides yet another avenue through which EPA could regulate GHGs through a state-run market-based flexible emissions reduction program.[92]

EPA Should Implement a Flexible Regime Across Greenhouse Gases and NSPS Categories

Nitric acid plants are not the only category of sources that emits greenhouse gases. Under the conventional implementation of NSPS emissions standards, EPA sets a separate standard for each pollutant under each category. The efficiency of greenhouse gas reductions can be greatly increased by linking the reduction of nitrous oxide emissions from nitric acid plants to reductions of all greenhouse gases across industries. EPA is in the process of developing proposed NSPS regulations for fossil fuel-based electric generating units and petroleum refineries.[93] EPA should utilize the delay in promulgating new standards for nitric acid plants to begin incorporating other industries into a broader regulatory framework.

The Benefits of Broad Scope in Market-Based Systems

First, EPA should, to the extent feasible, provide firms, including nitric acid plants, with the flexibility to exchange emissions permits across categories. Technological factors may make the reduction of a marginal unit of greenhouse gases more or less expensive for a particular industry. The reductions in nitrous oxide from nitric acid plants, for example, can be achieved at very low cost, particularly when compared to reductions at larger sources such as power plants. By providing firms with the lowest-cost reductions the flexibility to exchange their excess capacity with firms that are limited by technology or cost, EPA can minimize the overall cost of greenhouse gas reductions. By introducing flexibility *between industries*, EPA can take advantage of the relatively low marginal cost for reductions from nitric acid plants and reduce the costs of NSPS compliance across the economy.

Second, EPA should not limit flexibility across plants to nitrous oxide. While, nitrous oxide is the only significant greenhouse gas emitted by nitric acid plants, other greenhouse gases, such as carbon dioxide, are emitted by other categories of sources. The agency should allow firms to freely buy or sell permits for *any* of the six well-mixed greenhouse gases. Because a unit of any of these gases, when converted into appropriate carbon dioxide equivalent units, has a similar effect on global climate change, the marginal benefit of reduction will be equivalent.[94] Allowing emitters to exchange reductions across gases will increase the efficiency of the flexible programs by channeling reductions to the least-cost emitters of global climate pollution (rather than specified reductions for each particular gas).

The Legal Authority for Broad Scope in Market-Based Systems

The ability of EPA and the states to allow trading of GHG emissions allowances across different source categories (and possibly even with sources not regulated under Section 111, through the use of mechanisms commonly called "offsets") turns on their discretion to interpret the definition of a "standard of performance." There is no clear statutory preclusion to such a broad interpretation, and where statutory language is ambiguous, the Supreme Court has held that agencies have discretion to give reasonable interpretations. It is reasonable to define the "best system of emission reduction . . . (taking into account the cost . . .)" as one that uses flexible mechanisms to permit trading between source categories. Such an interpretation might even be supported by legislative history: over the years, Congress has moved increasingly away from requirements for technology-based, on-site emissions reductions under Section 111, and has even favorably discussed the achievement of emissions reductions by third parties.[95]

Specific Options: Flexible Emissions Budgets and Flexible Emissions Rates

Given that the agency possesses statutory authority to establish or encourage flexible emissions reduction regimes for both new and existing sources under NSPS, the agency should consider the best, most efficient, least burdensome mechanisms to reduce nitrous oxide emissions from nitric acid plants. EPA has a number of options to establish the "best system of emissions reductions."[96] Below are two potential options for the Agency to consider.

Flexible Emissions Budget for GHGs

The most efficient and effective mechanism to reduce nitrous oxide from nitric acid plants would be to establish or encourage a flexible emissions budget for polluters. Under this system, EPA would determine, based on the latest science and policy, the optimal quantity of emissions of greenhouse gases[97] and set that as a national emissions budget (which could be subdivided into state-specific budgets). Each source would be permitted to emit a portion of that total. The level of these budgets would depend on whether EPA is regulating only nitric acid plants or if it expanded the program to multiple categories of sources. If individual sources were able to reduce their emissions to a level below their budget, they would have the flexibility to sell those additional reductions. With a market of permits available for firms to buy and sell excess emissions, the marginal cost of emissions reductions would be equalized across firms. This would result in the most cost-effective reductions. Over time, EPA could reduce the overall national budget, thereby bringing down greenhouse gas emissions steadily to the optimal level.

In addition to channeling emissions reductions to sources that can most cost-effectively make them, a flexible emissions budget program will also provide an incentive for firms to develop new technologies to reduce greenhouse gases. By creating an economic opportunity for firms to cheaply reduce emissions, the private sector will have a strong signal that investments in emissions-reducing technology will be rewarded with a market for their sale. Technological innovation will bring down the cost of emissions reductions across the economy, allowing EPA to further reduce the national budget in the future.

In determining how to distribute budgets, one option would be for EPA and the states to auction emission permits to the sources willing to pay the highest price. The main advantage of an auction is it raises revenue, which could be used to ameliorate the potential economic impacts of the program, could be invested in research to solve other market-failures, or could be used to fulfill other policy goals such as deficit reduction. EPA's statutory authority to auction permits has not been affirmatively demonstrated; however, there is reason to believe that it is consistent with the agency's powers (though revenue would have to be deposited into the general treasury).[98]

Alternatively, EPA and the states could distribute free permits to firms. This distribution mechanism would have equivalent environmental outcomes of an auction. If the initial allocation is "incorrect" in terms of which firms can most efficiently reduce emissions, the flexibility provisions of the program will allow a redistribution of permits until they are with the most cost-effective reducers. However, the allocation decision will have an impact on the economic consequences of the flexible emissions budget program. To the extent a firm receives permits in excess of its optimal reduction of emissions, it will receive a windfall by selling those permits to other emitters. There are therefore strong equity reasons for EPA to pursue an initial auction of permits.[99]

Flexible Emissions Rates for GHGs[100]

Similar to traditional Section 111(b) standards of performance, a flexible emissions rate for GHGs would establish a baseline emissions rate for all firms. This rate is generally expressed in pollution per unit of output (e.g., kg N_2O per tons HNO_3).[101] Unlike the static status quo policy, however, the flexible emissions rate would introduce a market mechanism that channels reductions to those emitters with the lowest marginal cost of reduction. Firms that could reduce their emissions rate below the baseline would be able to sell extra permits to firms that had a higher marginal cost of emissions-rate reduction.[102] As with the emissions budget system outlined above, this flexible emissions rate program would push emissions reductions to the firms that could reduce most cost-effectively.

The cost of reductions, therefore, would approach the marginal cost of reduction across the regulated industry (nitric acid plants, or greenhouse gas emitters more generally, depending on the scope of regulation). The flexible emissions rate regime would similarly provide incentives for firms to continuously innovate. By providing incentives for firms to reduce emissions rates below the average level, this regulation would channel capital into the least GHG-intensive economic activities, and provide entrepreneurs and the private sector with the additional financial benefits for investment in new technologies to reduce emissions.

Additionally, flexible emissions rates would encourage efficiency. On top of incentives to invest in pollution-limiting technology like innovative catalytic processes, plants would also have a strong incentive to increase units of useful output (MWh, HNO_3) without increasing emissions (that is, producing more useful output for the same pollution inputs). Increasing output will lower the emissions rate, reducing the quantity of required permits the firm must purchase or increasing the number it can sell onto the market.

There is some concern that this will encourage firms to produce excess units of output and therefore limit the efficacy the policy has on reducing the overall quantity of emissions. Unlike the budget program, a flexible emissions standard program does not provide certainty as to the overall environmental benefit of the policy. Because emissions at individual plants can vary by units of output, firms can increase their output and thereby increase their emissions quantity while still complying with the regulations. Firms can build additional units, producing more *overall* greenhouse gases, as long as the emissions *rate* of those units is not above the regulatory standard.[103] This can lead to the hypothetical case where the average greenhouse gas-intensity of the industry decreases even while the total emissions increase.[104]

One way of limiting the impact of this problem is to set the national baseline rates based on the previous year's total emissions (reduced by a factor to continually reduce the pollution-intensity of the economy). By considering any increase or decrease in the previous year's total emissions and adjusting the allowable baseline rate accordingly, there will be the appropriate disincentive to increase aggregate emissions over the long-term.[105]

Flexible emissions rates have a de facto allocation of permits to existing users based on their current emissions profile. Firms which currently operate below the baseline emissions rate can immediately sell their "excess" permits to firms that are above the rate. This will likely result in a transfer of wealth from high-GHG producers to low-GHG producers. This wealth transfer will affect the producers themselves through decreased profits, and the consumers who purchase from these producers in higher prices. Unlike an auction-based emissions budget program, a flexible emissions rate system does not raise revenue that can be used to ameliorate some of these distributional concerns.

While a flexible emissions standard is more efficient than the historic implementation of Section 111(b) standards of performance, it is a second-best policy solution when compared to the flexible emissions budget system outlined above. It is important to emphasize, though, that the majority of the complications with a flexible emissions rate program would apply with equal force to the status quo policy of fixed emissions rates under NSPS. Therefore, while they do suggest that a flexible emissions budget policy would be preferable from an efficiency and environmental perspective, they should not be used to reject the second-best solution if a budget is not implemented.

Conclusion

EPA has several additional months to review is performance standards for nitric acid plants. The agency should use this time to carefully consider how to best maximize the net benefits of regulation. By applying cost-benefit analysis and incorporating the latest market data and technological studies, EPA can select the optimal level for the regulation of NO_x. The agency should also pursue regulation of N_2O, which will deliver additional net benefits in concert with NO_x controls. Finally, EPA should think about the future of greenhouse gas regulation under Section 111 and start to build flexible compliance mechanisms that will reduce costs without sacrificing ultimate emissions goals.

Notes

1 *See* Clean Air Act Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1683 (codified as amended at 42 U.S.C. § 7401 *et seq.*).

2 Part 60—Standards of Performance for New Stationary Sources, 36 Fed. Reg. 24,876, 24,876 (Dec. 23, 1971).

3 Standards of Performance for Nitric Acid Plants, 40 C.F.R. § 60.70(b) (2010). Currently, the performance standards for nitric acid plants stipulate that "no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases" containing either nitrogen oxides (NO_X) in excess of 1.5 kg per metric ton (or 3 lb per ton) or exhibiting ten percent opacity, or greater. 40 C.F.R. §§ 60.72(a)(1)–(2).

4 Clean Air Act, 42 U.S.C. § 7411(b)(1)(B) (2010).

5 Review of Standards of Performance for New Stationary Sources; Nitric Acid Plants, 49 Fed. Reg. 13,654 (Apr. 1984). Prior to 1984, one other review was conducted in 1979. Review of Standards of Performance for New Stationary Sources; Nitric Acid Plants, 44 Fed. Reg. 35,265 (June 19, 1979). Neither of these reviews resulted in any significant revisions to the nitric acid NSPS.

6 EPA agreed to, by November 2010, "sign and submit for publication in the Federal Register one or a combination of the following: (a) A proposed rule containing revisions to NSPS Subpart G pursuant to CAA 111(b)(1)(B); and/or (b) a proposed and/or final determination under CAA 111(b)(1)(B) not to revise NSPS Subpart G." Proposed Consent Decree, 74 Fed. Reg. 58,954 (Nov. 16, 2009).

7 Environmental Protection Agency Rulemaking Gateway, http://yosemite.epa.gov/opei/RuleGate.nsf/byRIN/2060-AQ10 (last visited May 7, 2011).

8 Exec. Order No. 12866 Section 1(a), 58 Fed. Reg. 51,735 (Sept. 30, 1993); Exec. Order No. 13563 Section 1(b), 76 Fed. Reg. 3,821 (Jan. 18, 2011) (stipulating that agencies must "propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify)").

9 *See also* Institute for Policy Integrity, The Road Ahead: EPA's Options and Obligations for Regulation Greenhouse Gases 63 (2009), *available at* http://policyintegrity.org/files/publications/TheRoadAhead.pdf ("When the CAA gives EPA regulatory discretion, the agency frequently uses cost-benefit analysis to determine how best to exercise its authority. Under Executive Orders that have been in place for nearly thirty years, all major regulatory actions are subjected to cost-benefit analysis, unless specifically prohibited by statute. Although the use of cost-benefit analysis is prohibited in some areas of the CAA, many other provisions permit or even require EPA to consider costs, benefits, and efficiencies.") (citations omitted).

10 Clean Air Act, 42 U.S.C. § 7411(a)(1) (2006) (emphasis added).

11 New York v. Reilly, 969 F.2d 1147, 1150 (D.C. Cir. 1992). This position is also consistent with recent Supreme Court decisions. *See, e.g.*, Entergy v. Riverkeeper, 129 S. Ct. 1498, 1510 (2009) ("[W]hether it is reasonable to bear a particular cost can very well depend on the resulting benefits.").

12 Richard L. Revesz & Michael A. Livermore, Retaking Rationality: How Cost-Benefit Analysis Can Better Protect the Environment and Our Health 10 (2008) ("The goal of cost-benefit analysis is straightforward: It seeks to maximize the net benefits of regulation.").

13 Last year, EPA tightened the NO_X standard under the NAAQS program "in order to provide requisite protection of public health." This revision was in large part based on scientific reports demonstrating increased understanding of adverse health affects of NO_X. Primary National Ambient Air Quality Standards for Nitrogen Dioxide, 75 Fed. Reg. 6,474 (Feb. 9, 2010); *see also* Environmental Protection Agency, Integrated Science Assessment for Oxides of Nitrogen —Health Criteria (2008), *available at* http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=194645 (go to "Downloads" and click

on report PDF link).

14 *See* Environmental Protection Agency, Available and Emerging Technologies for Reducing Greenhouse Gas Emissions From the Nitric Acid Production Industry 9 (2010), *available at* http://www.epa.gov/nsr/ghgdocs/nitricacid.pdf.

15 Section 111 instructs EPA to consider "any nonair quality health and environmental impact" of its performance standards. It is possible that the climate impacts of nitrous oxide reductions could count as a "nonair quality impact"; EPA has discretion to define the scope of these statutory terms.

16 These include "(1) extended absorption, (2) nonselective catalytic reduction (NSCR), and (3) selective catalytic reduction (SCR)." Environmental Protection Agency, Alternative Techniques Document 5-1 (Dec. 1991), http://www.epa.gov/ttn/catc/dir1/nitric.pdf. According to EPA's 1991 study, the extended absorption technique is capable of reducing NO_X emissions to .59 to 1.28 kg per metric ton, well below the standard of 1.5 kg per metric ton. Nonselective catalytic reduction plants have reduced NO_X emissions to .2 to 1.0 kg per metric ton.

17 The current standard of performance for nitric acid plants mandates that NO_X emissions be reduced by 93 percent below emissions produced by an uncontrolled facility, with a maximum output of 1.5 kg nitrogen dioxide per ton of nitric acid produced. Environmental Protection Agency, Background Information, Doc. EPA/APTD-0711 (Aug. 1971). However, more recent industry information indicates that nitric acid plants are fully capable of reducing their emissions to 95 to 98 percent below the uncontrolled facility emissions level. Environmental Protection Agency Report, Doc. EPA-450/3-91-026 (Dec. 1991). Current technologies used by nitric acid plants in the European Union demonstrate the availability of more cost-effective reduction solutions. There, model studies have identified technologies that reduce emissions to 0.42 kg/ton of nitric acid, roughly one-third of the requirement outlined in 40 C.F.R. part 60. European Union Report, Nitric Acid Industry: Synopsis Sheet (2005), *available at* http://www.citepa.org/forums/egtei/13-Synopsis-sheet-nitric-acid29-09-05.pdf. These studies are based on model data and do not necessarily represent current recommendations for regulation of NO_X emissions. However, they do provide an excellent baseline by which to determine best demonstrated technology.

18 *See* Clean Air Act, 42 U.S.C. 7411(b)(1)(B) (2010) ("When implementation and enforcement of any requirement of this chapter indicate that emission limitations and percent reductions beyond those required by the standards promulgated under this section are achieved in practice, the Administrator shall, when revising standards promulgated under this section, consider the emission limitations and percent reductions achieved in practice.").

19 CAIR is currently in a state of flux due to several court decisions invalidating CAIR and EPA's formulation of new rules that would achieve desired results. See Environmental Protection Agency, Clean Air Interstate Rule, http://www.epa.gov/CAIR/ (last visited May 7, 2011).

20 Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone, 75 Fed. Reg. 45,210 (Aug. 2, 2010).

21 Environmental Protection Agency, The NOX Budget Trading Program: 2008 Emission, Compliance, and Market Data 4 (2009), *available at* http://www.epa.gov/airmarkt/progress/NBP_1/NBP_2008_ECM_Data.pdf. However, in the Proposed Transport Rule, EPA determines that significant NO_X reductions can occur at $500/ton. *See* 75 Fed. Reg. 45,210, 45,275 (Aug. 2, 2010). Additionally, while this appears to be the most current publicly available data, EPA should use the most updated information it possesses when setting the price level.

22 So long as relevant factors such as population density are similar between the locations in which the NO_X trading program applies and the locations in which nitric acid plants are located, the benefits per unit of NO_X reduction are the same for areas subject to the trading program and for nitric acid plants.

23 The amount of N_2O is a function of "combustion conditions in the oxidizing unit, catalyst compositions, catalyst age, and burner design." Environmental Protection Agency, Available and Emerging Technologies, *supra* note 14, at 7.

24 For EPA analysis, N_2O is treated as having 310 times the global warming potential (GWP) of carbon dioxide when normalized over 100 years. Environmental Protection Agency, U.S. Adipic Acid and Nitric Acid N2O Emissions 1990-2020: Inventories, Projections and Opportunities for Reductions 1 (2001), *available at* http://www.epa.gov/nitrousoxide/pdfs/adipic_nitric_n2o.pdf. Part of the reason that N_2O has such a high GWP is its long atmospheric lifetime relative to CO_2 (120 years). Environmental Protection Agency, Available and Emerging Technologies, *supra* note 14, at 2. In 2009, nitric acid plants emitted approximately 47 Gg of N_2O, or 14.6 Tg equivalent of carbon dioxide (Tg CO_2 Eq.). Environmental Protection Agency, 2011 U.S. Greenhouse Gas Inventory Report: Industrial Processes, http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Chapter-4-Industrial-Processes.pdf (last visited May 7, 2011).

25 Cars emit 5.5 metric tons CO_2 Eq./yr.; therefore, 14.6 Tg CO_2 Eq. = 2.6 million cars. EPA, Emissions Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle, http://www.epa.gov/otaq/climate/420f05004.htm (last visited May 7, 2011).

26 Environmental Protection Agency, U.S. Adipic Acid and Nitric Acid N2O Emissions, *supra* note 24, at 1.

27 Clean Air Act, 42 U.S.C. § 7411(b)(1)(B) (2010). While EPA will be acting to set emissions standards for nitrous oxide during a review and not upon a new listing of a category, once it commences a review, EPA must "follow[] the procedure required by this subsection for promulgation . . . ." *Id.* Therefore, because cost-benefit analysis is not precluded as a standard for determining which pollutants to regulate *at promulgation*, it is likewise not precluded during review.

28 As argued above, Administration and EPA policy support that, when not otherwise prohibited, the agency should set regulation based on a cost-benefit analysis, at the level that maximizes net benefits. See *supra* Part I.A.

29 42 U.S.C. § 7411(a)(1) ("[S]tandards of emissions *for air pollutants*.") (emphasis added).

30 Massachusetts v. EPA, 549 U.S. 497, 529 (2007) ("[N]itrous oxide . . . are without a doubt 'physical [and] chemical . . . substance[s] which [are] emitted into . . . the ambient air.' The statute is unambiguous.").

31 Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514, 31,518 (2010).

32 42 U.S.C. § 7411(b)(1).

33 Even if such findings were required, they would likely be met for nitrous oxide from nitric acid plants. *See infra*.

34 Environmental Protection Agency, Background on Establishing New Source Performance Standards (NSPS) Under the Clean Air Act, *available at* http://www.epa.gov/airquality/pdfs/111background.pdf.

35 List of Categories of Stationary Sources, 36 Fed Reg. 5,931 (March 31, 1971).

36 42 U.S.C. §7411(a)(1).

37 Standards of Performance for Petroleum Refineries, 73 Fed. Reg. 35,838, 35,859 (June 24, 2008) ("The Agency has always interpreted this initial requirement as providing the Administrator with significant flexibility in determining which pollutants are appropriate for regulation under section 111(b)(1)(B).").

38 *See infra* Part II.B.

39 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009).

40 *See generally* EPA, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (2010), *available at* http://www.epa.gov/oms/climate/regulations/scc-tsd.pdf.

41 In evaluating the benefits of nitrous oxide reduction, EPA should be aware of one challenge in using existing SCC values. Nitrous oxide has similar global warming properties to carbon dioxide; however, EPA has noted that due to differences in radiative forcing and atmospheric lifetimes, a simple arithmetic conversion between the global warming potential of CO_2 and N_2O will not yield an accurate social cost of N_2O. *Id.* at 1. While this methodological consideration adds a level of complexity to monetizing the benefits of nitrous oxide reduction, it should not foreclose regulation. Factors exist that would cause the social cost of non-CO_2 gases to be higher than CO_2 in some respects and lower in others. *Id.* There is little reason to believe the economic benefits of nitrous oxide reduction are so drastically different that they would lead to a different outcome as to *whether* EPA should set emissions standards for nitric acid plants. EPA can utilize the SCC values it currently has and update the *level* of the standard as additional work on non-CO_2 greenhouse gas costs is developed.

42 *Id*.

43 *See* Institute for Policy Integrity & Environmental Defense Fund, Comments on Proposed Vehicle Emission and Fuel-Economy Standards (2009), *available at* http://policyintegrity.org/what-we-do/update/comments-on-proposed-vehicle-emission-and-fuel-economy-standards/.

44 Plants would also face compliance costs such as monitoring. In the case of nitrous oxide at nitric acid plants, however, these costs are likely to be minimal; importantly, plants are already required to monitor and report their nitrous oxide emissions under a separate EPA rule. 74 Fed. Reg. 56,260 (Oct. 30, 2009); Mandatory Greenhouse Gas Reporting: Nitric Acid Production, 40 C.F.R. pt. 98.222 ("You must report N_2O process emissions from each nitric acid production train as required by this subpart.").

45 Environmental Protection Agency, Available and Emerging Technologies, *supra* note 14.

46 *Id.* at 9.

47 See *infra* Part III.

48 *See supra* Part I.A.

49 National Emissions Standards for Hazardous Air Pollutants From Portland Cement Manufacturing Industry and Standards of

Performance for Portland Cement Plants, 75 Fed. Reg. 54,970, 54,997 (2010).

50 *See* Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (defining arbitrary and capricious standard in rulemaking).

51 *See id.* at 41–42.

52 Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514, 31,518 (2010).

53 Standards of Performance for Petroleum Refineries, 73 Fed. Reg. 35,838, 35,859 (June 24, 2008).

54 For instance, EPA has concluded its listening sessions for the forthcoming electric generating unit and petroleum refinery NSPS rules, and these rules are likely to be proposed before the nitric acid rules are proposed.

55 Standards of Performance for Coal Preparation and Processing Plants, 74 Fed. Reg., 51,950, 51,958 (2009).

56 Standards of Performance for New Stationary Sources; Onshore Natural Gas Processing SO_2 Emissions From Onshore Natural Gas Processing, 49 Fed. Reg. 2,656, 2,659 (Jan. 20, 1984).

57 This is indicated by EPA reports that show only 17% of plants are using NSCR technology. Environmental Protection Agency, Greenhouse Gas Inventory Report, *supra* note 24, at 4-19.

58 Standards of Performance for New Stationary Sources; Polypropylene, Polyethylene, Polystyrene, and Poly(ethylene terephthalate) Manufacturing Industry, 52 Fed. Reg. 36,678, 36,682 (Sept. 30, 1987) ("These pollutants, however, are emitted at much lower quantities . . . and, as a result, standards development for this industry is focusing initially on limiting emissions of VOC.").

59 627 F.2d 416 (D.C. Cir. 1980).

60 Clean Air Act, 42 U.S.C. § 7411(a)(4) (2010) ("The term 'modification' means any physical change in . . . 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.") (emphasis added).

61 *Id.* §7411(a)(2).

62 *See* Clean Air Watch Comments 4, *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2007-0877-0065.1.

63 EPA has already determined that nitrous oxide, along with other greenhouse gases, is an air pollutant that endangers public welfare. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,495, 66,516 (Dec. 15, 2009) ("The Administrator finds that elevated concentrations of greenhouse gases in the atmosphere may reasonably be anticipated to endanger the public health and to endanger the public welfare of current and future generations. The Administrator is making this finding specifically with regard to . . . nitrous oxide."). Moreover, nitric acid plants are the largest industrial contributor to nitrous oxide air pollution, comprising over 88% of total industrial N_2O emissions in 2009. *See* Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009, at 4-2, *available at* http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Chapter-4-Industrial-Processes.pdf.

64 Standards of Performance for Petroleum Refineries, 73 Fed. Reg. 35,838, 35,858 (2008).

65 Clean Air Act, 42 U.S.C. § 7411(b)(1)(B) (emphasis added).

66 *See* Policy Integrity, The Road Ahead, *supra* note 9, at 50-51.

67 *See* 42 U.S.C. § 7411(d)(1)(A)(i)–(ii) ("The Administrator shall prescribe regulations which shall establish a procedure . . . under which each State shall submit to the Administrator a plan which (A) establishes standards of performance for any existing source for any air pollutant (i) for which air quality criteria have not been issued or which is not included on a list published under section 7408(a) of this title or emitted from a source category which is regulated under section 7412 of this title but (ii) to which a standard of performance under this section would apply if such existing source were a new source.").

68 *Id.* § 7411(d)(1)(B).

69 *See, e.g.*, Approval and Promulgation of State Plans for Designated Facilities and Pollutants; State of Iowa, 69 Fed. Reg. 51,957 ("Section 111(d) of the CAA requires states to submit plans to control certain pollutants (designated pollutants) at existing facilities (designated facilities) whenever standards of performance have been established under section 111(b) of the same type, and EPA has established emission guidelines for such existing sources.").

70 40 C.F.R. § 60.22 (2010).

71 *Id.* § 60.24(b)(1).

72 Robert R. Nordhaus, *New Wine Into Old Bottles: The Feasibility of Greenhouse Gas Regulation Under the Clean Air Act*, 15 N.Y.U. ENVTL. L.J. 53, 55–56 (2007) (quoting Robert N. Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?*, 1997 U. CHI. LEGAL F. 298, 297–98).

73 42 U.S.C. § 7411(a)(1).

74 While conventional pollutants often have localized effects that, without additional regulatory controls, can introduce concerns about "hot-spots," greenhouse gases are a global pollutant. These complications do not necessarily suggest that market-mechanisms are inappropriate for conventional pollutants, but add a level of complexity that does not apply to greenhouse gases.

75 *See, e.g.*, Exec. Order No. 12898, 59 Fed. Reg. 7,629 (Feb. 16, 1994).

76 42 U.S.C. § 7411(d)(2).

77 Id. § 7410.

78 Id. § 7410(a)(2)(A).

79 *Id.* § 7411(d).

80 40 C.F.R. § 60.24(b)(1).

81 Id. § 60.21(k).

82 While CAMR was later vacated by the D.C. Circuit Court of Appeals, that decision was made on grounds unrelated to the cap-and-trade program that EPA implemented pursuant to Section 111(d). *See* New Jersey v. EPA, 517 F.3d 574 (D.C. Cir. 2008).

83 *See* World Resources Institute & Columbia Law School Center for Climate Change Law, Working Paper, What's Ahead for Power Plants and Industry?: Using the Clean Air Act to Reduce Greenhouse Gas Emissions, Building on Existing Regional Programs 14 (2011), *available at* http://pdf.wri.org/working_papers/whats_ahead_for_power_plants_and_industry.pdf.

84 *See, e.g.*, EPA Brief, *New Jersey v. EPA*, 2007 WL 2155494 (July 23, 2007) ("For these reasons, it was at the very least "permissible" for EPA to construe the statutory definition of 'standard of performance' in section 111 to allow the type of cap-and-trade system reflected in CAMR.").

85 Clean Air Act Amendments of 1990, Pub. L. 101-549, § 403(a) (amending Section 111(a) of the Clean Air Act).

86 578 F.2d 319 (D.C. Cir. 1978). The case involved an attempt to avoid compliance with an emissions standard under 111(b) by improving emissions rates at another facility.

87 EPA Brief, *supra* note 84.

88 Clean Air Act, 42 U.S.C. § 7411(d)(2) (2010).

89 *Id.*

90 *Id.* § 7602(y).

91 *Id.* § 7411(c)(1).

92 States would not possess any additional authority under § 111(c) to implement market-based programs; only the same authority EPA already has under § 111(b).

93 Environmental Protection Agency, Settlement Agreements to Address Greenhouse Gas Emissions from Electric Generating Units and Refineries: Fact Sheet (2011), http://www.epa.gov/airquality/pdfs/settlementfactsheet.pdf (last visited May 7, 2011).

94 There may be some differences related to how long the gases remain in the atmosphere. These complications, however, are likely not sufficient to overcome the benefits of inter-pollutant trading. Moreover, once the agency determines social costs for each of the well-mixed gases, these values can be used directly to convert between the various greenhouse gases. *See* Letter from Policy Integrity & Environmental Defense Fund to Senior Government Officials (Sept. 11, 2009), *available at* http://policyintegrity.org/documents/Letter_on_the_Interagency_SCC_9-11-09.pdf.

95 *See* Policy Integrity, The Road Ahead, *supra* note 9, at 90. Note that the legislative history and statutory structure do not quite as strongly support cross-category trading for new sources; but EPA could still adopt the approach used in CAMR for new sources, subjecting them simultaneously to baseline performance standards and a market cap; and EPA and the

states will be on more solid legal footing for cross-category trading between existing sources. States' additional authority to consider "other factors" and use a SIP-like approval process might also help the developing of a broad, flexible regime.

96 42 U.S.C. § 7411(a)(1).

97 This level could be set based on a cost-benefit analysis of nationwide reduction. See arguments *supra*.

98 *See* Policy Integrity, The Road Ahead, *supra* note 9, at 65.

99 *Id.* at 64.

100 For a primer on this policy, *see* Richard Rosenzweig & Mathew Varilek, Discussion Draft for EPRI Workshop, *Key Issues to Be Considered in the Development of Rate-Based Emissions Trading Programs* (April 2003), *available at* http://www.natsource.com/uploads/features/Draft%20Discussion%20Paper%20-%20Rate-Based%20Emissions%20Trading.pdf.

101 The output could be defined as the physical quantity of output (e.g., lbs. of nitric acid), the energy value (e.g., mmBtu), or a monetary measure (per dollar value of output). For a discussion of the differences between these systems see *id*. at 8.

102 A potential concern in trading between rates for firms with different total aggregate emissions could be easily solved by making the unit of the permit sold based on quantity rather than rate. For example, if the average emissions rate were 0.6 mmt CO_2 eq. per MWh, a firm that emitted at only 0.5 mmt CO_2 eq. per MWh could trade its permits of (0.6 – 0.5) x total aggregate emissions. On the other side, a firm that needed to buy permits could do so up to their total amount of aggregate emissions. *See id.* at 10.

103 It should be noted that this is also true of the traditional standard of performance emissions regulations for NSPS. Therefore, this is only a disadvantage relative to a flexible emissions budget program.

104 *See* Rosenzweig & Varilek, *supra* note 100, at 29.

105 *See* Richard Munson & Thomas Casten, *Simplifying Climate Change Legislation: Output Based Allocations*, 21(5) Electricity J. 64, 69 (2008).

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