EPA's New Source Review Program: Time for Reform?

by Art Fraas, John D. Graham, and Jeff Holmstead

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Summary

This Article examines the complex CAA program known as new source review (NSR), which affects virtually every major manufacturing facility and power plant in the United States. The NSR program provides important health and environmental benefits but has become a significant impediment to the growth and modernization of the U.S. manufacturing sector. Because of a new, more stringent air quality standard for ozone, the resulting changes in the NSR program may effectively prevent industrial development in some parts of the country. The authors propose administrative reforms that EPA could take to address some of the major concerns about NSR while still maintaining the environmental benefits of the program: (1) replace current deterministic, upper-bound modeling requirements with a probabilistic approach to air quality modeling; (2) expand the pool of emission reduction credits that may be used to offset emissions from new or expanded facilities; and (3) take actions to facilitate NSR permitting when there are changes to national ambient air quality standards. The authors also offer two potential statutory reforms.

The administrations of both George W. Bush and Barack Obama recognized that manufacturing is one of the most heavily regulated sectors in the U.S. economy. Since 1981, manufacturers have become subject to more than 2,200 unique regulations, almost one-half attributable to one federal agency, the U.S. Environmental Protection Agency (EPA).[1] Both administrations also sought to streamline existing federal regulations that apply to the manufacturing sector in order to reduce economic burdens that threaten the competitiveness of U.S. manufacturing. However, a recent report by the Regulatory Studies Center at George Washington University found that the retrospective reviews of manufacturing regulations under both presidential administrations have had limited impact. Indeed, some of the retrospective reviews appear to have led to greater rather than diminished regulatory burdens.[2]

EPA's new source review (NSR) program is of special interest because it affects virtually every major manufacturing facility and power plant in the United States—and any company that might want to build such a facility in the future.[3] In this Article, we discuss the major concerns about the NSR program that have been raised by industry and the policy community, and also highlight the expanding burdens of the program resulting from increasingly stringent national ambient air quality standards (NAAQS). However, since the NSR program is also recognized as a source of significant environmental benefits, the simple option of deregulation does not seem to be particularly promising. We argue that creative regulatory reforms can accomplish most or all of the anticipated environmental benefits at considerably reduced cost to the regulated industry and the U.S. economy.

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1. Paul Bernstein et al., Macroeconomic Impacts of Federal Regulation of the Manufacturing Sector (NERA Economic Consulting & Manufacturers Alliance for Productivity and Innovation 2012).
2. Sofie Miller, *EPA's Retrospective Review of Regulations: Will It Reduce Manufacturing Burdens?*, 14 Engage 4-14 (2013), *available at* http://www.fed-soc.org/publications/detail/epas-retrospective-review-of-regulations-will-it-reduce-manufacturing-burdens.
3. National Research Council, New Source Review for Stationary Sources of Air Pollution 68-76 (2006).

We start with a brief summary of certain key features of the Clean Air Act (CAA) and a brief discussion of how the NSR program fits within the structure of the Act. We then identify aspects of the current NSR regulatory approach that are likely to impose increasing costs on manufacturers in the near future. We propose options for regulatory reform that are designed to streamline and modernize regulatory requirements and reduce regulatory costs, while still allowing the regulatory program to achieve significant environmental results. We recognize that reforms that can be adopted through executive action are more likely to occur than those that require new legislation by the U.S. Congress, but we also outline two variants of a potentially promising legislative reform that could replace the existing case-by-case NSR review process with a system of economic incentives.

I. Background

A. NAAQS

The CAA requires that EPA establish NAAQS for certain pollutants known as "criteria pollutants": pollutants that come from a variety of sources, are widespread in many geographic areas, and "reasonably may be expected to endanger public health or welfare."[4] EPA has identified and set NAAQS for six such pollutants, including ozone and particulate matter (PM). The statutory language requires primary health-based NAAQS to be set at levels "which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health."[5] This requirement has yielded an underlying health science based on an increasingly sophisticated set of studies focused on sensitive subpopulations and more subtle health endpoints.

The CAA also requires EPA review of NAAQS every five years.[6] Although EPA has not been able to meet the five-year deadline in recent years, environmental groups have used litigation effectively to force EPA into what amounts to almost continuous review of NAAQS, especially NAAQS for ozone and PM. The result has been a series of more stringent standards over the past decade. And given the focus on sensitive subpopulations and more subtle health effects, it appears likely that there will be continuing pressure to ratchet down NAAQS even further in future years.

Since 2009, EPA has set more stringent NAAQS for four of the six criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), PM, and ozone. These NAAQS impose substantial costs on the U.S. economy and, in particular, on the manufacturing sector. For the recently revised ozone NAAQS, for example, EPA estimated annual costs of $1.4 billion (not including the cost in California, which faces a particularly difficult challenge in reducing ozone levels), but some experts believe that the cost will be much higher.

Some major metropolitan areas such as Los Angeles, Houston, and the East Coast megalopolis have had a continuous classification as "nonattainment" (NA) for the ozone and fine PM NAAQS.[7] These areas face continuing pressure to reduce emissions from the transportation and manufacturing sectors and severe restrictions on the siting of major new sources. Other large cities find that, with the lowering of NAAQS, they are in NA again (after spending years to meet an earlier standard) and must adopt even more stringent emissions controls for their manufacturing, commercial, and transportation sources.[8] In addition, as discussed below, the continuing ratcheting downward of NAAQS is making it increasingly difficult to site major new manufacturing sources.

Studies of the historical effect of the CAA on economic activity report significant economic costs in NA areas.[9] For example, Michael Greenstone estimated that, as compared to attainment counties in the United States, NA counties lost $37 billion in capital, $75 billion of economic production (in 1987 dollars), and 590,000 jobs during the period from 1972 to 1987.[10] In a more recent study, Greenstone et al. estimated a significant decline in total factor productivity for pollutant-intensive plants in NA areas.[11] They report that this decline in productivity translates into a loss of

4. 42 U.S.C. §§7401-7671q, §7408; ELR Stat. CAA §§101-618, §108.
5. 42 U.S.C. §7209. Secondary standards are required to protect welfare; EPA has generally set welfare standards at the same level as the primary health NAAQS.
6. *Id.*
7. While classified as nonattainment areas, the air quality in these areas is better than the NAAQS for a significant number of days in the year.
8. To be sure, additional health and welfare benefits are associated with more stringent NAAQS. In the case of ozone, EPA estimates that benefits increase significantly with successively more stringent standards. And even net benefits (benefits minus costs) arguably increase with the more stringent ozone standards. This result is largely driven on the benefit side by the substantial additional reductions in premature mortality with successively more stringent ozone NAAQS. On the cost side, EPA assumes that the cost of needed emissions reductions will be capped at $15,000 per ton, arguing that technological innovation and the ability of states and local governments to delay unreasonably costly measures will mitigate the cost of NAAQS.
9. Michael Greenstone, *The Impacts of Environmental Regulations on Industrial Activity: Evidence From the 1970 and 1977 Clean Air Act Amendments and the Census of Manufactures*, 110 J. Pol. Econ. 1175-1219 (2002); J. Vernon Henderson, *Effects of Air Quality Regulation*, 86 Am. Econ. Rev. 789-813 (1996). John A. List et al., *Effects of Environmental Regulations on Manufacturing Plant Births: Evidence From a Propensity Score Matching Estimator*, 85 Rev. Econ. & Stat. 944-52 (2003).
10. Greenstone, *supra* note 9, at 1176.
11. Michael Greenstone et al., The Effects of Environmental Regulation on the Competitiveness of U.S. Manufacturing (NBER Working Paper Series No. 18392, National Bureau of Economic Research 2012), *available at* http://www.nber.org/papers/w18392.pdf.

$450 billion for manufacturing plants in NA areas during the 1972 to 1993 period of study.[12]

While these studies suggest a substantial shift of pollution-intensive industry away from NA areas in the United States, these studies may simply reflect a shift of activity within the United States from NA areas to attainment areas. In other words, although the CAA has clearly imposed significant economic costs on NA areas, it may have created commensurate economic gains in manufacturing activity and employment in attainment areas.

Unfortunately, relatively few studies in the economic literature evaluate the effect of environmental regulation on the competitiveness of the U.S. manufacturing sector as a whole. A variety of other factors likely play an important—even dominant—role in decisions on whether to locate in the United States versus another country. These factors include, for example, access to (and cost of) important factors of production, transportation costs, existing investment in facilities and infrastructure, tax considerations, and exchange rate effects.

Any empirical evaluation of the effect of environmental regulations is difficult to do because it must account for these other factors in teasing out any regulatory effect. Only a few studies have attempted to do it. This limited empirical literature suggests that environmental regulation has been a relatively minor factor in decisions as to whether manufacturing plants will be located in the United States or another country.[13] On the basis of this limited set of studies, Joseph Aldy and William Pizer have suggested that the adverse effect of CAA requirements in shifting economic activity and jobs away from NA areas to "clean" areas within the United States has been more important than the effects in terms of forcing this economic activity offshore to countries with less stringent environmental requirements.[14]

However, these economic studies have looked at the past history of the CAA in the decades before 2000. With the substantial tightening of NAAQS in more recent years, the difficulty of siting or expanding major manufacturing facilities in the United States may have created a more significant incentive to shift industrial activity to other countries with less burdensome regulatory requirements.

B. New Source Review

The CAA requires that, before a company can construct a new industrial facility or expand an existing facility in the United States, it must first go through the NSR permitting process and obtain a permit that, among other things, ensures that the new or expanded facility will employ up-to-date pollution control technology. The NSR program creates somewhat different requirements depending on whether the facility is located in an attainment area (an area that meets NAAQS or is unclassifiable due to the lack of data) or an NA area (an area that does not meet the NAAQS).

In NA areas, new plants and major modifications to existing plants are required to meet the lowest achievable emission rate (LAER), meaning that the plants must install state-of-the-art pollution controls in order to match or exceed the emission rate achieved by the lowest-emitting similar facility in the country. In addition, they must obtain pollution "offsets" from other facilities in the same area. These requirements reportedly make it difficult or even impossible to site new plants in certain NA areas.[15]

In particular, discussions with industry sources suggest that the cost of emissions offsets effectively prohibits the siting of major new industrial plants in certain NA areas. The idea behind offsets is that, in order to build a new industrial facility in an NA area, a company must pay someone else to reduce emissions in that same area by an amount that exceeds the emissions that will come from the new facility. Depending on the area, it must obtain offsets that are between 10% and 50% greater than the projected emissions from the new facility.

Not surprisingly, offsets cannot be created on the basis of actions already required by EPA or state regulations. To be counted as an offset, an emissions reduction must go beyond what is required by law. But for more than 40 years, EPA and states have been looking for every conceivable way to reduce emissions related to ozone. In many areas, all the cost-effective emissions reductions have been mandated by regulation. Where any reductions can be made, they are very expensive.

For example, the Houston area, especially near the Houston Ship Channel, has numerous industrial facilities, but they are generally well-controlled. Because there is so much industry, it is possible to purchase offsets, but they are very expensive. Houston-area offset prices vary from $150,000 to $200,000 per ton for volatile organic compounds (VOCs) and $80,000 to $100,000 per ton for nitrogen oxide (NO_x).[16] Even a relatively small facility with state-of-the-art controls will emit more than 100 tons per year of these pollutants. The so-called "offset ratio" in the Houston area is 1.4 to 1, meaning that the new facility would need to offset 140% of its projected emissions. Thus, even if the new facility will emit only 100 tons per year of NO_x and VOCs, the company trying to build it

12. Greenstone et al., *supra* note 11, at 2.
13. Adam B. Jaffe et al., *Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?*, 33 J. Econ. Literature 132-63 (1995); Arik Levinson & M. Scott Taylor, *Unmasking the Pollution Haven Effect*, 49 Int'l Econ. Rev. 223-54 (2008).
14. Joseph E. Aldy & William A. Pizer, The Competitiveness Impacts of Climate Change Mitigation Policies (NBER Working Paper 17705, 2011), *available at* http://www.nber.org/papers/w17705. *See also* Bruce G. Carruthers & Naomi R. Lamoreaux, *Regulatory Races: The Effects of Jurisdictional Competition on Regulatory Standards*, 54 J. Econ. Literature 52-97 (2016).
15. Existing plants in these areas may also find it difficult to make major modifications.
16. Mike Taylor, Update on Scarcity of Houston-Galveston-Brazoria (HGB) Emission Reduction Credits (ERCs) and Allowances, and Use of NO_x ERCs for VOC ERCs (2014), *available at* http://www.awma-gcc.org/docs/Sept2014Presn.pdf; Texas Commission on Environmental Quality (TCEQ), Trade Report (2015), *available at* www.tceq.texas.gov/assets/public/implementation/air/banking/reports/ectradereport.pdf.

would need to purchase 140 tons of NO_x offsets and 140 tons of VOC offsets. At current offset prices, this means an upfront cost of $32 million to $52 million just to purchase emissions offsets.

In the South Coast NA area in California, average offset prices in 2014 were $23,500 per ton for VOCs and $63,000 per ton for NO_x.[17] Table 1 provides reported prices and quantities for major areas in California. In addition, the quantities involved in these emissions offset transactions are relatively small compared with the emissions from a new major source coming into an NA area.[18] If the applicant does not have a facility in the NA area that it can readily control (or tear down) to provide offsets, then emissions offsets for five or more years in the future are reportedly hard or even impossible to find.

Table 1. 2014 California Offset Prices for Emission Reduction Credits ($/ton)

	VOC ($/ton)	VOC (tons)	NO_x ($/ton)	NO_x (tons)
Bay Area	$1,200-$9,500 [$6,196]	212	$14,500-$15,000 [$14,643]	73
San Joaquin	$900-$6,000 [$3,877]	255	$18,000-$44,000 [$36,519]	177
Santa Barbara	$125,000	0.06	$125,000	0.56
South Coast	$7,400-$32,880 [$23,462]	26	$63,014	5.5
Ventura	$15,000-$70,000 [$50,938]	21		

Source: California Air Resources Board (CARB), Emission Reduction Offset Transaction Costs: Summary Report for 2014 (2015), *available at* http://www.arb.ca.gov/nsr/erco/erc14.pdf.
Brackets denote average (mean) price.

More stringent NAAQS standards will also have an important effect on the siting of new sources in attainment areas. Under the "prevention of significant deterioration" (PSD) provisions of the CAA, new plants and major modifications in attainment areas must also go through a preconstruction permitting process. This process requires that these plants:

- Adopt the best available control technology (BACT) to control all pollutants (not just criteria pollutants) that are regulated under the CAA. BACT is sometimes no different from LAER but may be less stringent, and less costly, for certain types of facilities.
- Provide an analysis of the effect of anticipated plant emissions on ambient air quality, including both preconstruction monitoring of air quality in the area and air quality modeling of the effect of the plant emissions on ambient air quality.

To obtain a permit, the permit applicant must show, to the satisfaction of the permitting authority (generally the state environmental agency), that (1) projected emissions from the new plant will not result in changes in ambient air quality that would cause the area to exceed NAAQS for any pollutant; and (2) even if projected emissions will not violate NAAQS, they will not result in an increase in ambient concentrations of any pollutant that exceeds the allowable PSD "increments" set by the CAA.[19]

The requirement to show that emissions from a new facility will not "cause or contribute" to a violation of any NAAQS will be more challenging now that the ozone standard has been lowered from 75 to 70 parts per billion (ppb), because many areas of the country that have always been in attainment do not meet the new standard. Until these areas are designated as NA areas, a permit applicant would need to show that the proposed plant will not "contribute to" a violation of the new standard, which would appear to be impossible in or near areas that are already in violation of the standard. EPA has said that it intends to create at least two options that would address this concern: (1) by setting certain de minimis emissions thresholds below which a new facility would be deemed not to "contribute" to a violation of the NAAQS; or (2) by allowing the permit applicant to purchase offsets.

Given the history of CAA regulation, it is likely that these options, when finalized by EPA, will be challenged in court. Even if they pass muster in the courts, it remains to be seen whether either of these options will be practically viable—especially for large industrial facilities.[20] If not, it will not be possible to build or expand a new industrial facility in certain areas, even if the facility would use state-of-the-art technology to control its emissions and even if the local community desperately wants it to be built.

II. Analyses of the NSR Program

A. *Costs of the NSR Process and Permitting Delays*

In a 2001 report on NSR, EPA observed that the permit application process can involve up to five different stages: preparation of a permit application; agency determination of application "completeness" (a process that may include extensive discussion between the applicant and permitting officials and the preparation and submission of additional information); public notice and comment on a draft

17. California Air Resources Board, Emission Reduction Offset Transaction Costs: Summary Report for 2014 (2015), *available at* http://www.arb.ca.gov/nsr/erco/erc14.pdf.
18. NSR generally applies to sources emitting 100 tons/year of a precursor ozone pollutant.
19. The CAA established PSD increments for PM and SO_2 for the three classes of attainment areas: Class I (pristine), Class II (intermediate), and Class III (growth). EPA has established PSD increments for the other conventional pollutants through rulemaking.
20. For example, it appears that a number of rural areas may exceed the new 70 ppb ozone standard—not because of local emissions, but because of background ozone and pollution transported from distant sources. Some areas have no local stationary sources and thus no way to generate offsets that can be used by new plants. In such cases, the offset requirement will impose a de facto ban on most types of industrial development.

permit; issuance of a final permit along with response to comments; and administrative and judicial appeals.[21] This same report notes that "most developers describe [NSR] permitting as an extremely complex and time-consuming process."[22] A recent comment filed by an industry coalition stated: "Sources generally invest years in engineering, design and assessment studies before submitting a permit application for a major source. Even under optimistic conditions, it can take at least two years from the beginning of the frontend engineering work until public notice of the draft permit is published."[23]

The NSR process imposes direct costs in terms of the time and resources required to prepare the permit application and to provide responses to questions and issues that arise in the permitting process. The uncertainty and delay that attend the permitting process may impose additional costs, including financial costs and penalties.[24] The opportunity costs associated with delays or cancellation of projects include the additional production forgone and, in some cases, forgone emissions reductions from retrofitted facilities. In addition, the potential for long delays and the uncertainty that attends the NSR process could lead to suboptimal decisions in upgrading existing capacity and installing new capacity.[25]

Some economists and industry representatives have argued that the focus of NSR on preconstruction review of new or modified plants, and the attendant significant costs associated with the NSR program, have penalized the construction of new plants and the retrofit of existing plants—resulting in a "new source bias."[26] Thus, it has arguably been more economic in some cases to continue to operate relatively old, inefficient, and high-polluting plants than to install new facilities or upgrade existing facilities with better pollutant control technology.[27] To the extent this has occurred, NSR review has had the perverse effect of delaying reductions in pollutants such as SO_2 and NO_x.[28]

B. *The Time Needed to Obtain an NSR Permit*

Under the CAA, EPA and other permitting agencies are required to either grant or deny an NSR permit within one year of receiving a permit application, but there is no practical way to enforce this deadline, and the permitting process often takes longer—sometimes much longer—than a year. A 2015 Resources for the Future discussion paper provides a snapshot of the NSR process from the date EPA or state authorities notify applicants that the NSR application is complete to the issuance of the final permit.[29] During the period from 2002 to 2014, the nationwide average time to obtain an NSR permit for coal- and natural gas-fired electric generating units (EGUs) and refineries was roughly 14 months.[30] This represents a substantial increase in average processing time for NSR permits compared with the reported permitting times for the 1997-2001 period. The distributions are skewed—median values are less than the mean—with some projects requiring substantially longer to obtain NSR approval.[31] In addition, there was a significant variation across EPA regions in the processing time required for approval of new natural gas-fired EGUs—from seven months for Region 7 (Iowa, Kansas, Mississippi, and Nebraska) to 19 months for Region 9 (Arizona, California, and Nevada).

The data also show substantial year-to-year variation in processing times, with markedly longer processing times during the 2003-2005 and 2009-2011 periods (Table 2). The increase in permitting time during the 2003-2005 period may reflect the uncertainty in the NSR program

21. U.S. EPA, NSR 90-Day Review Background Paper 5 (2001).
22. *Id*. at 11.
23. Shannon Broome & Bob Morehouse, Comments of the Air Permitting Forum: National Ambient Air Quality Standards for Ozone (2015), *available at* https://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2008-0699-3578.
24. U.S. EPA, *supra* note 21, at 11. "Permitting (including required public hearings and comment processes) can be costly not only because of the time and human resources involved, but also because of uncertainty and delay." "Delay, for example, can cause a developer to miss advantageous financial circumstances when interest and equity costs are low." *Id*. at 11. In addition, the applicants may have penalty clauses associated with delays in the start of construction in their contracts with engineering and construction firms. According to industry sources, these penalties can be as much as $35,000 to $40,000 per day.
25. These time-cost considerations may be particularly important in the petroleum refining industry, where the National Petroleum Council claims that "the most critical factor in the U.S. refining industry's ability to meet new fuel requirements in a timely manner is the ability to obtain permits." *Id*. at 44. Archie W. Dunham et al., U.S. Petroleum Refining: Assessing the Adequacy and Affordability of Cleaner Fuels (National Petroleum Council 2000). EPA's 2001 background report also cites statements by several oil company executives claiming that the NSR process impedes the U.S. refinery industry's capacity to expand. *See* U.S. EPA, *supra* note 21, at 44.
26. Howard K. Gruenspecht & Robert N. Stavins, *New Source Review Under the Clean Air Act: Ripe for Review*, 147 Resources 19, 20-21 (2002). *See also* U.S. EPA, *supra* note 21, at 18, 29. The direct costs to add pollution controls at existing facilities are often significantly greater than the corresponding control cost for a new plant, because pollution controls can be incorporated in the initial design of a new facility, whereas compatibility problems and space constraints at existing facilities often complicate the retrofit of controls at these facilities.
27. EPA's 2001 NSR report found some evidence to support this argument, reporting that NSR for existing sources "has impeded or resulted in the cancellation of projects which would maintain and improve reliability, efficiency, and safety of existing energy capacity." U.S. EPA, New Source Review: Report to the President 1 (2002), *available at* https://www.epa.gov/sites/production/files/2015-08/documents/nsr_report_to_president.pdf (cited by National Academy of Sciences, New Source Review for Stationary Sources of Air Pollution 45 (National Academies Press 2006)).
28. U.S. EPA, *Clean Air Act Requirements and History*, https://www.epa.gov/clean-air-act-overview/clean-air-act-requirements-and-history (last visited Nov 15, 2016). To be sure, supporters of the current NSR program argue that NSR review yields important reductions in the covered pollutants. For example, EPA's 2001 NSR report estimated that PSD BACT permitting during 1997-1999 avoided 1.4 million tons per year in conventional pollutant emissions (largely reductions in SO_2 and NO_x emissions). U.S. EPA, *supra* note 21, at 8. *See also* Richard L. Revesz & Jack Lienke, Struggling for Air: Power Plants and the "War on Coal" (Oxford University Press 2016).
29. Arthur Fraas et al., EPA's New Source Review Program: Evidence on Processing Time (Resources for the Future 2015).
30. The difference in processing times between NA and attainment areas was small and not statistically significant. These data are taken from EPA's RACT/BACT/LAER Clearinghouse (RBLC). EPA staff believe only one-half of the approved NSR projects are reported to the RBLC database.
31. However, the clearinghouse database had few entries for new plants in recent years—only one additional NSR permit for a new coal-fired plant in 2012 and no additional permits for coal-fired plants in 2013 and 2014.

due to the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit review of EPA's 2002 and 2003 revisions to the program.[32] The longer processing times during the 2009-2011 period may reflect a transition as the Obama Administration put its climate policy in place (meaning that sources for the first time had to use BACT to control their carbon dioxide emissions) and as sources faced new air quality modeling requirements with EPA's revision of the NO_2, SO_2, and fine PM NAAQS. During the 2010-2014 period, for example, one-third of the combined cycle plants received NSR permits after processing delays by the state or EPA permitting authorities ranging from more than one year—the statutory deadline for action—to three years.[33]

Table 2. Average Permitting Time for Natural Gas EGUs (Including PSD and NA Areas)

	All natural gas		New permits		Additions		Modifications	
Year	Mean	Number	Mean	Number	Mean	Number	Mean	Number
2002	321	73	324	47	299	25	769	1
2003	379	64	362	36	406	27	267	1
2004	612	46	521	27	829	13	551	6
2005	463	27	665	15	124	3	241	9
2006	290	23	355	6	286	11	231	6
2007	343	24	371	16	393	3	223	5
2008	377	21	384	3	715	4	278	14
2009	409	33	439	25	364	5	233	3
2010	468	24	554	14	372	5	321	5
2011	436	21	587	8	415	5	297	8
2012	268	31	245	14	223	11	403	6
2013	225	26	270	11	228	7	161	8
2014	235	3	—	0	—	0	235	3
Average	384	416	411	222	391	119	293	75

III. Historical Concerns About the NSR Program

A. *Delays Caused by Regulatory Overlap*

For NSR, several different layers of government are likely to be involved. Where EPA has approved the state implementation plan (SIP) provisions for NSR, the state is the primary permitting authority. However, under EPA regulations, EPA retains authority over air quality modeling, and the states may be required to consult with the EPA region (and EPA headquarters in some cases) on modeling issues.[34]

In states that have not obtained EPA SIP approval for their NSR process, EPA is the permitting authority. In most of these states, EPA has delegated the NSR process to the states (meaning that state officials take the administrative steps to process permit applications) but retains ultimate permitting authority and must be consulted on all substantive issues, including modeling, the selection of BACT, emissions limits, and monitoring and recordkeeping requirements. In a relatively few cases, a state has refused to do NSR for one or more pollutants, and in these cases, EPA issues the NSR permit.[35]

B. *Changes in NAAQS: Problems in Transition and Lack of Timely EPA Guidance*

The recent changes in the NO_2, SO_2, fine PM, and ozone NAAQS have further complicated the NSR process, resulting in permitting delays and, in some cases, the decision by industry to defer or cancel projects.[36] New or revised NAAQS must be addressed immediately in the NSR permit process, even before EPA makes formal designations as to which areas of the country are in attainment or NA with the new standard.[37]

As a result, the new NAAQS can have an immediate impact on pending permit applications.[38] Even if a permit

32. The D.C. Circuit largely upheld EPA's 2002 revisions to its NSR program in June 2005. New York v. Environmental Prot. Agency, 413 F.3d 3, 35 ELR 20135 (D.C. Cir. 2005). On Dec. 24, 2003, however, the D.C. Circuit blocked the 2003 NSR rule revising the routine maintenance, repair, and replacement provisions from going into effect until the court reached a final decision. In *New York II*, the D.C. Circuit held that the 2003 NSR revision was invalid. New York v. Environmental Prot. Agency, 443 F.3d 880, 36 ELR 20056 (D.C. Cir. 2006).

33. Section 165(c) of the CAA requires completion of NSR within one year of the completeness determination. Combined cycle EGUs are the "cream of the crop" in terms of low-cost, efficient, clean generation of electricity. Arthur Fraas et al., *supra* note 29, at 2. *See also* Arthur Fraas & John D. Graham, Regulatory Reforms to Nurture the Resurgence of the US Manufacturing Sector 20 (working paper 2015), https://spea.indiana.edu/doc/research/manufacturing-initiative/fraas-graham-2015.pdf.

34. 40 C.F.R. §51 app. W (2005).

35. For example, EPA issued NSR permits for greenhouse gas emissions in Texas from 2010-2014, while the TCEQ issued NSR permits for the other regulated NSR pollutants.

36. For example, the Baton Rouge Area Chamber reported that four major industrial projects were either put on hold or redirected to another location after EPA proposed to revise the ozone NAAQS in December 2015. Baton Rouge has monitored ozone levels of 72 ppb, a level above EPA's revised standard of 70 ppb. Baton Rouge Area Chamber, BRAC Public Policy Commentary: Eighteen of Twenty Top-Performing Metro Economies at Risk From New Ozone Standards (Mar. 2, 2015), http://www.brac.org/brac/news_detail.asp?article=1947.

37. *See* Sierra Club v. Environmental Prot. Agency, 762 F.3d 971 (9th Cir. 2014).

38. In some cases, EPA has adopted a grandfathering provision that applies to permit applications that EPA or the state permitting authority found to be

application has been pending for months or years and the permit applicant has shown that the new facility will not cause or contribute to the violation of any NAAQS, EPA has often required the permit applicant to redo its modeling analysis using the new standard.

In some cases, this has proven difficult, costly, and rife with delays because EPA's practice has been to adopt a revised, more stringent NAAQS and begin work on implementation and modeling guidance only after adopting the newly revised NAAQS. Although EPA staff have claimed that state environmental agencies know how to proceed when a NAAQS is changed, the state agencies have disagreed in comments to the Agency, and have sometimes delayed action on permit applications until EPA issues the necessary guidance.[39]

In the case of EPA's 2010 revision of the NO_2 NAAQS, for example, EPA adopted stringent one-hour primary standards—the 98th percentile one-hour daily maximum averaged over three years—to supplement the existing annual standard. Shortly after the one-hour NO_2 NAAQS was issued, EPA put out a memorandum stating that anyone with a pending permit application—even with applications that had been pending for several years—would need to redo a modeling analysis to demonstrate that projected plant emissions would not cause or contribute to a violation of the new one-hour NO_2 NAAQS.[40]

However, the adoption of the short-term NO_2 standard greatly complicated the air quality modeling that new sources were required to provide in obtaining an NSR permit. The standard air quality models in place incorporate overly conservative assumptions for modeling single source effects on ambient NO_2 levels. This over-conservatism was not a problem with the annual NO_2 NAAQS but, with the new, stringent one-hour NO_2 NAAQS, it effectively prevented showing that these new plants would not cause or contribute to NA.[41]

It appears that EPA did not fully anticipate these issues, but Agency officials have been working through the modeling issues raised by the short-term one-hour NO_2 NAAQS ever since it was adopted. A year after setting the revised NO_2 NAAQS, EPA provided initial guidance on some of the modeling issues (e.g., the treatment of intermittent, auxiliary sources) and additional flexibility in terms of modeling the cumulative effect of other sources within the region. But EPA still has not provided the modeling tools that, according to many state environmental officials, should have been in place before the new standard was adopted. EPA finally issued a notice of proposed rulemaking in July 2015 to address these remaining issues—five years after promulgating the one-hour NO_2 NAAQS—and a final rule is expected in the next few months.[42]

The Avenal Power Center, one of the combined cycle projects affected by the 2010 NO_2 NAAQS revision, provides a stark lesson in the obstacle course associated with the NSR permitting process. Avenal was a proposed state-of-the-art combined cycle electric generating project to be located in California, and an EPA regional office was the permitting authority. EPA's Region 9 notified Avenal that its NSR permit application was complete on March 19, 2008.

On February 9, 2010, EPA revised the NO_2 NAAQS by adopting a new stringent one-hour NO_2 standard to supplement the existing annual NO_2 NAAQS, and EPA took the position that the Avenal developers were now required to show that it would not cause or contribute to a violation of the one-hour NO_2 NAAQS. The developers submitted a new modeling analysis to demonstrate compliance with the new standard, but EPA said it could not determine whether it was acceptable because the Agency had not yet adopted a new modeling protocol for use with the one-hour standard.

On March 9, 2010, two years after Region 9 found that its NSR application was complete, Avenal filed suit in federal district court charging that EPA had failed to act within one year as required by §165(c) of the CAA.[43] The developers took the position that, because EPA had been legally required to take final action on the permit application well before the new one-hour standard was even proposed, it should not be required to redo its permit application to demonstrate compliance with the new standard. In January 2011, after briefing and oral argument on these issues but before the court reached a decision, EPA informed the court that it had decided to grandfather certain PSD applications, including the Avenal application, from the NSR requirement that projects meet the one-hour

"complete" before the new standard was established. U.S. EPA, National Ambient Air Quality Standards for Ozone, 80 Fed. Reg. 65291, 65431-34 (Oct. 26, 2015). In such cases, permit applicants are not required to redo their modeling under the new standard. Importantly, EPA did adopt this type of grandfathering approach under the new ozone standard—although not for the earlier revisions to the NO_2, SO_2, and PM standards.

39. For example, in the case of the proposed ozone NAAQS, the Association of Air Pollution Control Agencies (AAPCA) reports that 26 state agencies raised background ozone as an achievability or implementation challenge, and 21 of these states reported concerns and limitations with the tools identified by EPA for permitting or regulatory relief. AAPCA, State Environmental Agency Perspectives on Background Ozone Regulatory Relief (2015), *available at* http://www.csg.org/aapca_site/documents/AAPCASurvey-StateEnvironmentalAgencyPerspectivesonBackgroundOzoneandRegulatoryRelief-June201.pdf; Dylan Brown et al., *Air Pollution: Strong Opinions, Shaky Data in Arguments Over Permitting*, Greenwire, May 14, 2015, http://www.eenews.net/stories/1060018570. In the final ozone NAAQS, EPA acknowledges that it received comments from states and organizations requesting that the Agency issue implementation rules and guidance in a timely manner. 80 Fed. Reg. at 65435.

40. Memorandum from Stephen D. Page, to Air Division Directors and Deputies Regions I-X (Apr. 1, 2010) (on file with EPA), *available at* https://www.epa.gov/sites/production/files/2015-07/documents/psdnaaqs.pdf.

EPA identifies these de minimis levels as ozone significant impact levels and model emission rates for precursors.

41. Similar problems also arose with EPA's promulgation of a one-hour SO_2 NAAQS in June 2010. For a case study of one plant's problems with the SO_2 NAAQS, see Ashley Jones, Presentation at the 10th Modeling Conference, Challenges With Modeling for the 1-hr SO_2 NAAQS Standard: An Aluminum Plant Case Study (Mar. 15, 2012), *available at* https://www3.epa.gov/ttn/scram/10thmodconf/presentations/3-24-Challenges_with_Modeling_1hr_SO2_NAAQS-An_Aluminum_Plant_Case_Study_03-15-12.pdf.

42. EPA proposed its revisions to the guideline on July 29, 2015 (80 Fed. Reg. 45339, 45346-49). The existing guideline is published as 40 C.F.R. §51 app. W (2005).

43. Jeff Holmstead, one of the authors of this Article, represented the plaintiff in this case.

NO_2 NAAQS, and explained that it would request comments on its grandfathering proposal.

On May 26, 2011, the court issued an order requiring EPA to take final action on the NSR permit within 60 days (i.e., by August 27, 2011). The EPA regional office issued the NSR permit to Avenal one day later, on May 27, but this did not constitute final action because of the possibility for opponents of the project to appeal the permit to EPA's Environmental Appeals Board (EAB). Project opponents did appeal to the EAB in early June, submitting four petitions seeking a review of the permit.

On August 18, 2011, the EAB issued its decision, declining to review the permit given the time constraints imposed by the district court order requiring the Agency to make a final permit decision by August 27. The environmental opponents of Avenal also filed suit with the U.S. Court of Appeals for the Ninth Circuit. The Ninth Circuit agreed with the environmental groups that Avenal must show that it would not cause or contribute to a violation of the one-hour NO_2 NAAQS.[44] It appears that, after the Ninth Circuit decision, Avenal decided not to go forward with the project.

IV. Heightened NSR Concerns Under the New Ozone Standard

The new ozone standard illustrates some of the difficulties that arise when EPA adopts a new standard before deciding how it should be implemented. There are several areas of concern with siting new sources under NSR given the interaction with the revised ozone NAAQS, including the effect of modeling requirements, the difficulty of securing needed emissions offsets, and the issues associated with the adoption of a standard at or near background levels of ozone.

A. Modeling Requirements

In the past, EPA's approach has been to "assess the ozone impacts of an individual source . . . on a case-by-case basis in consultation with the appropriate EPA Regional Office and/or permit reviewing authority."[45] There has not been a "preferred or recommended analytical technique or modeling system," and analyses of single-source effects for NSR have usually involved only a qualitative assessment (although in a few cases, applicants have been required to use sophisticated chemical transport modeling).

In its July 2015 proposal to revise its Guideline on Air Quality Modeling, EPA asserts that advances in photochemical modeling have reached the point where it is reasonable to identify specific air quality models appropriate for use in assessing the ozone effects of individual sources seeking an NSR permit. As a result, EPA states that it plans to require more rigorous single-source modeling for ozone under the PSD permitting program.[46] Thus, a qualitative evaluation will no longer be sufficient, and new sources must provide air quality modeling to show that the plant will not cause or contribute to a violation of the new ozone NAAQS.

If the final air quality modeling rule—expected in the next few months—retains a requirement for single-source modeling for the ozone NAAQS, nothing will be in place in terms of clear direction on the specific modeling required. New sources and the permitting authorities will face continuing uncertainty about the modeling required to demonstrate that plant emissions will not cause or contribute to a violation of the ozone NAAQS. Coupled with the more stringent ozone standard, the new modeling requirements for ozone will likely create a significant new challenge for many companies seeking to build new manufacturing plants or industrial facilities in the United States. The bottom line is that new sources will be in a kind of limbo.

EPA has suggested that it will address this concern in part by creating a new de minimis exemption for proposed sources whose emissions are too low to have a meaningful impact on ozone formation. However, EPA does not yet have anything in place to help identify de minimis sources that would be exempt from modeling requirements. Instead, in its recent air quality modeling proposal, EPA explains that it will undertake a new rulemaking that will provide a technical basis to identify emissions levels and ambient impacts that would not be expected to contribute significantly to ambient ozone levels.[47] EPA has set a schedule for this rulemaking that will take at least another two years—substantially lagging behind last October's change to the ozone NAAQS.

B. Finding Emissions Offsets in PSD Areas

As noted above, EPA policy allows new sources in PSD areas to use emissions offsets to address cases where the plant emissions would cause or contribute to a violation of NAAQS. In theory, this would provide an option for sources located in areas that meet the prior ozone standard of 75 ppb but have monitored levels that exceed the new 70 ppb standard. Until these areas are designated as NA (a process that takes several years), sources located in these areas will be subject to the PSD provisions for NSR, including the requirement that sources show that they will not cause or contribute to a violation of the new ozone NAAQS. Since monitored levels in these areas exceed the new standard, the only recourse these sources may have is to obtain emissions offsets.

44. Sierra Club v. Environmental Prot. Agency, 762 F.3d 971 (9th Cir. 2014).
45. Memorandum from Tyler J. Fox, to the Proposed Regulatory Docket No. EPA-HQ-OAR-2015-0310 (June 30, 2015) (on file with EPA), *available at* https://www3.epa.gov/ttn/scram/11thmodconf/20150630-Ozone_Docket_Memo.pdf.
46. 80 Fed. Reg. at 45346. In 2012, EPA granted a Sierra Club petition and committed to undertake a rulemaking to evaluate whether updates to the guideline are warranted and, if so, to incorporate new analytical techniques in the guideline for ozone and fine PM.
47. Memorandum from Tyler J. Fox, *supra* note 45.

The problem, however, is that these areas will not have the arrangements in place to generate offsets for several years. History has shown that it takes several years for an area to develop the institutional arrangements necessary for the generation of acceptable offsets. EPA does, at least in theory, allow offsets from other areas under certain circumstances, but the opportunity to use these "trades" across areas has historically been constrained by EPA. In particular, the applicant must demonstrate a "net air quality benefit" across the region—a showing that must be made through detailed computer modeling to EPA's satisfaction. Some commenters on the ozone NAAQS proposal highlighted the difficulty of obtaining EPA approval of such trades.[48] Finally, it should be noted that rural areas with ozone levels exceeding 70 ppb that do not have any other controllable sources may never be able to generate the needed emissions offsets. As a result, the recent ozone NAAQS may effectively ban the construction of new sources in these rural areas.

C. *Dealing With Background Ozone*

In the case of the recent ozone NAAQS, the new 70 ppb standard likely approaches background levels in some areas of the United States, leaving little "headroom" for new manufacturing facilities in terms of showing that their residual emissions, even after installing the best available pollution control technology, will not violate the ozone NAAQS. Recent research has found that stratospheric intrusions and long-range transport—particularly in western states—have resulted in daily maximum eight-hour ozone levels of 70 ppb or more.[49] With the ozone NAAQS at or below background, sources will find it impossible to show that they will not "contribute to" a violation of the standard.

EPA has argued that stratospheric intrusions can be dealt with through its exceptional events policy, which allows EPA to disregard exceedances of a NAAQS caused by certain types of exceptional events. However, states that have tried to use the policy in the past claim that it has been extremely difficult, costly, and time-consuming to get EPA recognition of any exceptional events—perhaps in part because EPA has established a high hurdle for accepting state claims of exceptional events. In any event, the existing rule sets restrictive requirements for such claims, in part by requiring the affected states to show a "clear causal relationship" between the measured level and the event that has affected air quality in the area.

This requirement necessitates extensive monitoring and modeling to establish a clear causal relationship in a context where there continue to be significant questions about the accuracy of ozone air quality modeling. Further, the state must show that the exceedance is in excess of normal historical fluctuations. It is not clear that states will be able to meet these restrictive conditions because little historical data exist on such intrusions. In the final ozone rule, EPA signaled that it intended to complete revisions to the Exceptional Events Rule and guidance document before October 2016.[50]

In October 2016, EPA issued revisions to its existing Exceptional Events Rule as promised. The rule addresses some of the issues raised by stakeholders since promulgation of the current rule in 2007, with the objective of providing clarity on the criteria needed to prove an exceptional event and increasing the administrative efficiency of the process. Unlike existing EPA policy, however, the rule restricts the scope of the Exceptional Events Rule to specific regulatory actions, such as the designation of areas subject to a NAAQS as attainment or NA and determinations of attainment of a NAAQS by NA areas. EPA explains in the preamble that it is preparing a guidance document to address the exclusion of data for other applications, such as NSR.[51] EPA has not announced a schedule for issuing such a guidance document and, if history is a guide, there may be uncertainty for many years about ways in which exceptional events will affect the NSR program.

V. Potential Administrative Reforms

Past efforts to reform the NSR program have largely focused on changes that would ease the burden on existing sources by reducing the number of projects and activities that would be treated as major modifications of an existing source that require an NSR permit. For example, the most recent changes—issued in 2002—allow the use of projected future actual emissions, rather than potential emissions, in measuring emissions increases; a longer look-back period in selecting the baseline against which future projected actual emissions are compared; and a new program referred to as the plantwide applicability limitations (PAL) program, which creates an incentive for sources to

48. For example, the South Carolina agency in charge of implementing the CAA commented:

> One result of recent emission control measures is that there are minimal potential offsets available for any potential major new source review projects in future nonattainment areas. Unless the EPA broadens its acceptance of offset opportunities, most, if not all future offsets may only be obtained from closed facilities. In practical terms, the opening of a new business means the closure of another business.

See Letter from South Carolina Department of Health and Environmental Control to U.S. Environmental Protection Agency (Mar. 17, 2015), http://www.scdhec.gov/HomeAndEnvironment/Docs/NAAQS/15_Ozone_Comment_20150317a_hp.pdf; Broome & Morehouse, *supra* note 23.

49. Meiyun Lin et al., *Springtime High Surface Ozone Events Over the Western United States: Quantifying the Role of Stratospheric Intrusions*, 117 J. Geophysical Res.: Atmospheres (2012), *available at* http://onlinelibrary.wiley.com/wol1/doi/10.1029/2012JD018151/abstract; Allen S. Lefohn et al., *Quantifying the Importance of Stratospheric-Tropospheric Transport on Surface Ozone Concentrations at High- and Low-Elevation Monitoring Sites in the United States*, 62 Atmospheric Env't 646, 646-56 (2012); Allen S. Lefohn et al., Background Ozone and Its Importance in Relation to the Health Risk and Exposure Assessment for Ozone Assessment Document 7 (2014).

50. U.S. EPA, *supra* note 38, at 80 Fed. Reg. 65437.

51. 81 Fed. Reg. 68229-30 (Oct. 3, 2016).

reduce their emissions as a strategy for avoiding NSR in the future.[52]

There certainly is merit in exploring additional NSR reforms for existing sources, but this Article is primarily focused on the ways in which the current NSR program may impede construction of new facilities, even with state-of-the-art emission controls. Below, we discuss a set of reforms designed to address these issues and to make the NSR program more sensible when it comes to new sources.

A. A More Realistic Approach for Air Quality Modeling

EPA's current modeling guidance requires deterministic air quality models using the maximum allowable emissions rate and the maximum allowable operating conditions for each averaging time.[53] It also requires the use of modeling assumptions that yield the maximum impact on air quality in calculating background, including the effect of other sources in the area. However, sources typically operate well below their maximum allowable emission rates, and it would be highly unusual for all the sources in an area to be emitting at their highest allowable rates at the same time—and during a period when weather conditions would maximize the ambient impacts of their emissions. As a result, EPA's current modeling guidance substantially overstates the ambient air quality effects of a potential new source.

One solution to the over-conservatism of the current approach would be to adopt a probabilistic modeling approach. Adoption of probabilistic methods would allow the use of distributions to reflect the variability in actual emissions, meteorology, and background. One common approach is to use Monte Carlo analysis to combine the information from the various probability distributions to provide an estimate (in the form of a distribution) of the effect on air quality. Thus, probabilistic analysis provides information on the variability and uncertainty in the estimated air quality effects and on the extent to which current deterministic modeling requirements overestimate the actual air quality impacts of a new source.

Adoption of probabilistic air quality modeling approaches would be particularly appropriate with the statistical form adopted for the short-term NAAQS.[54] Where a short-term NAAQS has been established to protect a sensitive subpopulation, it might also be possible to use probabilistic modeling to predict the likelihood that a member of such a subpopulation might be present and potentially exposed to peak concentrations caused by unusual circumstances related to weather or emission events.

Obviously, in order for probabilistic modeling to be helpful, EPA must indicate a receptivity to such modeling. But the Agency should also provide guidance on what probabilistic cutpoint must be met when making a determination that a new source will not contribute to adverse air quality impacts. EPA is already using probabilistic modeling to various degrees in other programs, so it should be feasible to develop guidance for appropriate use of such modeling in the NSR program.

B. Reforms to the Offset Program

The statutory offset requirements for the NSR program were established in 1977 and were based on the assumption that, if an area was in NA, the problem was largely caused by local industrial sources that needed to install pollution controls. Therefore, if a company wanted to locate a new facility in that area, it could pay for pollution controls at another facility and thus obtain the emissions reduction credits it would need to offset emissions from the new facility.

Although this may be the case in some areas of the country, it is not the case in many others—especially when it comes to ozone. With the lowering of the ozone standard to 70 ppb, it appears that a number of rural areas will become NA areas, including areas that currently have no industrial facilities at all. In such areas, violations of the ozone standard are typically caused by a combination of natural background, motor vehicles that travel through the area, and pollution transported from long distances. Here, no offsets are available and, depending on how the offset program is implemented, the offset requirement may well serve as an effective prohibition on the construction of any industrial facilities.

The other scenario in which the offset requirement may effectively ban new industrial facilities arises from the fact that some areas of the country have been very aggressive over many years in their regulatory efforts to reduce ozone levels. It may be true, as some critics suggest, that some of these areas did not take aggressive regulatory action until passage of the 1990 CAA Amendments, but states with persistent ozone problems have spent the past 25 years looking for every conceivable way to reduce emissions related to ozone. In these areas, all the cost-effective emissions reductions (and some very costly ones as well) have already been mandated by regulation, and EPA does not allow such emissions reductions to be used as offsets. Where there are any offsets to be had in these areas, they are very expensive and often make it economically infeasible to locate any

52. 67 Fed. Reg. 80189 (Dec. 31, 2002). In 2005, the D.C. Circuit upheld these provisions—but rejected two other provisions intended to ease the burden of NSR for existing plants. New York v. Environmental Prot. Agency, No. 02-1387, 35 ELR 20135 (D.C. Cir. 2005) (*New York I*). The D.C. Circuit also turned down a separate 2003 EPA rule—the "Safe Harbor Rule"—in 2006. New York v. Environmental Prot. Agency, 443 F.3d 880, 883, 36 ELR 20056 (D.C. Cir. 2006) (*New York II*).

53. This means the modeling must reflect allowable operating conditions as set out by "federally enforceable emission limits, operating level, and operating factor" for each pollutant and averaging time. U.S. EPA, New Source Review Workshop Manual C.44-45 (draft 1990). Similar language in EPA's rule revising its Guideline on Air Quality Models requires the use of the operating conditions causing the "maximum ground-level concentrations." 70 C.F.R. §51.

54. The one-hour NO_2 and 24-hour fine PM NAAQS require areas to meet the 98th percentile averaged over three years; the one-hour SO_2 NAAQS requires areas to meet the 99th percentile averaged over three years. The ozone NAAQS requires that areas not exceed 70 ppb for the average fourth high eight-hour ozone level over three years.

new industrial facility in the area, even a relatively small facility with state-of-the-art pollution controls.

Fortunately, potential administrative reforms would help address both concerns—rural areas where no offsets are available and heavily regulated areas where offsets, if they are available at all, are very costly. First, the CAA allows the developer of a proposed new facility to obtain offsets from another area (i.e., an area outside the NA area where the new facility will be located) as long as (1) the other area is also in NA and has "an equal or higher nonattainment classification" and (2) emissions from the other area contribute to NA in the area in which the new source will be located. Historically, it has been very difficult to obtain permission to use out-of-area offsets because EPA and states have required extensive modeling studies to show that emissions from the offset-producing area contribute to pollution levels that exceed NAAQS in the area in which the new facility is to be located. Industry representatives also report that, even where such modeling has been done, EPA has been reluctant to approve it.

However, advances in our understanding of air pollution have shown that ozone and fine PM (often referred to as $PM_{2.5}$) are more a regional issue than a local issue, and that elevated levels of these pollutants in a particular area are caused in part by emissions from many other areas, including some that are very distant. This finding—based on EPA modeling studies showing that there is long-range transport of emissions that contribute to ozone and fine PM NA—is the basis for EPA's recent Cross-State Air Pollution Rule. The Rule required substantial emissions reductions from power plants in 28 states because EPA has found that they contribute to ozone and fine PM NA in *other* states.

Thus, instead of requiring case-by-case modeling studies to justify the use of out-of-area offsets, EPA and states could in many cases rely on the long-range transport studies that EPA has already done to show that emissions from 28 states contribute to ozone and fine PM NA in many other states. Even where EPA has not already done such modeling, companies seeking to rely on out-of-area offsets should be able to employ similar studies to justify the use of such offsets. This reform would not address all the concerns about current offset requirements, but it would significantly expand the pool of potential offsets in many parts of the country (especially in rural areas) while still achieving the program's environmental goals.

Unfortunately, the use of out-of-area offsets may not be an option for some heavily regulated areas such as the South Coast Air Quality Management District (SCAQMD) and the San Joaquin Valley in California because of the requirement that such offsets must come from an area that has "an equal or higher nonattainment classification." For the purposes of ozone, there are five different NA classifications—marginal, moderate, serious, severe, and extreme—and a developer who might want to build or expand a facility in an extreme area like SCAQMD would be able to use out-of-area offsets only from another extreme area, where offsets will also be very costly and may not be available.

Even in these areas, however, other reforms to the offset program may expand the pool of offsets and allow the development of some new manufacturing facilities. For example, EPA has historically insisted that emissions reductions required by regulation may not be used as offsets. This may be true when it comes to regulations promulgated by EPA, but states are also required to adopt their own sets of regulations, SIPs, to show how they will come into attainment. If an area wanted to preserve the option of attracting new manufacturing facilities, it could be allowed to set aside some of its SIP emissions reductions to be used as offsets, as long as the SIP shows that other reductions would allow the area to continue making reasonable further progress toward attainment.

As discussed above, a number of studies have shown that NA areas have lower levels of economic growth than attainment areas. This is likely caused, to a large extent, by current offset requirements, which have been developed over many years in a series of restrictive EPA policies and guidance documents. It may be time, especially in light of the new ozone standard, to revisit these requirements to ensure that they strike the right balance between improving air quality and allowing continued economic growth in NA areas.

C. Adoption of a Consistent Treatment for Pending Permit Applications

EPA has been inconsistent in its treatment of NSR permit applications that are pending when a new NAAQS comes into effect. Before 2010, it appears that such decisions were generally made on an ad hoc basis by individual state agencies. Some would require permit applicants to redo their air quality modeling to show compliance with a new standard, but others believed that this approach was not required. In their view, if an applicant had done the necessary modeling to show compliance with the standards in place when the permit application was submitted, no additional air quality modeling was required.

EPA did not address this issue when it adopted its one-hour NO_2 standard in 2010, but it became a point of contention between several permit applicants and environmental groups that were opposing their proposed projects. In response, EPA said that it did have authority to grandfather pending permit applications whenever a new or revised NAAQS was adopted, so applicants would not need to redo their air quality studies based on the standard. However, the Agency said, because it did not explicitly include a grandfathering provision as part of the new NO_2 NAAQS, all applicants with pending permit applications were required to do another air quality study to show that emissions from their proposed projects would not cause or contribute to a violation of the new standard.

Perhaps, because of the problems that this created for many permits that were pending back in 2010, the Agency did include an explicit grandfathering provision as part of the 2015 ozone standard. The Agency could easily adopt this approach in connection with any future NAAQS revisions and grandfather those NSR applications that are reasonably complete before the new NAAQS comes into effect as a part of its final rule. In its ozone NAAQS proposal, EPA is already moving in this direction. It could also extend this approach to protect applicants for projects that are proposed for attainment areas, as long as their applications are complete before the area is designated NA.

Without this type of protection, project opponents will have an incentive to delay the permitting process as long as possible in the hope that the area will be designated NA before a final permit can be issued. A more consistent grandfathering approach would ensure that companies do not spend years trying to obtain a PSD permit, only to reach the end of the process and find they now need to get an NA NSR permit (with offsets that may not be available) rather than a PSD permit.

D. Timely Issuance of Implementation Rules and Modeling Guidance

As mentioned earlier, one of the most important reforms EPA could make is simply to make sure that the necessary implementation rules, guidance, and air quality models are already in place when a revised NAAQS comes into effect. This would require a commitment of EPA resources that the Agency has so far not been willing to make, but it certainly could be done.

Part of the problem may be that the nuts and bolts of implementing a new standard are not terribly "sexy." The most senior EPA officials, those who are politically appointed, understand that they will be in place for only a few years, and they generally want to spend their time and attention on higher-profile issues. When it comes to NAAQS, they receive praise from the environmental community for lowering the standards, but not for the difficult task of actually figuring out how a lower standard can be implemented. It is rare to have political leaders at EPA, either Republican or Democratic, who want to make their mark on the world by dealing with air quality modeling and the arcane world of offsets.

On the other hand, it would be relatively simple to address this issue with a basic structural reform at EPA. The Agency already has a well-established process for reviewing NAAQS—a process that normally takes several years. At present, this process does not involve key stakeholders involved in implementing the NSR permitting program. The NAAQS review process should be structured so that by the end of the process, the necessary implementation rules and modeling guidance have also been finalized. This simple step would address many of the concerns that have arisen over the past few years.

VI. Potential Statutory Reforms

A. A Narrow Fix: Emissions Fees in Lieu of Offset Requirements

Current modeling and offset requirements may be the most significant regulatory impediment to the development of new and expanded manufacturing plants in the United States. In attainment areas, more stringent NAAQS coupled with conservative models and modeling assumptions make it difficult (and sometimes impossible) for a permit applicant to show that a new facility will not "cause or contribute to" a violation of any NAAQS. Even where it may be possible to make such a showing, the process is uncertain, lengthy, and burdensome.

When a new or expanded source in an attainment area cannot make such a showing, it must obtain emissions offsets in order to obtain a permit. In this sense, it is treated just like a facility in an NA area. In either case, a new facility may not be built unless the permit applicant can obtain sufficient pollution offsets. However, as outlined above, offsets are not available in many areas, and in areas where they are available, they can be prohibitively costly.

We propose a narrow statutory reform that could address these issues while still obtaining most or perhaps even more of the environmental benefits of the current program: allow permit applicants to pay emissions fees in lieu of meeting the current offset requirements, and require the state or local environmental agency to use these fees to pay for or subsidize emissions reductions that the agency believes will do the most good in terms of reducing environmental risks.[55]

Depending on the size of the fee, states may or may not be able to obtain the emission offsets required by the current NSR program, but they may be able to obtain even more because they could seek emissions reductions from a much broader range of sources than allowed under the current program. Current EPA practice favors offsets that come from other industrial sources—not from "mobile sources" (including cars, trucks, and construction equipment) and not from "area sources" (such as dry cleaners, auto body shops, and other paint and coating operations). Our proposal would have emissions fees paid into a fund that would be under the control of the state or local environmental agency, which could use the proceeds to finance emissions reductions and other air quality programs. In some cases, this might include subsidizing diesel retrofits or other emissions reductions from mobile or area sources

55. Both California and Texas run Clean Air Investment Funds (the Carl Moyer Memorial Air Quality Standards Attainment Program and the Texas Emission Reduction Plan (TERP), respectively) that have proven effective in implementing novel emission reduction approaches. For example, the Carl Moyer Program provides grants to owners of heavy-duty vehicles to replace older heavy-duty engines with new and cleaner engines, and to install electric idling-reduction equipment. The TERP has funded alternative fuel and natural gas fueling stations, among other projects. *See* https://www.arb.ca.gov/msprog/moyer/moyer.htm and https://www.tceq.texas.gov/airquality/terp.

that can be more important in terms of improving ambient air quality than traditional offsets.

In some cases, states could use their existing regulatory authority to obtain emissions reductions that could be used as offsets. Under current law, existing sources do not necessarily have an incentive to make even cost-effective emissions reductions because (1) they do not have to pay for their emissions and (2) they may want to "hoard" potential reductions to offset future emission increases.[56] As a result, existing plants have an incentive to retain any potential reductions to support their own plans for plant expansion, instead of generating emission offsets for a new plant.[57] States could use their existing regulatory authority to obtain such reductions and create offsets that could be used by anyone seeking to build a new source (or expand an existing one).

Under the approach that we are proposing, a new or expanded facility would still need to obtain a permit to ensure that it will be built with modern pollution control technology—BACT in attainment areas and LAER technology in NA areas—but instead of obtaining offsets, it would make a payment to the state or local environmental agency based on its projected emissions. We anticipate that such per-ton emissions fees would be different for different pollutants based on the "reasonable cost" of a technology-based level of control. Some examples of identifying a "reasonable" control cost include the following:

- Section 185 of the CAA (adopted in 1990), which established an emissions fee of $5,000 per ton adjusted annually by the Consumer Price Index. In 2013, the fee was $9,400 per ton for NO_x and VOC emissions for severe and extreme NA areas.
- EPA's regulatory impact analysis for the recently adopted ozone standard, which used a control cost of $15,000 per ton as a reasonable estimate of the highest per-ton cost that would be necessary for the cost of "unknown" controls required to meet the current ozone NAAQS.

We anticipate that these numbers ($9,400-$15,000 per ton) would be at the upper end of the range of potential emissions fees, since they reflect the projected cost of obtaining emissions reductions in the areas with the most serious air quality problems.

B. Broader Structural Reform: Emissions Fees in Lieu of NSR

A more sweeping statutory reform could replace the entire NSR permitting program with a system of industrial emissions fees. The fees could be based on the projected per-ton cost of controlling different pollutants, or they could instead be damage-based. Damage-based fees could vary based on geographic location, insofar as reasonable estimates of damages are available. Different fees would be applied to different pollutants, based on the best available knowledge of their relative toxicity to human health and the environment. Emissions near population centers would likely be assessed a higher fee than emissions in rural areas.[58]

A virtue of emissions fees compared with the NSR process is that companies can build the fees into their cost structures, creating a clear economic incentive to control or modify their production processes to reduce emissions. Because the fee is automatic, it circumvents all the costly preparations and delays associated with NSR and reduces the power of EPA and state officials over specific companies involved in new construction or in the upgrade or repair of existing facilities. With emissions fees, the company does not face any uncertainty about how the regulator will react to a facility that is new or undergoing repair and maintenance. With NSR, there is considerable uncertainty as to how state or EPA officials will define the NSR obligation for a specific facility. And it is this regulatory uncertainty that may discourage a company from making investments in new facilities. Note that an emissions fee could also be extended to apply to existing sources, removing new source bias.

However, there are important barriers and hurdles to implementing an emissions fee approach. First, a growing body of scientific evidence calls into question a key assumption of the CAA: that there is a "safe" amount of pollution that can be established by environmental science. While a threshold dose for adverse effects seems likely for each individual, there is a wide range of susceptibility to adverse effects, considering the differences among healthy adults, senior citizens, asthmatics, children, and people with cardiopulmonary problems. If the safe population dose threshold is defined as the safe dose for the most susceptible individual, then the population threshold may be very close to zero or background levels.

As a result, the environmental community may oppose the adoption of an emissions fee approach in place of NSR modeling requirements to ensure protection of air quality, out of their concern for the adequacy of protection of public health. On the other hand, some environmental groups are simply looking for the most effective way to reduce emissions, and they may see emissions fees as more effective than an NSR program that is politicized, fragmented, and under constant litigation.

56. Plants do pay nominal Title V fees based on their emissions.
57. This asymmetry between the grandfathering of emissions for existing plants while new plants must obtain emission offsets serves as an important wedge in terms of cleaner new firms buying out the dirtier existing plants in NA areas.
58. In fact, current estimates suggest a substantial variation in damages from one location to another. Further, the damage estimates even vary significantly across locations within the same urban area, by season, and even by time of day. Neal Fann et al., *The Influence of Location, Source, and Emission Type in Estimates of the Human Health Benefits of Reducing a Ton of Air Pollution*, 2 Air Quality, Atmosphere & Health 169, 169-76 (2009); Nicholas Z. Muller & Robert Mendelsohn, *Efficient Pollution Regulation: Getting the Prices Right*, 99 Am. Econ. Rev. 1714, 1714-39 (2009); Arthur Fraas & Randall Lutter, *Efficient Pollution Regulation: Getting the Prices Right: Comment*, 102 Am. Econ. Rev. 602, 602-07 (2012).

To the extent that fees would be based on estimated damages, an emissions fee approach would require a rigorous benefit analysis. While EPA has developed benefit estimates for the ozone and fine PM NAAQS pollutants, debate is ongoing (and controversial) over the uncertainty in EPA's estimates of the health effects of ozone and PM exposure.[59] In particular, considerable uncertainty exists in the estimated health effects associated with exposures at the low ambient levels of ozone and fine PM that characterize U.S. air quality. Even EPA acknowledges significant uncertainty associated with mortality estimates for exposures at the low ambient levels of ozone and fine PM that are present in the United States.[60] Nonetheless, EPA knows how to use tools of uncertainty analysis and those tools could be applied to help develop appropriate emissions fees.

Second, current NSR requirements are designed to protect against short- and long-term violations of the several NAAQS. However, there is substantial seasonal, day-to-day (and even hourly) variability in the effect of emissions from a major plant on ambient air quality. This variability arises from variations in such factors as background emissions and meteorological conditions. As a result, a fixed emissions fee may approximate the effect of emissions in terms of long-term average ambient air concentrations of pollutants such as ozone and fine PM, but such fees would have to vary substantially on a day-to-day (and even hourly) basis across different locations within an urban area to track the daily effect of plant emissions on air quality and the associated air pollution damages.

Thus, a stable annual emissions fee would only rarely be "right" on a day-to-day (or hourly) basis in protecting against short-term violations of NAAQS and in reflecting the damages of plant emissions. A short-term, variable emissions fee responding to variations in meteorological and atmospheric conditions would more closely approximate (although still imperfectly) the damage effects of emissions from a major facility, but implementation of such a variable fee would be challenging. The variability in the fee would also give up some of the "certainty" advantages that would accompany a stable long-term emissions fee.

Nonetheless, with modern computer technology and "big data" systems, a variable emissions fee may be feasible and could prove to be less administratively onerous for industry and EPA than the current NSR program. Clearly, however, it would have to be structured in a way that provides certainty and predictability for source owners, perhaps by limiting the range in which the fee can fluctuate and setting the fee far enough in advance that they can plan their operations based on the amount of the fee.

The air chemistry associated with NO_x emissions is particularly complicated. The resulting non-convexity in the relationship between reductions in NO_x emissions and ambient ozone and fine PM levels yields negative benefits in some major metropolitan areas. In other words, reducing NO_x emissions can actually make air quality worse in some areas. As a result, it is not clear how best to implement an emissions fee program for NO_x emissions in these major urban areas.[61] However, such modeling difficulties are also a conundrum in the command-and-control approach to NSR that EPA is now implementing.

Third, an emissions-fee approach will require that covered facilities estimate or monitor their emissions of multiple pollutants on a continuing basis. Much of this information is already reported by companies to state environmental agencies, EPA, or both. Since companies would know that under this new approach, fees would be charged for emissions, they would have an additional incentive to understate their emissions to EPA. A rigorous EPA enforcement system—with substantial penalties for false reporting—will be required to ensure the integrity of reported emissions.

Although intensive monitoring and enforcement programs are feasible for major manufacturing plants (the kinds of sources subject to the NSR program), these intensive programs would not be feasible for the large number of smaller stationary/area sources and the transportation programs required to achieve and maintain air quality that meets NAAQS. Thus, for these smaller sources, something like the current CAA processes to implement NAAQS (e.g., SIPs) will continue to be necessary.

VII. Conclusion

The NSR program has become a significant impediment to the construction and expansion of manufacturing facilities in the United States. With increasingly stringent NAAQS, and especially under the new ozone standard, it may effectively prevent industrial development in some parts of the country. We have identified several administrative actions that EPA could take to address these issues while still maintaining the environmental benefits of the program.

We start with two reforms that would be beneficial even if none of the NAAQS is revised again. First, EPA could adopt a probabilistic approach to air quality modeling to replace its current deterministic, upper-bound modeling requirements. Such an approach would more

59. National Research Council, Estimating the Public Health Benefits of Proposed Air Pollution Regulations (National Academies Press 2002); Arthur Fraas, *The Treatment of Uncertainty in EPA's Analysis of Air Pollution Rules: A Status Report*, 2 J. Benefit Cost Analysis 1, 1-27 (2011); Kerry Krutilla et al., *Uncertainty in the Cost-Effectiveness of Federal Air Quality Regulations*, 6 J. Benefit Cost Analysis 66, 66-111 (2015); Neal Fann et al., *Letter in Response to Fraas & Lutter Article: Uncertain Benefits Estimates for Reductions in Fine Particle Concentrations*, 33 Risk Analysis 755, 755-56 (2013); Arthur Fraas & Randall Lutter, *Uncertain Benefits Estimates for Reductions in Fine Particle Concentrations*, 33 Risk Analysis 434, 434-49 (2013); Arthur Fraas & Randall Lutter, *Reply to Letter by Fann, Lamson, Anenberg, and Hubbell Regarding Fraas & Lutter Article: Uncertain Benefits Estimates for Reductions in Fine Particle Concentrations*, 33 Risk Analysis 757, 757-59 (2013).

60. Krutilla et al., *supra* note 59.

61. Fann et al., *supra* note 58; Muller & Mendelsohn, *supra* note 58; Arthur Fraas & Randall Lutter, *Do Some NO_x Emissions Have Negative Environmental Damages? Evidence and Implications for Policy*, 45 Envtl. Sci. & Tech. 7613, 7613-14 (2011); Fraas & Lutter, *supra* note 58.

accurately predict the air quality impacts of a new or expanded facility and thus make it easier to obtain permits for new and expanded facilities in attainment areas. Second, EPA could adopt reforms that would expand the pool of offsets and allow more clean development in both attainment and NA areas while preserving the program's environmental benefits.

We also recommend two simple reforms that would explicitly address the NSR issues that arise when a NAAQS is revised. First, EPA should revise its regulation to clarify that permit requirements and standards will be based on the date a complete permit application is submitted (which is within the control of the permit applicant) and not on the date the permit is actually issued (which may be years later and is solely within the control of the permitting authority). Second, the Agency should adopt internal staffing reforms to ensure that the necessary implementation rules, guidance, and air quality models are already in place when a revised NAAQS comes into effect.

Additionally, we offer two potential statutory reforms. The first would be fairly narrow but would significantly improve the NSR program by allowing permit applicants to pay emissions fees in lieu of meeting the current offset requirements. These fees would go into a fund that the state or local environmental agency would use to pay for or subsidize emissions reductions that the agency believes will do the most good in terms of reducing environmental risks.

Finally, we note that a more fundamental reform would be to change the statute and replace the NSR program for major manufacturing facilities with a system of emissions fees for each of the NSR pollutants. By monitoring emissions, each company would know its financial responsibility for pollution and could take steps to reduce or prevent emissions and thereby avoid fees. Such an approach would eliminate the uncertainty and unpredictability of the NSR process and encourage the expansion of existing manufacturing plants and the construction of new ones.

Appendix: Chronology for PSD Application for Footprint Power Salem Harbor Development LP Gas-Fired Combined Cycle EGU (630 MW)

Initial application	Dec. 21, 2012
Additional information submitted	Apr. 12, 2013
	June 10, 2013
	June 18, 2013
	Aug. 6, 2013
	Aug. 20, 2013
	Sept. 4, 2013
	Sept. 9, 2013
Draft PSD permit issued for public comment	Sept. 9, 2013
Public hearing	Oct. 10, 2013
Public comment extended	Nov. 1, 2013
Revised General Electric (GE) guarantee	Nov. 1, 2013
Response to EPA & other comments; emissions update with additional GE guarantee	Dec. 11, 2013
Additional letter on startup/shutdown	Jan. 10, 2014
Additional air quality monitoring for PM, & updated emissions rates for carbon monoxide & sulfuric acid	Jan. 16-21, 2014
Draft final permit issued	Jan. 30, 2014
Petition submitted to EAB	Mar. 3, 2014
Petition denied	Sept. 2, 2014
Final permit issued	Sept. 11, 2014