UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT

WILDEARTH GUARDIANS, Petitioner, v. U.S. ENVIRONMENTAL PROTECTION AGENCY and LISA JACKSON, Respondents, PUBLIC SERVICE COMPANY OF NEW MEXICO, Intervenor.	)	Case No. 11-9552 Consolidated with Case No. 11-9557 and Case No. 11-9567

PETITION FOR REVIEW OF
ENVIRONMENTAL PROTECTION AGENCY RULE

PETITIONER WILDEARTH GUARDIANS' OPENING BRIEF
(DEFERRED APPENDIX APPEAL)

/s/Samantha Ruscavage-Barz
Samantha Ruscavage-Barz
WildEarth Guardians
516 Alto Street
Santa Fe, NM 87501
Tel. 505-988-9126 x1158
sruscavagebarz@wildearthguardians.org

Counsel for Petitioner WildEarth Guardians

ORAL ARGUMENT REQUESTED

CORPORATE DISCLOSURE STATEMENT

WildEarth Guardians has no parent companies, subsidiaries, or affiliates that have issued shares to the public.

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Cases

Statutes & Regulations

Federal Register

Other Authorities

STATEMENT OF RELATED CASES

There are two related cases challenging the same final rule as is challenged herein. All three cases challenging the rule have been administratively consolidated and are subject to a single joint briefing schedule. The cases are:

1. PUBLIC SERVICE COMPANY OF NEW MEXICO v. U.S. ENVIRONMENTAL PROTECTION AGENCY et al., Case No. 11-9557

2. SUSANA MARTINEZ, Governor of New Mexico et al. v. U.S. ENVIRONMENTAL PROTECTION AGENCY, Case No. 11-9567

GLOSSARY

Act	Clean Air Act
APA	Administrative Procedure Act
AR	Administrative Record
BART	Best Available Retrofit Technology
EPA	Administrator, Environmental Protection Agency
FIP	Federal Implementation Plan
NAAQS	National Ambient Air Quality Standards
NOx	Nitrogen Oxide
RH	Regional Haze
SCR	Selective Catalytic Reduction
SIP	State Implementation Plan
SJGS	San Juan Generating Station

STATEMENT OF JURISDICTION

I. SUBJECT MATTER AND APPELLATE JURISDICTION

Petitioner, WildEarth Guardians ("Guardians"), seeks review of a final rule promulgated by Respondents by Lisa P. Jackson, Administrator of the United States Environmental Protection Agency and the United States Environmental Protection Agency (collectively "EPA"). EPA published the challenged final rule, entitled "Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination," in the Federal Register on August 22, 2011. 76 Fed. Reg. 52,388. The Clean Air Act provides that a petition for review of a final rule may be filed in the U.S. Court of Appeals for the appropriate circuit within 60 days of the publication of a final rule.

A. Agency Jurisdiction

EPA had jurisdiction under Section 110(c) of the Clean Air Act to promulgate the rule challenged herein. 42 U.S.C. § 7410(c)(1).

B. Appellate Jurisdiction

Pursuant to Section 307(b)(1) of the Clean Air Act, this Court has jurisdiction to review challenges to EPA's final rule promulgated pursuant to Section 110(c) of the Act. 42 U.S.C. § 7607(b)(1). Section 307(b)(1) provides that a petition for review of any final EPA action under the Act that is locally or regionally applicable may be filed only in the United States Court of Appeals for the appropriate circuit. Venue is proper in this Court pursuant to Section 307(b)(1) because this case concerns a final rule for a facility in New Mexico.

C. Timeliness

On August 22, 2011, EPA published notice in the Federal Register of its promulgation of the final rule. 76 Fed. Reg. 52,388. Guardians filed its Petition for Review one week later on August 29, 2011. Thus, pursuant to 42 U.S.C. § 7607(b)(1), Guardians' Petition for Review is timely because it was filed within 60 days of publication of the challenged action in the Federal Register.

D. Final Decision

EPA's promulgation of the final rule constitutes final agency action subject to judicial review. 42 U.S.C. § 7607(d)(1)(B) (Judicial review provisions of Section 307(b)(1) apply to "the promulgation or revision of an implementation plan by the Administrator under section 110(c)").

II. GUARDIANS HAS STANDING

To establish standing, a party must show that it has suffered an injury-in-fact, *i.e.,* a concrete and particularized, actual or imminent invasion of a legally protected interest; that the injury is fairly traceable to the challenged action of the defendant; and that a favorable decision will likely redress the injury. *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560-561 (1992). In *Friends of the Earth v.*

Laidlaw Envtl. Servs., 528 U.S. 167 (2000), the Supreme Court held that a plaintiff's members' "reasonable concerns" of harm caused by pollution from the defendant's activity directly affected those affiants' recreational, aesthetic, and economic interests for purposes of establishing injury-in-fact. *Id.* at 183-84.

Guardians has standing to challenge EPA's final rule. *See* Declaration of Jeremy Nichols ("Nichols Decl."), Ex. 1. Guardians is a non-profit environmental organization that works to safeguard the Earth's climate and air quality. *See* Nichols Decl. ¶ 2. Guardians has standing as an organization because: its member Mr. Nichols has standing to sue in his own right; the interests at stake are germane to Guardians' purpose; and neither the claim asserted, nor the relief sought requires Mr. Nichols to participate directly in this lawsuit. *Hunt v. Washington State Apple Advertising Commission*, 432 U.S. 333, 343 (1977).

Here, Mr. Nichols, a member and employee of Guardians, has suffered an injury sufficient to demonstrate standing. Mr. Nichols regularly visits, and will continue to visit, the area of the San Juan Generating Station ("SJGS"), including Mesa Verde National Park; Farmington, New Mexico; and public lands adjacent to the power plant. *Id.* ¶¶ 3, 5. While visiting this area, he observes air pollution coming out of the SJGS smokestacks, depreciating his enjoyment of scenery and his recreational experience. *Id.* ¶¶ 4-6.

Mr. Nichols is also concerned about the air pollution from the SJGS and its impact on his health. *Id.* ¶¶ 8-9. Mr. Nichols is further concerned that the wildlife, scenic beauty, and natural environment in and around the SJGS is being harmed by the power plant's excessive haze and smog—harm that will continue for at least five years because of EPA's enlargement of the compliance time frame for the SJGS to install emission-reducing technology from three years to five years, thereby harming his recreation and aesthetic interests in that area now and in the future. *Id.* ¶ 6, 17.

Mr. Nichols' injuries are caused by EPA's decision to extend the compliance time frame for installation of emission-reducinging technology at the SJGS to five years, which will delay the cleanup of haze from the SJGS for two additional years. *Id.* ¶ 17. The requested relief would redress his injuries by curtailing the impact of air pollution in and near the SJGS, or at the very least reducing the risk of illegal pollution in and near the SJGS. *Id.*

Because Mr. Nichols, a member of Guardians, has standing to bring this action in his own right, the organization satisfies the first element of the Supreme Court's *Hunt* test. Guardians also satisfies the second and third *Hunt* requirements, because the interests of Guardians' members at stake are germane to the organization's purpose, and none of the claims Guardians asserts in this Petition for Review requires its members to participate as individuals in this litigation. *See*

Nichols Decl. ¶¶ 2, 10-13. Accordingly, Guardians has standing to bring this action.

STATEMENT OF ISSUES FOR REVIEW

I. IS EPA'S DECISION TO ALLOW THE SJGS FIVE YEARS TO INSTALL THE BEST AVAILABLE RETROFIT TECHNOLOGY, INSTEAD OF THREE YEARS AS ORIGINALLY PROPOSED BY EPA, ARBITRARY AND UNSUPPORTED BY THE RECORD?

STATEMENT OF THE CASE

I. NATURE OF THE CASE

This Petition seeks review of EPA's final rule entitled "Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination." 76 Fed. Reg. 52,388 (Aug. 22, 2011) (hereafter, "the BART Rule"). The BART Rule requires the San Juan Generating Station ("SJGS"), one of the largest sources of air pollution in the United States, to install Best Available Retrofit Technology ("BART") to reduce emissions of air pollutants that cause haze and smog. In its BART Rule, EPA determined that Selective Catalytic Reduction ("SCR") is the best available retrofit technology for the SJGS to achieve emission reductions. In its proposed BART Rule, EPA determined that SJGS could install the SCR technology in three years. 76 Fed. Reg. 491, 492 (Jan. 5, 2011). However, seven months later in its final BART Rule, EPA determined that SJGS needed five years to install this SCR technology, the maximum time contemplated by the Statute. EPA's change of course is arbitrary and unsupported by the record.

For a source subject to BART, EPA's Clean Air Act regulations provide that each BART determination must include a compliance time frame, and must include a requirement that the source "install and operate BART as expeditiously as practicable, but in no event later that 5 years after approval of the implementation plan revision." 40 C.F.R. § 51.308(e)(1)(C)(iv). EPA's own analysis of the appropriate compliance time frame for the SJGS to install BART, contained in the record, shows that the five-year time frame for installation of BART at the SJGS is not warranted, and that a more expeditious time frame is practicable. Indeed, on the same record, EPA originally determined the SJGS could install BART in three years. Because the Clean Air Act requires that EPA set a time frame for BART installation and operation to occur "as expeditiously as practicable," and the record demonstrates that the five-year time frame is well beyond the time necessary for the SJGS to install BART, EPA's decision to impose a five-year compliance time frame for BART is arbitrary, capricious, and contrary to law.

II. DISPOSITION AND COURSE OF PROCEEDINGS BELOW

On January 5, 2011 EPA published its proposed BART Rule setting a three-year compliance schedule and solicited comments on alternative compliance time frames up to five years. 76 Fed. Reg. at 492. Guardians submitted timely comments in which it voiced its support for the three-year compliance time frame and noted that there were ample data to support a time frame of less than three years. AR Doc. No. 24 at 12 (Collaborative Comment Letter from Environmental Groups).

Seven months later, on August 22, 2012, EPA published its final BART Rule, increasing the compliance time frame to five years. 76 Fed. Reg. 52,388 (Aug. 22, 2011). On August 29, 2011, Guardians timely filed its Petition for Review of the BART Rule with this Court.

STATEMENT OF FACTS

I. CLEAN AIR ACT REQUIREMENTS

Congress enacted the Clean Air Act to "speed up, expand, and intensify the war against air pollution in the United States with a view to assuring that the air we breathe throughout the Nation is wholesome once again." H.R.Rep. No. 1146, 91st Cong., 2d Sess. 1,1, 1970 U.S. Code Cong. & Admin. News 5356, 5356. The Act employs a model of cooperative federalism whereby EPA and the states share the responsibility "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." 42 U.S.C. § 7401(b)(1). Under the Clean Air Act, each state is required to develop and submit, for EPA's approval, a State Implementation Plan

("SIP") indicating how it will implement, maintain, and enforce the Act's air quality standards. *See generally* 42 U.S.C. § 7410(a)(2). When EPA determines that a SIP is complete (or it is deemed complete by operation of law), the agency has 12 months to review the SIP to ensure it meets the minimum requirements of the Act. 42 U.S.C. § 7410(k)(2). At the end of the 12-month period, EPA must then approve or disapprove the SIP in whole or in part. 42 U.S.C. § 7410(k)(3).

If a state fails to submit a SIP, submits an incomplete SIP, or if EPA disapproves a SIP in whole or in part because the SIP does not meet the Clean Air Act's minimum requirements, then EPA must develop its own plan, called a Federal Implementation Plan ("FIP"). 42 U.S.C. § 7410(c)(1). The Act requires EPA to Promulgate a FIP within two years of such a finding or disapproval "unless the State corrects the deficiency, <u>and</u> the Administrator approves the plan or plan revision, <u>before</u> the Administrator promulgates such [a FIP]." *Id.* (emphasis added).

To fulfill the purpose of the Clean Air Act, Congress has established a number of different air pollution goals, including the national goal of "prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas[1] which impairment results from manmade air

---

1 Class I areas consist of all international parks, national wilderness areas that exceed 5,000 acres in size, national memorial parks that exceed 5,000 acres in size, and national parks that exceed 6,000 acres in size. 42 U.S.C. § 7472.

pollution." 42 U.S.C. § 7491(a)(1). Thus, a SIP must include provisions for eliminating soot and smog from air pollution sources within a state's borders that may reasonably be anticipated to cause or contribute to visibility impairment for any protected area located within or beyond that state's boundaries. 42 U.S.C. § 7410(a)(2)(D)(i)(II) (visibility requirements for Interstate Transport SIPs or FIPs). A SIP must also include provisions for complying with EPA's Regional Haze Rule. *See generally* 42 U.S.C. § 7491 (requirements for Regional Haze SIPs or FIPs). With respect to addressing regional haze[2] in a FIP or SIP, the Clean Air Act requires regulating entities to evaluate the use of retrofit controls, *i.e.*, Best Available Retrofit Technology ("BART"), at major stationary sources with the potential to emit greater than 250 tons of any pollutant. 42 U.S.C. § 7491(g)(7).

II. THE INTERSTATE TRANSPORT AND REGIONAL HAZE FIPs FOR NEW MEXICO

On May 25, 2005 EPA made a finding that New Mexico, along with six other states, failed to submit an Interstate Transport SIP revision required to satisfy the "good neighbor" provisions of Section 110(a)(2)(D)(i) with respect to the 1997 8-hour ozone National Ambient Air Quality Standard ("NAAQS") and the $PM_{2.5}$ NAAQS. 70 Fed. Reg. 21,147 (April 25, 2005). This finding started the two-year

[2] Regional haze is visibility impairment produced by a multitude of sources that emit fine particles into the air across a broad geographic region. 64 Fed. Reg. 35,715 (July 1, 1999). The emission and movement of sulfur dioxide, nitrogen oxides and fine particulate matter (*e.g.*, sulfates, nitrates, organic carbon, elemental carbon, and soil dust) "impairs visibility by scattering and absorbing light." *Id.*

clock for EPA to either approve an Interstate Transportation SIP revision for these states or promulgate a FIP by May 25, 2007. *Id.*; *see also* 42 U.S.C. § 7410(c)(1). When EPA failed to meet this statutory deadline for Interstate Transport SIPs and FIPs, WildEarth Guardians brought suit against EPA on June 3, 2009 to compel the agency to take action. *See WildEarth Guardians v. Jackson*, 2011 WL 6779276 (N.D. Cal. Dec. 27, 2011). The case resulted in a consent decree in which EPA agreed to approve a SIP or promulgate an Interstate Transport FIP by specified dates for each of the seven states for each of the four elements of Section 110(a)(2)(D)(i), including the visibility requirement. *Id.* at *1. With respect to New Mexico, EPA was required to take final action on an Interstate Transport FIP or SIP by August 5, 2011.

New Mexico submitted a revised Interstate Transport SIP to EPA on September 17, 2007 to address Section 110(a)(2)(D)(i) of the Act. 76 Fed. Reg. 491, 496. On January 5, 2011 EPA proposed to disapprove New Mexico's Interstate Transport SIP because it did not include adequate provisions for visibility protection in other states pursuant to Section 110(a)(2)(D)(i)(II) of the Act. *Id.* In its September 2007 Interstate Transport SIP submission, New Mexico stated that it would address the requirements that it not interfere with visibility programs in other states through a Regional Haze SIP update that it would submit to EPA by December 2007. *Id.* New Mexico did not make the requisite Regional

Haze SIP submission in 2007 or at any time prior to EPA's announcement of its proposed Interstate Transport and Regional Haze FIPs in January 2011. *Id.*

New Mexico was required to submit to EPA a Regional Haze SIP by December 17, 2007. *See* 40 C.F.R. § 51.308(b). In January 2009, EPA made a finding that New Mexico had failed to submit a Regional Haze SIP meeting the requirements of the Clean Air Act, including the requirement for BART. 74 Fed. Reg. 2,392 (Jan. 15, 2009). EPA acknowledged that this finding started "the two year clock for the promulgation by EPA of a FIP." *Id.* Accordingly, EPA was required to either promulgate a Regional Haze FIP or approve a Regional Haze SIP from New Mexico by January 15, 2011. *See* 42 U.S.C. § 7410(c)(1).

On January 5, 2011 EPA proposed Interstate Transport and Regional Haze FIPs for New Mexico to ensure that emissions from New Mexico sources do not interfere with visibility programs of other states, and to implement nitrogen oxide ("NOx") and sulfur dioxide ("SO_2") emission limits at the San Juan Generating Station ("SJGS") to prevent such interference. 76 Fed. Reg. 491-92 (Jan. 5, 2011). In the proposed rule, EPA recognized that:

> NOx and SO2 are significant contributors to visibility impairment in and around New Mexico. As the Four Corners Task Force notes, '[r]eduction of NOx is particularly important to improve visibility at Mesa Verde National Park, which is 43 km away from SJGS. . .[V]isibility has degraded at Mesa Verde over the past decade, and the portion of degradation due to nitrate has increased. . .'

76 Fed. Reg. at 493. To achieve the emission limits, EPA proposed Selective

Catalytic Reduction ("SCR") as BART for the SJGS. *Id.* at 503. Finally, EPA proposed a three-year compliance time frame based on its analysis of the time required for SCR installations at other facilities. *Id.* at 504.

On August 22, 2011 EPA published the final rule at issue in this Petition for Review implementing the Interstate Transport and Regional Haze FIPs. In this Rule, EPA acknowledged that it had received a Regional Haze SIP from New Mexico on July 5, 2011, but that with only one month before the agency was scheduled to finalize the BART Rule, EPA would not have been able to review the SIP, propose a rule, and promulgate a final rule before the deadline by which EPA had committed to promulgate both a final Interstate Transport FIP and a final Regional Haze FIP ("the BART Rule").[3] *Id.* at 52,390. As discussed above, EPA was required to take final action on Interstate Transport FIP or SIP by August 5, 2011. *Id.* In the interests of efficiency, and because EPA had a non-discretionary duty to also take action on a Regional Haze FIP or SIP for New Mexico, EPA chose to promulgate a Regional Haze FIP with the Interstate Transport FIP. *Id.*

The Interstate Transport and Regional Haze FIPs implement NOx and SO_2 emission limits at the SJGS, requiring the plant to reduce NOx pollution to 0.05

---

[3] As discussed on p. 11 above, New Mexico missed its December 2007 deadline to submit a Regional Haze SIP. In January 2009, EPA put New Mexico on notice regarding the State's failure to submit a Regional Haze SIP. New Mexico made no effort in the intervening years to remedy its haze problem until one month before EPA was scheduled to finalize the BART Rule.

pounds per million BTU and SO_2 pollution by 0.15 pounds per million BTU. *Id.* As part of the Regional Haze FIP, EPA implemented a BART requirement for SJGS to use Selective Catalytic Reduction ("SCR") technology to meet emission reductions, and determined that SCR was "the most cost-effective pollution control to achieve emission reductions outlined in the federal plan." *Id.* In the final rule, EPA extended the time frame for the SJGS to install SCR from three years, the time frame initially provided in the proposed rule, to five years due to "site congestion" at the SJGS. *Id.* at 52,408. Guardians disagrees with this conclusion and does not believe it is supported by the record as discussed below.

EPA determined that, when implemented, the BART Rule requiring SCR technology "will reduce the visibility impacts due to [the SJGS] by <u>over 50% at each one of the 16 national parks and wilderness areas in the area</u> and promote local tourism by decreasing the number of days when pollution impairs scenic view." *Id.* at 52,389 (emphasis added). Moreover, EPA also recognized that health benefits would flow from the BART Rule because installation of SCR technology would reduce NOx pollution by over 80 percent. *Id.*

<u>SUMMARY OF THE ARGUMENT</u>

On August 22, 2011, EPA promulgated the BART Rule to address the Clean Air Act's Regional Haze requirements for NOx at the SJGS. The Rule included the BART requirement that the SJGS install SCR technology to reduce NOx emissions, and required the SJGS to comply with the NOx emission limit within five years. The Clean Air Act regulations require EPA to include a compliance time frame for a BART-eligible source to implement BART, and mandate that compliance be achieved "as expeditiously as practicable, but in no event later than 5 years after approval of the implementation plan revision." 40 C.F.R. § 51.308(e)(1)(C)(iv) (emphasis added). In the proposed BART Rule, EPA proposed a three-year compliance time frame for the SJGS to install BART. EPA enlarged the compliance time frame to five years when the agency promulgated the final BART Rule.

The record does not support EPA's rationale for increasing the compliance time frame to from three years to five years. EPA's own analysis demonstrates that 37 to 43 months is a practicable compliance time frame for installation of SCR at the SJGS. Moreover, EPA also concluded that because the largest SCR retrofit project in the United States, completed in five years, was not comparable to the SJGS, the same time frame was not appropriate for the SJGS and it would take less time for the SJGS to install BART. Accordingly, because EPA's decision to impose a five-year compliance timeframe for BART is contradicted by the agency's own analysis, EPA's decision is arbitrary, capricious, and contrary to law.

ARGUMENT

I. STANDARD OF REVIEW

The judicial review provisions of the Clean Air Act set forth the same standard of review for challenges to rules promulgated by EPA as is found in the Administrative Procedure Act. *See* 42 U.S.C. § 7607(d)(9)(A). Therefore, this Court may reverse the compliance time frame in EPA's BART if it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." *Id.*; 5 U.S.C. § 706(2)(A).

Agency action is arbitrary and capricious if the agency has not "examine[d] the relevant data and articulate[d] a satisfactory explanation for its action including a 'rational connection between the facts found and the choices made.'" *Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mutual Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (quoting *Burlington Truck Lines, Inc. v. U.S.*, 371 U.S. 156, 168 (1962)). Further, agency action is arbitrary and capricious if the agency has offered an explanation for its decision that runs counter to the evidence before the agency or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Id.*; *see also Colorado Environmental Coalition v. Dombeck*, 185 F.3d 1162, 1167 (10th Cir. 1999).

II. EPA'S DECISION TO ALLOW THE SJGS FIVE YEARS INSTEAD OF THREE YEARS TO COMPLY WITH THE BART RULE IS NOT SUPPORTED BY THE RECORD

When EPA proposed ITS BART Rule in January 2011, it included a proposed three-year compliance time frame based on the agency's review of time frames for other SCR installations included in two studies[4] evaluating various NOx control technologies. 76 Fed. Reg. at 504. The 2002 whitepaper prepared by the Institute of Clean Air Companies entitled "Typical Installation Timelines for NOx Emissions Control Technologies on Industrial Sources," indicated that SCR installation ranged from 28 months for smaller units to 58 months for the largest units. *See* Exhibit 2 at 8. The second document, prepared in 2002 for the U.S. EPA Office of Research and Development entitled "Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies," indicated a 21-month installation time for SCR on a single unit, and 35 months to install SCR on multiple units. *See* Exhibit 3 at 22. Based on these data, EPA characterized the three-year time frame as "a conservative and adequate estimate of time for the planning, engineering, installation, and start-up of these

---

4 Although neither of these documents were included in the rulemaking record, they are properly part of the record because EPA relied on these documents, as stated in the proposed rule, and provided web addresses to access these documents. "The complete administrative record consists of all documents and materials directly or indirectly considered by the agency." *Bar MK Ranches v. Yeutter*, 994 F.2d 735, 739 (10th Cir. 1993). These documents are included as Exhibits 2 and 3.

controls." *Id.* EPA also invited comments on alternative time frames for compliance, up to the five-year maximum. *Id.*

However, only eight months after finding a three-year time frame was "conservative and adequate," EPA abruptly reversed course and granted the SJGS the maximum allowable five-year time frame to install the SCR technology. EPA switched course based on its finding of "site congestion" at the SJGS that the agency purportedly observed during a visit[5] to the SJGS on May 23, 2011. *See generally* AR Doc. No. 127 (site visit report and photos). However, nowhere in the record does EPA define "site congestion," explain how it evaluated site congestion, or describe the factors at the SJGS that contribute to site congestion. EPA also does not explain how site congestion at the SJGS will affect or delay SCR installation time. The record completely lacks any explanation and analysis of site congestion in general and as it applies to the SJGS in particular, rendering EPA's reliance on this factor to establish a compliance time frame arbitrary and capricious.

Additionally, EPA based its new finding on its review of the SCR compliance time frames for nine sources, which ranged from 13 to 69 months, and

---

[5] EPA's "report" of its site visit consists of a single page listing the time, place, and purpose of the visit, along with a list of attendees, photo points, and activities that took place during its half-day visit. *See* AR Doc. No. 127 at 1 (noting that the site visit was in response to PNM's assertion that the EPA had failed to consider site congestion at the SJGS).

used these numbers to calculate a median (33 months) and an average (37 months) SCR compliance time frame. *See* AR Doc. No. 2 at 71 ("Complete Response to Comments" listing specific sources and their compliance time frames). EPA's average compliance time frame of 37 months is only slightly less than the average compliance time frame of 43 months estimated in a 2010 report by the Utility Air Regulatory Group ("UARG") referenced in a comment. *Id.* Data in the UARG Report[6] include SCR compliance time frames for 14 sources ranging from 28 to 62 months. *Id.* at 71-72. None of the sources used by EPA or included in the UARG Report overlap. *Id.* at 72.

However, EPA does not provide information as to which, if any, of the sources it considered and the sources included in the UARG Report are comparable to the SJGS.[7] Nor is any information provided regarding the criteria either EPA or the UARG used to select the sources included in their samples. EPA also does not provide any indication of where along the continuum of compliance time frames the SJGS would fall or whether any of the sources in either sample had

6 EPA references the UARG Report in footnote 56 in the final BART Rule, but has not included the report in the record. EPA summarized the results of the report in the final BART Rule and in EPA's "Complete Response to Comments," AR Doc. No. 2 at 71-72.

7 EPA does state that it used one of the sources from its review—the St. John River Power Park—to estimate the cost of installing SCR technology at the SJGS, implying that this facility is comparable to the SJGS. AR Doc. No. 2 at 71. Installation of SCR at the St. Johns facility took 36 months "from contract award to startup." *Id.*

"site congestion" comparable to the SJGS. EPA simply concludes its discussion of average SCR compliance times with the statement that "based on our site visit, [] site congestion will require a longer total installation time for all four units [at the SJGS] than the average found in both of these collections." *Id.* at 72.

Although there is a 23-month time gap between EPA's 37-month average for SCR installation and a 17-month time gap between the UARG Report's 43-month average for SCR installation and the 60-month statutory maximum, there is no indication in the record that EPA considered a compliance time frame longer than either 37 or 43 months but shorter than 60 months to comply with the Clean Air Act's requirement that BART be achieved "as expeditiously as practicable." There is also no evidence in the record the EPA considered a phased compliance time frame for each of the four units at the SJGS that would require a more expeditious time frame for completion of SCR installation at the first unit, and extend the time frame by the appropriate number of months for each of the remaining units accordingly, even though the agency included a phased implementation time line among the sources it considered when estimating an average SCR compliance time. *See id.* at 71 (list of sources includes "30 months for 4 units based on 21 months typical for one unit, each additional unit at same facility adds 2-3 months"). There is no analysis in the record to support EPA's conclusion that a longer than average time frame for SCR installation is warranted at the SJGS, nor is there any evidence that once EPA made this decision, the agency considered a compliance time frame shorter than the statutory maximum. Thus, there is no record evidence that would allow this Court to reasonably discern EPA's path to its decision to expand the compliance time frame to the five-year maximum. *See Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43 ("We will. . .uphold a decision of less than ideal clarity if the agency's path may reasonably be discerned.") (citation omitted).

Even if EPA's determination that a longer than the average compliance time frame for SJGS is warranted, which it is not, EPA's own analysis comparing the SJGS with a facility that took five years to complete SCR installation led the agency to conclude that a five-year compliance time frame is not appropriate for the SJGS. The 2,200 megawatt Sammis plant in Ohio was "the largest air quality control retrofit in the history of the United States and is considered to be the most difficult in the country <u>because of the extremely limited space for installation</u> of the new air emission control equipment and systems." *Id.* (emphasis added). The Sammis plant was able to install SCR technology on two units in 62 months concurrent with new installations of other pollution-reducing equipment "requiring significant ductwork modification." AR Doc. No. 2 at 72-73. Moreover, EPA stated that the 62-month time frame for SCR installation at the Sammis plant "would have been shorter" had it not been for the significant ductwork modification necessary to concurrently install a <u>different</u> technology. *Id.* at 73.

After consideration of the scope of the Sammis SCR retrofit project, EPA determined that SCR installation at the SJGS would not require the same expanded time frame as the Sammis retrofit because "this project [Sammis] is not comparable to SCR retrofits at SJGS" given that the SJGS is "relatively unconstrained" compared to the Sammis plant. *Id.* With respect to site congestion, EPA concluded that the units at the Sammis facility were "more congested than the SJGS units." *Id.* at 75. All of these factors led EPA to conclude that "we do not believe a timeframe as long as that allowed for the Sammis units is warranted, nor is it allowed by the [Regional Haze Rules]." *Id.* EPA then disregards all of its analyses and conclusions when it announces its decision that it is "finalizing a schedule which requires compliance with [BART] within 5 years—rather than 3 years—from the effective date of our final rule." 76 Fed. Reg. at 52,409.

EPA's own analysis demonstrates that installation of SCR technology can be accomplished in an average time range of 37 to 43 months. Moreover, in its analysis of the SJGS and the Sammis facilities, EPA concluded that the two were not comparable, in part because Sammis was more severely congested, and that therefore the Sammis compliance time frame of 60 months was not warranted for the SJGS. Yet EPA ignored all of its own analyses when it set the five-year compliance time frame for the SJGS in the BART Rule. Because EPA's decision "runs counter to the evidence before the agency," EPA's decision to implement a five-year compliance time frame for BART was arbitrary and capricious and violated the Clean Air Act. *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43; *see also General Chemical Corp. v. U.S.*, 817 F.2d 844, 846 (D.C. Cir. 1987) (finding agency action arbitrary and capricious because it was "internally inconsistent and inadequately explained" and "not supported by substantial evidence on the record considered as a whole."). Moreover, given that EPA extended the compliance time frame to the statutory maximum based solely on its finding of site congestion at the SJGS, EPA must "articulate a satisfactory explanation" for its decision beyond conclusory statements unsupported by analysis. *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43.

III. EPA FAILED TO SET AN EXPEDITIOUS TIME FRAME FOR COMPLIANCE EVEN THOUGH THE AGENCY'S OWN ANALYSIS SHOWED THAT A SHORTER TIME FRAME WAS PRACTICABLE

The Clean Air Act and its regulations require all BART determinations to include a compliance schedule requiring compliance "as expeditiously as practicable, but in no event later than 5 years after approval of the implementation plan revision." 40 C.F.R. § 51.308(e)(1)(C)(iv); 42 U.S.C. 7491(g)(2). However, rather than setting an expeditious compliance timeframe for BART at the SJGS based on EPA's own analysis, the agency instead allowed the facility to take the maximum period of time allowed by the Act even though the agency's own analysis showed that a more expeditious time frame was practicable. In so doing, EPA ignored Congress's intent that BART be implemented as soon as practicably possible.

The statutory language regarding compliance time frames for BART is clear and unambiguous. EPA must require compliance "as expeditiously as practicable." 42 U.S.C. § 7491(b)(2)(A). Congress mandated that EPA promulgate BART regulations that include the requirement that all BART-eligible sources:

> shall procure, install, and operate, as expeditiously as practicable (and maintain thereafter) the best available retrofit technology, as determined by the State (or the Administrator in the case of a plan promulgated under section 110(c)) for controlling emissions from such source for the purpose of eliminating or reducing any such impairment. . .

Id. Congress defined "as expeditiously as practicable" to mean "as expeditiously as practicable but in no event later than five years after the date of approval of a plan revision under this section (or the date of promulgation of such a plan revision in the case of action by the Administrator under section 110(c) for purposes of this section)." 42 U.S.C. § 7491(g)(4). Thus, Congress mandated that BART be operational as soon as possible, but provided an absolute deadline to advance its "national goal" to prevent future, and remedy existing, visibility impairment in Class I national parks and wilderness areas. 42 U.S.C. § 7491(a)(1). Thus, the five-year maximum compliance time frame is just that—the absolute maximum time that a source may have to comply with BART. If EPA determines that a source can comply with BART sooner than five years from the time of the final rule, then EPA must require compliance at the earliest practicable time, not the latest.[8]

If Congress had intended to allow five-year compliance time frames for all BART determinations regardless of whether BART could be achieved in less than five years, then Congress would have said so using similar language contained elsewhere in the Clean Air Act. For example, with regard to EPA's duty to promulgate a FIP, the Act states that:

> The Administrator shall promulgate a [FIP] <u>at any time within 2 years</u> after the Administrator finds that a State has failed to make a required submission or finds that the plan or plan revision submitted by the State does not satisfy the minimum criteria established under section 110(k)(1)(A). . .

42 U.S.C. § 7410(c)(1) (emphasis added). The plain meaning of this provision is that EPA has a 2-year deadline from the time in which any of the triggering events occurs to promulgate a FIP. There is nothing in this provision that suggests that EPA cannot wait until the last minute to promulgate a FIP. Other provisions of the Clean Air Act include similar language setting deadlines for action that do not preclude taking action at the last possible moment before the time frame expires. *See, e.g.*, 42 U.S.C. § 7661a(d) (requiring the Governor of each state to develop

---

8 Moreover, because of missed deadlines by both New Mexico and EPA, there has already been a five-year delay in implementing BART at the SJGS. *See* Section II in Statement of Facts above.

and submit to EPA a Title V permitting program "[n]ot later than 3 years after the date of the enactment of the Clean Air Act Amendments of 1990. . ."); 42 U.S.C. § 7547(a)(5) (requiring the Administrator to promulgate emission standards for locomotives "[w]ithin 5 years after the enactment of the Clean Air Act Amendments of 1990. . .").

Other deadline provisions of the Clean Air Act, however, go beyond setting deadlines for action and include additional language explicitly requiring action as soon as possible. A number of provisions require action "as expeditiously as practicable" and sometimes include a maximum deadline by which action must occur if it cannot occur sooner. *Compare* 42 U.S.C. § 7410(c)(5)(B)(i) (requiring that SIPs be revised to include measures to "establish, expand, or improve public transportation measures to meet basic transportation needs, as expeditiously as is practicable. . .") *with* 42 U.S.C. § 7407(d)(1)(B) (requiring the Administrator to make area designations "as expeditiously as practicable, but in no case later than 2 years from the date of promulgation of the new or revised national ambient air quality standard.).

When discussing the meaning of the "as expeditiously as is practicable but in no case less than 3 years" language in *Union Electric Co. v. EPA*, the U.S. Supreme Court noted that the reason for such language was "to guarantee the prompt attainment and maintenance of specified air quality standards." 427 U.S.

246, 249 (1976). The Court examined the legislative history behind the provision that contained this language and found that Congress rejected a more lenient standard that compliance occur "within a reasonable time" in favor of a more expeditious deadline. *Id.* at 258. The Court also interpreted "as expeditiously as practicable" to be the operative part of the deadline provision:

> The Conference Committee made clear that the States could not procrastinate until the deadline approached. Rather, the primary standards had to be met in less than three years if possible; they had to be met as expeditiously as practicable.

Id. at 260 (citation omitted) (emphasis added). Moreover, in noting that the Administrator could reject a state plan that should have included a requirement for meeting the standard sooner than the three-year maximum, the Court clearly did not interpret this language to mean that as long as action was taken "within three years" there would be no violation of the Clean Air Act. *Id.* at 265 n.13. Thus, the statutory maximum time frame for compliance does not become the default deadline where it is preceded by the phrase "as expeditiously as practicable" where there is evidence that a more expeditious time frame is warranted.

The Supreme Court has stressed that, when looking for the plain meaning of a statute, courts must "examine first the language of the governing statute, guided not by a single sentence or member of a sentence, but looking to the provisions of the whole law, and to its object and policy." *John Hancock Mut. Life Ins. Co. v. Harris Trust & Savings Bank*, 510 U.S. 86, 94-95 (1993) (internal quotations, brackets, and citations omitted). *See also Beecham v. United States*, 511 U.S. 368, 372 (1994) ("The plain meaning that we seek to discern is the plain meaning of the whole statute, not of isolated sentences."). The Supreme Court has also emphasized that "[o]ur cases express a deep reluctance to interpret a statutory provision so as to render superfluous other provisions in the enactment." *Pa. Dept. of Public Welfare v. Davenport*, 495 U.S. 552, 562 (1990). Statutes are to be given, wherever possible, such effect that no clause, sentence or word is rendered superfluous, void, contradictory or insignificant. *United States v. Menasche*, 348 U.S. 528, 538-39 (1955); *see also Bridger Coal Co./Pacific Minerals, Inc. v. Director, Office of Workers Compensation Programs*, 927 F.2d 1150, 1153 (10th Cir. 1991) ("We will not construe a statute in a way that renders words or phrases meaningless, redundant, or superfluous.").

Interpreting Section 169A(b)(2)(A)'s language to mean that as long as the time required for BART compliance does not exceed five years there is no violation of the Clean Air Act would render the "as expeditiously as practicable" language completely superfluous. If Congress intended to simply allow all BART-eligible sources to comply with BART within five years, Congress would have said so using the "within 5 years" language used in other sections of the Act. Instead, Congress prescribed a requirement that BART compliance be achieved as soon as possible using the best available technology for emissions reductions. Thus, if

EPA's analysis indicates that the SJGS can comply with BART in less than five years, EPA must require a shorter compliance time frame rather than defaulting to the statutory maximum for the convenience of the SJGS. If EPA wishes to depart from Congress' clear mandate that compliance with BART be achieved as soon as possible, EPA "must show either that, as a matter of historical fact, Congress did not mean what it appears to have said, or that, as a matter of logic and statutory structure, it almost certainly could not have meant it." *Engine Manufacturers Ass'n v. E.P.A.*, 88 F.3d 1075, 1089 (D.C. Cir. 1996).

CONCLUSION

For the reasons stated above, Guardians respectfully requests that the Court remand the provision of the BART Rule containing the five-year compliance time frame to EPA with instructions to adopt the three-year compliance time frame included in the proposed BART Rule, or better explain why this time frame is not possible, and award Guardians its costs of litigation, including reasonable attorneys' fees pursuant to 42 U.S.C. §7607(f).

Respectfully submitted April 30, 2012.

/s/ Samantha Ruscavage-Barz
NM Bar. No. 23276
WildEarth Guardians
516 Alto Street
Santa Fe, NM 87501
(505) 988-9126 x1158
sruscavagebarz@wildearthguardians.org
Counsel for Petitioner WildEarth Guardians

STATEMENT REGARDING ORAL ARGUMENT

Petitioner respectfully requests oral argument, as this appears to be an issue of first impression in this Court.

CERTIFICATE OF COMPLIANCE WITH RULE 32(a)

Certificate of Compliance With Type-Volume Limitation, Typeface Requirements, and Type Style Requirements

I certify that this brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6) because it is proportionally spaced and contains 6,686 words.

/s/ Samantha Ruscavage-Barz
NM Bar. No. 23276
WildEarth Guardians
516 Alto Street
Santa Fe, NM 87501
(505) 988-9126 x1158
sruscavagebarz@wildearthguardians.org

Counsel for Petitioner WildEarth Guardians

CERTIFICATE OF DIGITAL SUBMISSION AND PRIVACY REDACTIONS

I hereby certify that a copy of the foregoing Petitioner's Opening Brief, as submitted in digital form via the Clerk's ECF system, is an exact copy of the written document filed with the Clerk and has been scanned for viruses with the ClamXav Version 2.2.2 virus protection software for Mac and, according to the program, is free of viruses. In addition, I certify all required privacy redactions have been made.

By: *<u>/s/ Samantha Ruscavage-Barz</u>*
Samantha Ruscavage-Barz

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of PETITIONER WILDEARTH GUARDIANS' OPENING BRIEF was served on all counsel of record for the consolidated cases by the Court's ECF system on April 30, 2012.

/s/ Samantha Ruscavage-Barz
Counsel for Petitioner WildEarth Guardians

EXHIBIT 1

Declaration of Jeremy Nichols

UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT

WILDEARTH GUARDIANS, Petitioner, v. U. S. ENVIRONMENTAL PROTECTION AGENCY and LISA JACKSON, Administrator, U.S. Environmental Protection Agency, Respondents, PUBLIC SERVICE COMPANY OF NEW MEXICO, Intervenor.	)	Case No. 11-9552

DECLARATION OF JEREMY NICHOLS

I, Jeremy Nichols, declare as follows:

1. The facts set forth in this declaration are based on my personal knowledge. If called as a witness in these proceedings, I could and would testify competently to these facts.

2. I currently reside in Golden, Colorado. I am a member and employee of WildEarth Guardians. WildEarth Guardians is a non-profit environmental organization dedicated to protecting and restoring the wildlife, wild places and wild rivers of the American West. I am the Director of WildEarth Guardians' Climate and Energy

Program. In this capacity, I work to develop and promote cost-effective, clean energy solutions that safeguard environmental health and welfare. Much of my work focuses on advocating for clean air and ensuring the Clean Air Act is implemented and enforced. I support the mission of the organization, both personally and professionally.

3. I am familiar with the San Juan Generating Station, a 1,848 megawatt coal-fired power plant located 15 miles west of Farmington, New Mexico in San Juan County. The power plant consists of four boilers and has four smokestacks. I have observed the San Juan Generating Station and its smokestacks on numerous occasions, most recently on March 31, 2012 when my family and I visited friends in Farmington. Before then, I visited on October 27 and 28, 2011, May 22 and 23, 2011, February 16 and 17, 2011, November 16 2010, and on several dates prior. I visit Farmington frequently, at least three to four times a year, for work and for personal reasons, and have done so for the last five years. I have seen the plant up close driving along County Road 6800, which accesses the plant; from along a public road on Bureau of Land Management ("BLM") lands that travels along the west and north ends of the power plant, from along U.S. Highway 64 as I was traveling between Farmington and Shiprock, New Mexico; from the air as I have flown into and out of the Farmington airport; and while hiking on adjacent public lands, particularly lands east and west of the power plant that are easily accessible from Farmington. Below is a picture I took of the San Juan Generating Station on October 28, 2011. I took the picture to document the coal-fired power plant. The view is to the east from a BLM road that travels along the west side of the power plant.

4. I have observed air pollution coming out of the four smokestacks of the San Juan Generating Station on numerous occasions. Although emissions from the smokestacks are sometimes white due to steam, the emissions often leave a visible plume that ranges from orange to brown and trails across the sky. I find this plume and the air pollution coming from the smokestacks offensive to view and incredibly worrisome. Observing the emissions from the San Juan Generating Station is impossible to avoid whenever I visit Farmington.

5. I have also observed emissions from the San Juan Generating Station while visiting Mesa Verde National Park, which is located north of the power plant just over the border in southwestern Colorado. I enjoy visiting Mesa Verde National Park to view the landscape of the Four Corners region, to hike, and to explore the ancestral

Puebloan ruins. My most recent visit to Mesa Verde National Park was on March 29, 2012 and prior to that on August of 2010 and in October of 2009. From atop Mesa Verde National Park (Park Point, which is the highest part of Mesa Verde National Park), one can see extensively into northwestern New Mexico and view features such as Ship Rock. In my latest visit to Mesa Verde, as well as during my visit in October of 2009, this region was obscured with a whiteish haze that had a brownish, yellowish tinge. From Mesa Verde, I could barely see Ship Rock.

6. I enjoy viewing the landscape of the area where the San Juan Generating Station is located, as well as enjoying adjacent public lands through recreational activities. The landscape is very picturesque. I enjoy scenery that is not disturbed by industrial development, including air pollution. When I visit the area where the San Juan Generating Station is located, as well as nearby wild lands, including Mesa Verde National Park, my enjoyment is diminished by the sight of air pollution from the San Juan Generating Station.

7. I am familiar with the type and quantity of air emissions released by the San Juan Generating Station. I have read numerous reports on the emissions from the power plant in professional capacity and personally because of my interest in understanding air pollution. The more I can understand the air pollution coming from facilities like the San Juan Generating Station, the more I can effectively advocate for it to be cleaned up.

8. Much of this emissions information is readily available on the U.S. Environmental Protection Agency's ("EPA's") Air Markets Program Database website. For example, this data shows that in 2010, the San Juan Generating Station released

4,292.4 tons of sulfur dioxide and 15,774.8 tons of nitrogen oxides ("NOx"). This data can be accessed at http://ampd.epa.gov/ampd/.

9. I know that the EPA has identified these pollutants as a risk to public health and welfare. According to the EPA, NOx, for example, can adversely affect human respiratory health, can react with sunlight to form ground-level ozone, the key ingredient of smog, and create haze. *See* http://www.epa.gov/oaqps001/nitrogenoxides/health.html. The amount of NOx released by the San Juan Generating Station in 2010 would equal the amount of NOx emitted by 825,905 passenger vehicles (according to the EPA, a standard passenger vehicle emits 38.2 pounds of NOx annually, http://www.epa.gov/otaq/consumer/f00013.htm). EPA has determined that the San Juan Generating Station is one of the largest sources of NOx pollution in the United States.

10. WildEarth Guardians has a longstanding interest in the San Juan Generating Station. This large coal-fired power plant has been a concern for the organization due to its air pollution for many years. It is a huge coal-fired power plant and its air pollution affects so much of the environment in the Four Corners region. It is the second largest source of air pollution in New Mexico (the nearby Four Corners power plant is the largest). As part of our interest in advocating for clean air, confronting air pollution from the San Juan Generating Station has been one of our top priorities.

11. It was out of concern over air pollution from the San Juan Generating Station and its impacts to public health and the environment that in 2009, WildEarth Guardians filed suit against the EPA under the Clean Air Act over its failure to either promulgate a federal implementation plan or approve a state implementation plan to

ensure the State of New Mexico was adequately protecting downwind states from its air pollution. The EPA's duty to ensure states are limiting their air pollution in order to protect neighboring states is set forth at Section 110(a)(2)(D) of the Clean Air Act, 42 U.S.C. § 7410(a)(2)(D). The EPA often refers to these provisions as "good neighbor" requirements. That lawsuit culminated in a consent decree that obligated the EPA to perform its mandatory statutory duties by a date certain. That consent decree was filed in the U.S. District Court for the District of Northern California.

12. Ultimately, under that consent decree, EPA proposed a federal implementation plan for the State of New Mexico that focused on reducing emissions from the San Juan Generating Station. In assessing impacts to downwind states, EPA found that the San Juan Generating Station inordinately contributed to visibility degradation, otherwise known as haze, in Class I areas in downwind states. Class I areas include National Parks and Wilderness Areas that were created before 1977 (the exact definition is found in Section 162(a) of the Clean Air Act, 42 U.S.C. § 7472(a)). The EPA in particular found that the San Juan Generating Station interfered with visibility in 16 Class I areas, including Mesa Verde National Park in southwestern Colorado, Grand Canyon National Park, and Bandelier National Monument in New Mexico, and that emission reductions were needed to address this problem and comply with the Clean Air Act, in particular Section 110(a)(2)(D)(i)(II), 42 U.S.C. § 7410(a)(2)(D)(i)(II), which prohibits states from allowing emissions that interfere with measures to protect visibility in any other state.

13. To remedy this pollution, the EPA proposed a rule to ensure that the San Juan Generating Station met Clean Air Act best available retrofit technology ("BART")

requirements. This made sense because not only would BART reduce emissions such that visibility would be protected in surrounding states, but the EPA was behind in fulfilling its duty to ensure the San Juan Generating Station was meeting BART. BART is a requirement of the Clean Air Act's regional haze program, which is set forth under Section 169A of the Clean Air Act, 42 U.S.C. § 7491. The EPA's proposal was published on January 5, 2011. *See* 76 Fed. Reg. 491-507 (Jan. 5, 2011).

14. The EPA's proposed rule had many components, but probably the most significant aspect was that it would require the San Juan Generating Station to meet a limit on nitrogen oxide ("NOx") emissions equal to 0.05 pounds per million British thermal units ("mmBtus"). To meet this limit, an add-on control technology called selective catalytic reduction ("SCR") would have to be installed. The EPA proposed to require compliance with the proposed rule within three years after adoption of the final rule. The EPA proposed this compliance date in accordance with the Clean Air Act, which requires compliance with BART as expeditiously as practicable. *See* Section 169A(b)(2)(A), 42 U.S.C. § 7491(b)(2)(A).

15. WildEarth Guardians commented on the EPA's proposed rule, both in writing and in person at a public hearing held in Farmington, New Mexico on February 17, 2011. I personally attended the Farmington public hearing and offered comments on behalf of WildEarth Guardians. WildEarth Guardians supported the EPA's proposed rule. In written comments submitted on April 4, 2011, however, we urged the EPA to consider whether its proposed emissions limits should be strengthened.

16. On August 22, 2011, the EPA published its final rule establishing BART limits for the San Juan Generating Station. *See* 76 Fed. Reg. 52388-52440 (Aug. 22,

2011). The EPA retained most of its proposed rule except that it ultimately decided to require compliance with the Rule's NOx pollution emission limit within five years, rather than the shorter three-year compliance period in required in the proposed rule. In response, WildEarth Guardians filed a petition for review challenging the EPA's decision to require compliance with the Rule in five, rather than three, years.

17. The EPA's plan will redress many of the harms I have experienced related to air pollution from the San Juan Generating Station. It will address the offensive plume that I have observed; it will reduce haze in Mesa Verde National Park, and will enhance my enjoyment of the outdoors in the Farmington area. However, the EPA's failure to require compliance within five years, rather than three, effectively delays the clean up of the San Juan Generating Station—and in turn the redress of my harms—for two years. An earlier clean up date, as originally proposed by the EPA, would redress the harms that I have experienced and will continue to experience related to visible air emissions from the power plant sooner, rather than later.

18. I intend to visit the area around the San Juan Generating Station for years to come. I have friends that live in Farmington, including some long-time family friends, whom I visit regularly. My work with WildEarth Guardians involves issues related to the San Juan Generating Station. I intend to visit Farmington again in the summer of 2012. This visit will be work-related, but I will also spend time with friends and I expect to go hiking on public lands east of the power plant because they are easily accessible from Farmington. I expect to observe the San Juan Generating Station and air pollution coming from its smokestacks during these visits because it is unavoidable.

19. A ruling in favor of WildEarth Guardians will reduce this air pollution much sooner, in turn enhancing my recreational and aesthetic enjoyment of the lands around the San Juan Generating Station. A ruling in favor of WildEarth Guardians will also enhance the organization's ability to fulfill its conservation mission, which includes protecting important landscapes, such as Mesa Verde National Park, from air pollution.

Pursuant to 28 U.S.C. § 1746, I declare, under penalty of perjury, that the foregoing is true and correct.

Executed this 30th day of April 2012 in Golden, Colorado.

Jeremy Nichols

EXHIBIT 2

ICAC Report

ICAC INSTITUTE OF CLEAN AIR COMPANIES

Typical Installation Timelines for NO_x Emissions Control Technologies on Industrial Sources

Institute of Clean Air Companies
1730 M Street NW
Suite 206
Washington, DC 20036-5603
Telephone 202.457.0911
Fax 202.331.1388

David C. Foerter, *Executive Director*
Chad S. Whiteman, *Deputy Director*

December 4, 2006

About the Institute of Clean Air Companies

The Institute of Clean Air Companies (ICAC) is the national trade association of companies that supply air pollution control and monitoring technologies for stationary sources who provide solutions for a broad range of industrial applications as well as electric power plants. ICAC represents more than ninety of the leading manufacturers who provide emissions control solutions for affected industries as well as employment opportunities across the U.S. ICAC gives the air pollution control and monitoring industry a responsible and responsive presence in Washington, DC and throughout the country, which works constructively with government, business, public, and private groups to ensure that the air pollution control industry and its products are properly represented and understood.

Introduction

The following document provides information concerning the time needed for the installation of emissions control technologies for industrial sources. The document focuses on the deployment time of NO_x controls that are applied to various industrial categories including the following: low NO_x burners, selective non-catalytic reduction, selective catalytic reduction, and non-selective catalytic reduction. The information below can be used as a general guide for the typical time required to complete a typical NO_x control project from the initial bidding period through the start-up of the installed control technology. The level of retrofit difficulty and site specific conditions may increase or decrease the time required for the deployment of the control technology.

There are several points in the NO_x control technology deployment process where the end user dictates the amount of time consumed. For example, control technology manufacturers rely on the end user during the bid evaluation, project negotiation, review of engineering drawings, review of flow modeling studies (if applicable), scheduling the outage (if applicable), and compliance testing steps. For these steps, the end user is in control of the time required to complete each step as opposed to the emissions control manufacturer. For example, the timing of the initial bid evaluation and negotiation may vary depending on the amount of resources the end user has available to review and proceed with the decision making process or the amount of time prior the end user has prior to meeting a compliance deadline. The following deployment timelines have assumed that the affected source has decided to move forward with the installation of the control technology and is working with emissions control manufacturers to move the project forward in a reasonable timeframe.

Low NO_x Burners and Flue Gas Recirculation

There are a number of types of combustion control technologies that have been applied to industrial sources depending on the application and emissions requirement. The deployment times for two of the combustion control technologies including low NO_x burners (LNB) and LNB in conjunction with flue gas recirculation (FGR) are discussed below.

Low NO_x Burners - For coal-, oil-, and gas-fired boilers, low NO_x burners decrease the air introduced into the primary combustion zone thereby creating a fuel-rich environment and lower combustion temperatures that work to lower NO_x formation. Conventional burners operate with excess combustion air when compared to the stoichiometric requirement for complete combustion. When applying low NO_x burners, the percentage of excess air is reduced in the primary combustion zone with the remaining air required for complete burnout of combustibles added where the temperature is sufficiently low so that additional NO_x formation is minimized. Ultra Low NO_x Burners are an advanced generation of low NO_x burners that provides additional NO_x reductions through improved designs.

LNB + Flue Gas Recirculation - Flue gas recirculation reduces NO_x emissions by recirculating and mixing 5-40 percent of the boiler flue gas with the combustion air prior to combustion in the main combustion chamber. This process reduces the peak combustion temperature and lowers the percentage of oxygen in the combustion air/flue gas mixture; thus retarding the formation of thermal NO_x caused by high flame temperatures. FGR is often used in combination with LNB to reduce NO_x emissions below levels that may be achieved by using LNB alone. FGR has been applied to natural gas, kerosene, distillate oil, and coal-fired boilers.

The deployment time for retrofitting an existing boiler with LNB or ultra-LNB is relatively short due to the simplicity of the technology and the small number of burners on most industrial boilers. The vast majority of oil- and gas-fired package boilers used for various industrial applications have just one or two burners making the retrofits less intensive. A complete LNB system retrofit typically includes the following major components: windbox, burner(s), and burner management system. LNB manufacturers typically design their systems to keep the retrofit cost to a minimum by replacing only critical firing components, while keeping most of the burner system intact. For example, a LNB manufacturer may design their LNB system to adapt to the existing windbox geometry, backup fuel firing system, and ignition equipment. By minimizing the changes of equipment, LNB manufacturers minimize the amount of time required for the retrofit.

Retrofitting an existing industrial boiler with flue gas recirculation involves installation of a system to extract the flue gas from the boiler unit, ductwork, and fan. The deployment of a complete LNB + FGR system will include: windbox, burner(s), burner management system, potentially larger fan for FGR, and ductwork for FGR. A fly ash control device is necessary for coal-fired applications in order to clean the flue gas of particulate matter prior to recirculation of the gases back into the boiler. Retrofitting existing oil- and gas-fired boilers with flue gas recirculation involves all of the same components except for the fly ash collecting device.

For a complete system, the typical deployment of LNB or LNB + FGR takes between 24-32 weeks (6 – 8 months) on a typical industrial boiler covering the bid evaluation through the start-up of the technology. The deployment schedule for complete LNB or LNB + FGR technology on a typical industrial boiler can be divided into the following timeframes:

- 4-8 weeks – bid evaluation and negotiation
- 4-6 weeks - engineering and completion of engineering drawings
- 2 weeks – drawing review and approval from end user
- 10-12 weeks – fabrication of equipment and shipping to end user site

- 2-3 weeks – installation at end user site (Most of the components of the technology can be installed while the boiler is operating. The boiler may be required to shut-down for 1-2 days for a simple burner change-out or as much as seven days for a complete system installation.)
- 1 week – commissioning and start-up of technology

Variations in the schedule may occur due to site specific conditions that may increase or decrease the typical deployment time. The typical deployment time is short for systems that can use the existing burner management system, windbox, and other components and replace just the burner(s). For these applications, the deployment schedule may be as little as 12-16 weeks if only the burner(s) are being replaced.

Selective Non-Catalytic Reduction

Selective non-catalytic reduction (SNCR) is a chemical process for removing NO_x from flue gas. In the SNCR process, a reagent, typically urea or anhydrous gaseous ammonia is injected into the hot flue gas and reacts with the NO_x, converting it to nitrogen gas and water vapor. The chemical reaction for this technology is driven by high temperatures, typically from 1,600 – 2,100 °F, normally found in combustion sources. SNCR is "selective" in that the reagent reacts primarily with NO_x.

SNCR may be combined with low NO_x burners (LNB), over-fire air (OFA), neural networks, rich reagent injection (RRI), selective catalytic reduction (SCR) systems, or with gas reburn technologies to provide additional emissions reductions. Combined SNCR/SCR systems are finding new applications allowing higher overall NO_x reduction than SNCR alone and lower ammonia slip.

The principal components of the SNCR system are the reagent storage and injection system, which includes tanks, pumps, injectors, distribution modules, and associated controls. The combustion unit acts as the reactor chamber simplifying the SNCR process. The reagent is generally injected within the boiler superheater and reheater radiant and convective regions, where the combustion gas temperature is at the required temperature range. The number of injection ports and location is determined by flue gas flow and temperature profiles.

SNCR is a proven and reliable technology. SNCR was first applied commercially in 1974 and has been installed on approximately 400 applications worldwide. Applications include utility boilers and a broad range of industrial applications including installations on the following: wood-fired boilers, coal-fired boilers, co-generation boilers, pulp and paper boilers, steel industry furnaces, refinery process units, process heaters, cement kilns, municipal waste combustors, glass melting furnaces, hazardous waste incinerators, and other combustion sources. Urea-based SNCR has been applied commercially to sources ranging in size from a 60 mmBtu/hr (gross heat input) paper mill sludge incinerator to a 640 MWe pulverized coal-fueled, wall-fired electric utility boiler.

Given the simplicity of the SNCR system components, installation of SNCR is relatively easy and can be done in a relatively short period of time. It typically takes between 42-51 weeks (10-

13 months) to complete the SNCR project going from the bid evaluation through start-up. Under special circumstances and during periods of lower SNCR manufacturer activity, SNCR installations are typically completed in eight (8) months. A typical timeline for the completion of an SNCR projection starting from the commercial request for quote (RFQ) to the compliance testing is given in Table 1 below. Certain steps in the SNCR installation process have prerequisite steps while others may occur simultaneously. Below is a brief description of some of the aspects of the SNCR project timing:

1) ***Initial Stages of Planning and Development***
   a) Bid Evaluation – After the end user submits the request for quote (RFQ), the APC manufacturer will take typically take between 2-4 weeks to submit the proposal. The APC manufacturer relies on the end user to provide the appropriate information concerning the application in order to provide the design proposal. Some end users have in-house engineering resources that are make this process run more efficiently.
   b) Initial Engineering – Once the bid has been accepted, the initial engineering for the site will typically take between 1-4 weeks and is typically completed 4-8 weeks from the commercial RFQ date. The initial engineering will include things like the design of any concrete work for the reagent storage tanks and distribution system, placement of control systems, siting power delivery, etc.
   c) Modeling & Engineering Drawings – Computational fluid dynamic (CFD) modeling and engineering drawings are typically completed 18 weeks after the RFQ. The CFD modeling will help determine the number and location of the reagent injection ports that will be incorporated into engineering drawings. Initial engineering drawings are produced by the APC manufacturer and submitted to the end user for comment. The APC manufacturer addresses the comments and prepares the general arrangement drawings.
2) ***Procurement, Fabrication, Shipping*** – The procurement, fabrication, and shipment of the various components of the SNCR system will typically be completed by the 34th week from the RFQ. It typically takes between 16-20 weeks for this phase of the project. Some of the typical components that will need to be procured for the SNCR system include: urea solutionizing equipment (if applicable), reagent storage tank, injection lances, reagent control system, reagent pumps, reagent distribution piping, etc. Once the items have been procured, some of the components will need to be assembled prior to shipment including: reagent distribution models and piping, pump skid, process control skid, etc. The equipment is usually small enough to be shipped by truck upon assembly. The timing for shipment depends on the relative distance from the fabrication shop to the end user's site.
3) ***Equipment Installation*** – The equipment installation will typically be completed 42 weeks from the RFQ. Once the original engineering is complete at the end user site and the fabricated components arrive on-site, the equipment installation will take between 8-12 weeks not including the outage. Most of the equipment installation will be completed while the unit is operating. An outage of between 7-14 days may be required to install the reagent injection ports and lances in the combustion chamber. Usually, the work is done within an outage taken for other scheduled reasons. The amount of time taken for injection port installation will vary depending on the type of SNCR installation and the availability of existing ports on the combustion unit. If ports on the combustion unit are already in place, then the time needed to install the injection lances will be at a minimum.

4) ***Equipment Start-Up*** – Once all of the equipment has been installed, there will be a period of start-up, optimization, and compliance testing that will typically be completed some time between the 42nd and 51st week from the RFQ. It typically takes 2-4 weeks to complete the start-up after the installation; 2-4 weeks for the optimization; and approximately 3 weeks for the compliance testing.

SNCR Project Activity	Responsibility	Weeks from Commercial RFQ Date
RFQ Issued	Customer	0
APC Manufacturer Issues Proposal	Customer	2-4
Bid Evaluation and Negotiation	Customer	4-8
Receipt of Purchase Order	Customer	8
Begin Equipment Design	APC Manufacturer	9
Begin CFD/CKM Modeling[a]	APC Manufacturer	9
Submit P&ID Drawings[b]	APC Manufacturer	12
Customer P&ID Drawing Review and Comment	Customer	14
Submit General Arrangement Drawings	APC Manufacturer	16
Submit Modeling Report	APC Manufacturer	16
Customer Comments Received	Customer	18
Start Equipment Fabrication	APC Manufacturer	18
Equipment Shipment	APC Manufacturer	34
Installation Complete (Outage work for injection port installation)	TBD	8 to 12 weeks (Non-Outage) 1 to 2 weeks (Outage)[c]
Startup Complete	APC Manufacturer	42 to 46 weeks
Optimization Complete	APC Manufacturer	44 to 48 weeks
Compliance Testing Complete	Customer	47 to 51 weeks

[a] - Computational fluid dynamic modeling provides in-depth analysis of a complex fluid flow, including detailed flow characteristics (velocity, pressure, turbulence, temperature, species concentration) for process optimization.
[b] – P&ID drawings are process flow and instrument drawings that show process flow paths for liquids, solids, and electrical systems.
[c] - The injection port installation is done within an outage taken for other scheduled reasons and typically takes from one to two weeks. The injection port installation may be performed at the same time as other equipment fabrication or during another period of the SNCR project and may not add more time to the overall length of the SNCR project.

Selective Catalytic Reduction

Selective catalytic reduction (SCR) technology has been practiced worldwide for over 50 years with hundreds of successful applicatio ns in a broad field of industrial applications. Selective catalytic reduction technology has been successfully applied to a wide variety of combustion and chemical process operations including: gas turbines, stationary spark ignition engines, stationary compression ignition engines, refinery heaters, packaged boilers, ethylene cracker furnaces, nitric acid plants, catalyst manufacturing processes, nitrogen fixation processes, and solid/liquid or gas waste incineration equipment. The experience with SCR on industrial applications has been throughout the United States, with high concentrations in California, New Jersey, and Texas due to their more stringent NO_x requirements. SCR has been used by itself and in combination with other technologies, such as SNCR, LNB, and FGR.

The principal of operation for an SCR system is to inject a reducing agent into the hot flue gas upstream of a catalyst. The catalyst accelerates the reaction of the reducing agent with NO_x and is used to broaden the range of operating conditions, market applications, and NO_x destruction efficiencies achievable. The catalyst promotes the selective reaction of NH_3 with NO_x, forming nitrogen and water. Depending on the manufacturer's system, the catalyst may be a packed bed of pellets, extrudates or other particulate shapes, or as rigid honeycomb or plate type cubes that are assembled to form the catalyst bed. The reducing agent for SCR can be anhydrous ammonia, aqueous ammonia, or urea. Care is taken to inject the amount of reducing agent equal to the amount of NO_x in the stream to avoid excess ammonia, or ammonia slip. On most SCR applications, the flue gas temperature for optimum NO_x reduction is typically achieved between 500-1,000 °F. Catalyst designs can be tailored for the applications specific temperature window. For gas-fired boiler applications, catalysts have been designed for optimum performance at lower temperatures between 300-700 °F..

For smaller applications where the exhaust flow rate is 20,000 SCFM or less, SCR systems are supplied in a ready-to-install SCR skid package. SCR skid packages are typically applied on packaged boilers, engines, some chemical processes, etc. In addition, standard SCR packaged systems are available for the complete range of firetube and watertube boilers as well. The primary components of the SCR system include: ammonia storage and delivery system, ammonia injection grid, and catalyst reactor. The ammonia injection grid and SCR catalyst can often be installed immediately before or in the stack, thereby avoiding any modifications to combustion or heat-recovery equipment or negative effects on other upstream plant operations.

For larger applications of 20,000 SCFM or greater, designs permit a modularly constructed system, providing a high degree of flexibility in the design of the SCR system for the specific application, particularly for retrofit applications. This has made the SCR technology a cost-effective retrofit technology for gas-fired industrial boilers, larger chemical installations, distributed generation facilities, and major waste incineration plants.

Installation timing for SCR often depends on the size of the application and will be discussed in terms of those units that have flue gas flowrates less than 20,000 SCFM and those greater than 20,000 SCFM. Since smaller systems are skid mounted and designed for quick installation in the field, the deployment process from bid through startup takes significantly less time than a larger field erected system. The following table lays out the SCR deployment time from the request for quote issued by the end user to the optimization and compliance testing.

	Weeks From Commercial RFQ Date	
SCR Project Activity	**<20,000 SCFM SCR System**	**>20,000 SCFM SCR System**
RFQ Issued	0	0
APC Manufacturer Issues Proposal	1-3	2-4
Bid Evaluation and Negotiation	2-6	4-8
Receipt of Purchase Order	6	8
Client Kick Off Meeting	7	9
Customer GA[a] & P&ID Drawing Review and Comment	9-10	16-20
Drawing Review w/Customer	11-12	18-24
Start Equipment Fabrication	12-13	20-24
Equipment Shop Tested	22-23	36-40
Equipment Shipment	23-24	38-42
Field Installation Complete	26-30	44-52
Startup Complete	27-32	46-56
Optimization & Compliance Testing	28-36	48-58

[a] GA – general arrangement drawings are scaled, dimensioned, and annotated to reflect a reasonable layout for the project.

In summary, smaller skid-mounted SCR systems can be supplied from RFQ to compliance testing in 7-9 months or in approximately six (6) months from the purchase order to startup. Most of this time is spent in engineering design, fabrication, and field installation. Larger SCR systems that are field erected from modular components are typically supplied from RFQ to compliance testing in 11-13 months or in 9-12 months from the purchase order to startup.

Non-Selective Catalytic Reduction (NSCR)

Stationary NSCR, as with the automobile sector, involves the use of a three-way catalyst technology to promote the reduction of NO_x to nitrogen and water and simultaneous oxidation of CO and HC to carbon dioxide and water. NO_x is reduced by the CO and H_2 over the catalyst under slightly rich or stoichiometric conditions to produce CO_2 and water with typical conversion efficiencies in the range 80-99 percent achievable together with corresponding decreases in HC and CO.

Non-selective catalytic reduction (NSCR) can be applied to various spark ignited internal combustion engines that are rich-burn, including natural gas-fueled engines. These types of engines are commonly found in the following applications: gas gathering and storage, gas transmission, power generation, combined heat and power, cogeneration/trigeneration, irrigation, inert gas production, and non-road mobile machinery. NSCR has been used routinely in the automotive industry to reduce vehicular carbon monoxide, hydrocarbons, and NO_x emissions with over a billion catalyst units equipped to automobiles since the mid-1970s. The application of NSCR to stationary gas engines for the control of NO_x and CO first became commercially available in North America in the late 1980s and have well over 5,000 stationary engine installations in service today.

In addition to catalysts and housings (converters), NSCR retrofits require installation of an oxygen sensor and feedback controller to maintain an appropriate air-to-fuel ratio under variable load conditions. The catalyst applied to NSCR typically contains active metals such as platinum, palladium, and rhodium and is typically in the form of highly durable metallic monolith elements. NSCR converters are available off-the-shelf for very short turn-around installations. The time required for the deployment of off-the-shelf NSCR products is 6 to 8 weeks and for standard products, 8 to14 weeks with the following steps:

- 2-4 weeks - bid proposal and evaluation
- 4-6 weeks – engineering and shipping
- 1-2 weeks – installation
- 1-2 weeks – start-up

MEMBERS

Members
ADA Environmental Solutions, LLC
ALSTOM Power
Argillon LLC
Babcock & Wilcox
Babcock Power Inc.
BASF
Belco Technologies Corporation
Black & Veatch
Burns & McDonnell
Chemical Lime Company
Cormetech, Inc.
CRI Catalyst Company
CSM Worldwide, Inc.
Dürr Environmental & Energy Systems
Epcon Industrial Systems
Forney Corporation
Fuel Tech
GE Energy Services
Haldor Topsoe, Inc.
Hamon Research-Cottrell, Inc.
Hitachi Power Systems America, Ltd.
Hitz America Inc.
Horiba Instruments, Inc.
Johnson Matthey Stationary Source Emissions Control
Land Instruments International, An AMETECK Co.
Marsulex Environmental Technologies
Mitsubishi Power Systems, Inc.
Mobotec USA, Inc.
Ohio Lumex
Powerspan Corporation
Sargent & Lundy, LLC
SICK Maihak, Inc.
Spectrum Systems, Inc.
Stone & Webster Engineering Corporation
Süd-Chemie, Inc.
Tekran Instruments Corp.
Teledyne Monitor Labs
Thermo Electron Corporation
Washington Group International, Inc.
Wheelabrator Air Pollution Control
WorleyParsons

Associate Members
Advanced Electron Beams
Airflow Sciences Corporation
Airgas, Inc.
Andover Technology Partners
Applied Ceramics, Inc.
Aspectrics
Avogadro Environmental Corporation
Baldwin Environmental, Inc.
California Analytical Instruments
Carmeuse North America
Casey Industrial, Inc.
CEM Service Group, Inc.
Chemco Systems LP
Corning, Incorporated
Dekoron/Unitherm, Inc.
ECOM America Ltd.
Energy Services Consultants
Environmental Systems Corporation
Evergreen Energy
FFE Minerals
FlowTack, LLC
Graymont Inc.
GT&S, Inc.
Linde Gas, LLC
M&C Products Analysis Technology, Inc.
Matheson Trigas, Inc.
McIlvaine Company
Midwesco Filter Resources, Inc.
Millennium Chemicals, A Lyondell Company
NORIT Americas Inc.
NWL Transformers
Parker Hannifin, Parflex Division
Perma Pure
Praxair, Inc.
PSP Industries
Rauschert Process Technologies, Inc.
Restek Corporation
RJF Consultants, LLC
Scott Specialty Gases, Inc.
SCR-Tech
Solvay Chemicals, Inc.
Spectra Gases, Inc.
Structural Steel Services, Inc.
Terra Environmental Technologies
Testo, Inc.
Thermon Manufacturing Co.
TLT Babcock Inc.
Universal Analyzers, Inc.
VIM Technologies, Inc.
VIG Industries, Inc.
Zachry Construction Corporation

EXHIBIT 3

Excerpt from EPA Report

EPA-600/R-02/073
October 2002

Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies

Prepared by:
ARCADIS Geraghty & Miller
4915 Prospectus Drive, Suite F
Durham, NC 27713

EPA Contract No. 68-C-99-201
Work Assignment 3-034

U.S. EPA Project Officer: Ravi K. Srivastava
National Risk Management Laboratory
Research Triangle Park, NC 27711

Prepared for:
U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC 20460

Acknowledgements

ARCADIS would like to acknowledge the many contributors to this document, without whose efforts this report would not be complete. In particular, we wish to acknowledge the advice of Chad Whiteman of Clean Air Markets Division, Office of Air and Radiation, U.S. Environmental Protection Agency. Helpful suggestions were received from Kevin Culligan and Mary Jo Krolewski, both of Clean Air Markets Division. Technical guidance was received from Dr. Ravi Srivastava of the National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency.

ARCADIS would also like to acknowledge other organizations, which provided research that was incorporated into the report. These organizations include ESI International and Andover Technology Partners.

Executive Summary

This report evaluates the engineering and economic factors of installing air pollution control technologies to meet the requirements of multipollutant control strategies. The implementation timing and reduction stringency of such strategies affect the quantity of resources required to complete the control technology installations and the ability of markets to adjust and to provide more resources where needed. Using the Integrated Planning Model (IPM), the U.S. Environmental Protection Agency (EPA) estimated the number and size of facilities that need to install new emissions control equipment to meet the implementation dates and emission reductions set forth in the Clear Skies Act.

This study provides an estimate of the resources required for the installation of control technologies to obtain emission reductions of sulfur dioxide (SO_2), nitrogen oxides (NO_x), and mercury under the Clear Skies Act. More innovative control technologies and compliance alternatives requiring fewer resources than those considered for this study are likely to be developed with the implementation of the Clear Skies Act. Market based approaches reward firms for finding cost-effective measures that exceed emission reduction targets. For example, improved scrubber performance and the ability of some firms to switch to lower sulfur fuels under the Acid Rain Program were reasons the cost of that program were less than projected. The development of control technology alternatives to selective catalytic reduction (SCR) under the NO_X State Implementation Plan (SIP) Call is another example of how alternative solutions may require fewer resources than the projected approach. In addition to innovative technologies, the time allowed for installation of significant numbers of control technologies is an important factor to consider, especially for the near future. While it is expected that markets for the materials and labor used in the construction and operation of the control technologies will respond to increased demand, this response will not be instantaneous. It is likely that the strength of this market response will increase as time progresses. It is expected that the market would have sufficient time to respond to phase II of the program as the more stringent emission targets for phase II are set for 2018. Even though this analysis looks at the resource availability beyond 2010, these projections are of limited value as they do not take into account this market response. However, it is projected that there are sufficient resources available to complete the projected control technology installations for phase I by 2010. It should also be noted that decreasing the amount of time provided to install control technologies to meet a given strategy has the potential to affect the cost of compliance as this will accelerate their installation.

The control technologies considered by this report as candidates to be used for multipollutant control strategies include: limestone forced oxidation (LSFO) flue gas desulfurization (FGD) for the control of SO_2, SCR for the control of NO_X, and activated carbon injection (ACI) for the control of mercury.

Installation of LSFO presents a conservatively high estimate of anticipated resources and time to provide additional control of SO_2 emission, since LSFO systems commonly are more resource intensive than many other FGD technologies. Conservatively high assumptions were made for the time, labor, reagents, and steel needed to install FGD systems. For LSFO installation timing, it is expected that one system requires about 27 months of total effort for planning, engineering, installation, and startup, with connections occurring during normally scheduled outages. Multiple retrofits at one plant would take longer to install (e.g., approximately 36 months for the retrofit of three absorbers for six boilers). Limestone is the reagent used in LSFO to remove SO_2 from the flue gas stream. Steel is the major hardware component for FGD systems and is used primarily for the absorber, ductwork, and supports.

Other elements of FGD installations, such as construction equipment requirements, are typically modest, particularly given that systems are installed at the back end of the facility and close to the ground. More recently, improvements in technology have been implemented where space requirements were an issue for construction and accommodating the FGD system, including fewer and smaller absorbers and more efficient on-site use and treatment of wastes and byproducts.

SCR is currently the predominant technology to be used for NO_X control and is also the most demanding in terms of resources and time to install when compared to other NOx control technologies. It is expected that one SCR system requires about 21 months of total effort for planning, engineering, installation, and startup. Multiple SCR systems at one facility would take longer to install (e.g., approximately 35 months for seven SCRs). Ammonia and urea are the reagents used along with a catalyst to remove NO_X from the flue gas stream. Experience in installing SCRs for the NO_X SIP Call has shown that the SCR equipment can be installed on the facilities in the space provided. In some cases, some moving of equipment has been necessary. One of the primary pieces of specialized construction equipment that can be useful for SCR installations are tall, heavy-lift cranes, and these appear to be in adequate supply.

ACI was presumed to be the technology that would be used to reduce mercury where dedicated mercury controls were needed. Planning, engineering, installation, and start up of one ACI system is only about 15 months. Multiple ACI systems at any one facility are assumed to take longer to install (e.g., approximately 16 months for two ACI). ACI hardware is comprised of relatively common mechanical components and is largely made of steel. An ACI system requires much less in terms of steel, labor, or other resources to install than either FGD or SCR technology. Therefore, the impact of ACI hardware on resource demand is much less than that of FGD or SCR technologies for SO_2 or NO_X control, respectively.

The resources required for the installation of control technologies to achieve the emission reductions under the Clear Skies Act were estimated and compared to their current market availability. For the Clear Skies Act, control technology installations have been looked at for the periods between now and 2005, 2005 and 2010, 2010 and 2015, and 2015 and 2020. For the first period, it is assumed that all controls need to be installed in a 31-month period. This will provide a conservatively high estimate of the required resources because many of the necessary control installations have already begun. For the other five year-periods, it is conservatively estimated that all installations will be completed within three years. However, the estimates indicate that there is ample steel and general construction labor to support the installation of these technologies over these time periods. As noted above, projections beyond 2010 are of limited value as market conditions could change significantly between now and 2010 in response both to demand for resources for a multipollutant program and because of other market factors. Skilled labor requirements, specifically for boilermakers, were estimated and have the potential to be the more limiting resource requirement in phase I of the program. The demand for boilermaker labor due to the NO_X SIP Call over the next few years is likely to be limiting, but through the implementation of the Clear Skies Act, additional recruiting and training of new boilermakers would create a stronger market for skilled labor, ultimately increasing the supply.

With regards to reagents and other consumables, it is projected that there is sufficient supply of limestone for additional FGD systems. It is estimated that there is also enough SCR catalyst capacity to supply this market. Ammonia and urea supply is also plentiful, although it is expected that NO_X reduction will cause a moderate increase in U.S. demand. Bolstered by the fact that there is currently a worldwide excess capacity problem for suppliers of these globally traded commodity chemicals, it is projected that there will be an ample supply of ammonia and urea. U.S. demand for activated carbon is expected to slightly increase as a result of the Clear Skies Act. Activated carbon is traded on a global basis and there is currently substantial excess capacity that can readily provide for this increase in demand.

Contents

List of Figures

List of Tables

List of Acronyms

AC	Activated carbon
ACI	Activated carbon injection
CAAA	Clean Air Act Amendments
DCS	Distributed control system
ESP	Electrostatic precipitator
FF	Fabric filter
FGD	Flue gas desulfurization
GW_e	Gigawatt (electric)
IPM	Integrated Planning Model
LSD	Lime spray dryer
LSFO	Limestone forced oxidation
MEL	Magnesium enhanced lime
MW_e	Megawatt (electric)
NAAQS	National Ambient Air Quality Standards
PJFF	Pulsejet fabric filter
PLC	Programmable logic controller
SCR	Selective catalytic reduction
SIP	State Implementation Plan
TVA	Tennessee Valley Authority

Chapter 1
Background

In response to continuing concerns about emissions from electric generating units, further reductions of emissions of multiple pollutants from electric power sector are being considered. Because the largest portion of emission reductions are expected to come from the coal-fired electricity-generating segment of the electric power sector, this report considers environmental improvement for coal-fired electricity generating power plants. Strategies enabling the control of multiple pollutants (multipollutant control strategies) from these plants have recently been receiving increased attention.

Currently, power plants are required to reduce emissions of nitrogen oxides (NO_X) and sulfur dioxide (SO_2). The revisions of the National Ambient Air Quality Standards (NAAQS) aimed at reducing haze may require electric utility sources to adopt additional control measures. In addition, the U.S. Environmental Protection Agency (EPA) has determined that the regulation of mercury emissions from coal-fired power plants is appropriate and necessary. Concurrently, legislation has been proposed in previous and current Congresses that would require simultaneous reductions of multiple emissions, and the Administration's National Energy Policy recommends the establishment of "mandatory reduction targets for emissions of three main pollutants: sulfur dioxide, nitrogen oxides, and mercury."

The administration's multipollutant proposal, a far reaching effort to decrease power plant emissions, was introduced as the Clear Skies Act in the U.S. House of Representatives on July 26, 2002 and in the U.S. Senate on July 28, 2002. This legislation is intended to reduce air pollution from electricity generators and improve air quality throughout the country. The Clear Skies Act is designed to decrease air pollution by 70 percent through an emission cap-and-trade program, using a proven, market-based approach that could save consumers millions of dollars. The Clear Skies Act calls for:

- Decreasing SO_2 emissions by 73 percent, from current emissions of 11 million tons to a cap of 4.5 million tons in 2010, and 3 million tons in 2018,
- Decreasing NOx emissions by 67 percent, from current emissions of 5 million tons to a cap of 2.1 million tons in 2008, and to 1.7 million tons in 2018, and
- Decreasing mercury emissions by 69 percent by implementing the first-ever national cap on mercury emissions. Emissions will be cut from current emissions of 48 tons to a cap of 26 tons in 2010, and 15 tons in 2018.

Therefore, it is timely to review the engineering and resource requirements of installing control technologies for multipollutant control strategies.

This report analyzes the resources required for installing and operating retrofit control technologies for achieving reductions in multiple pollutants from coal-fired power plants in the United States. It examines the control technology's hardware, reagents, availability of the needed construction equipment, time required to implement at plants with single and multiple installation requirements, and the availability of labor needed for installation. The control technologies considered in this report include limestone forced oxidation (LSFO) wet flue gas desulfurization (FGD), selective catalytic reduction (SCR), and activated carbon injection (ACI) for the control of SO_2, NO_X, and mercury, respectively.

The report is organized into eight chapters and one appendix. Chapter 1 provides general background information on emission control technologies. Chapter 2 analyzes the SO_2 control technology resource requirements by providing information on control technology's hardware and reagents, the construction equipment necessary to install a control technology, time required to implement this control technology at plants with single and multiple installation requirements, and the amount of labor needed to install the control technology. Chapters 3 and 4 review, in the same fashion, the resource requirements of installing NO_X and mercury control technology, respectively. Chapter 5 focuses on synergistic combinations of control retrofits on a single unit. Chapter 6 examines the availability of resources necessary for the installation of SO_2, NO_X, and mercury control retrofit technologies for the timing and emission reductions proposed under the Clear Skies Act. Conclusions are presented in Chapter 7 and references in Chapter 8. Appendix A is located at the end of this report. It provides implementation schedules for single and multiple control technology installations.

Chapter 3
NO_x Control Technology Retrofits

In this chapter, retrofit of SCR will be assessed for coal-fired electric utility boilers that would be affected by a multipollutant regulation. SCR is the NO_X control technology that is expected to have the greatest impact on future utility boiler NO_X emissions and is the most difficult NO_X control technology to install. It is, therefore, the most important NO_X control technology to understand from both a NO_X reduction and resource requirement perspective.

3.1 System Hardware

The SCR process operates by reacting ammonia with NO_X in the exhaust gas in the presence of a catalyst at temperatures of around 315 to 370 °C. For most applications, this temperature range makes it necessary to locate the SCR reactor adjacent to the boiler – immediately after the boiler and before the air preheater as shown in Figure 3-1. An infrequently used alternative approach is to locate the SCR after the FGD. This approach, however, increases operating costs, as it requires additional heating of the gas. By locating the SCR reactor as in Figure 3-1, it is often necessary to install the catalyst reactor in an elevated location, which may result in a structure hundreds of feet tall. Figure 3-2 shows the configuration of the SCR that was retrofit onto AES Somerset Station, a 675 MW_e boiler already equipped with an electrostatic precipitator (ESP) and wet FGD system. In this common installation, the SCR reactor is installed on structural steel that elevates it above existing ductwork and the ESP (designated "precipitator" in the Figure 3-2). In the lower right corner of Figure 3-2, an image of a person provides a perspective of the size of the SCR installation.

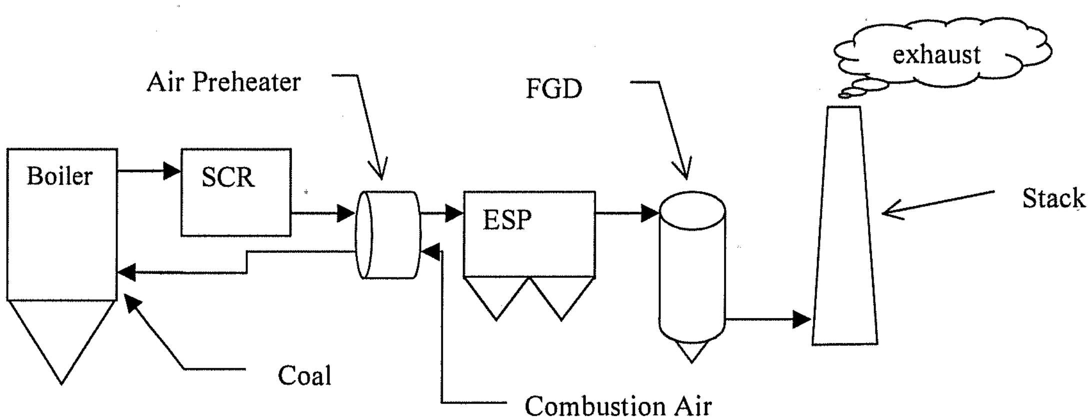


Figure 3-1. Gas path for coal-fired boiler with SCR, ESP, and FGD.

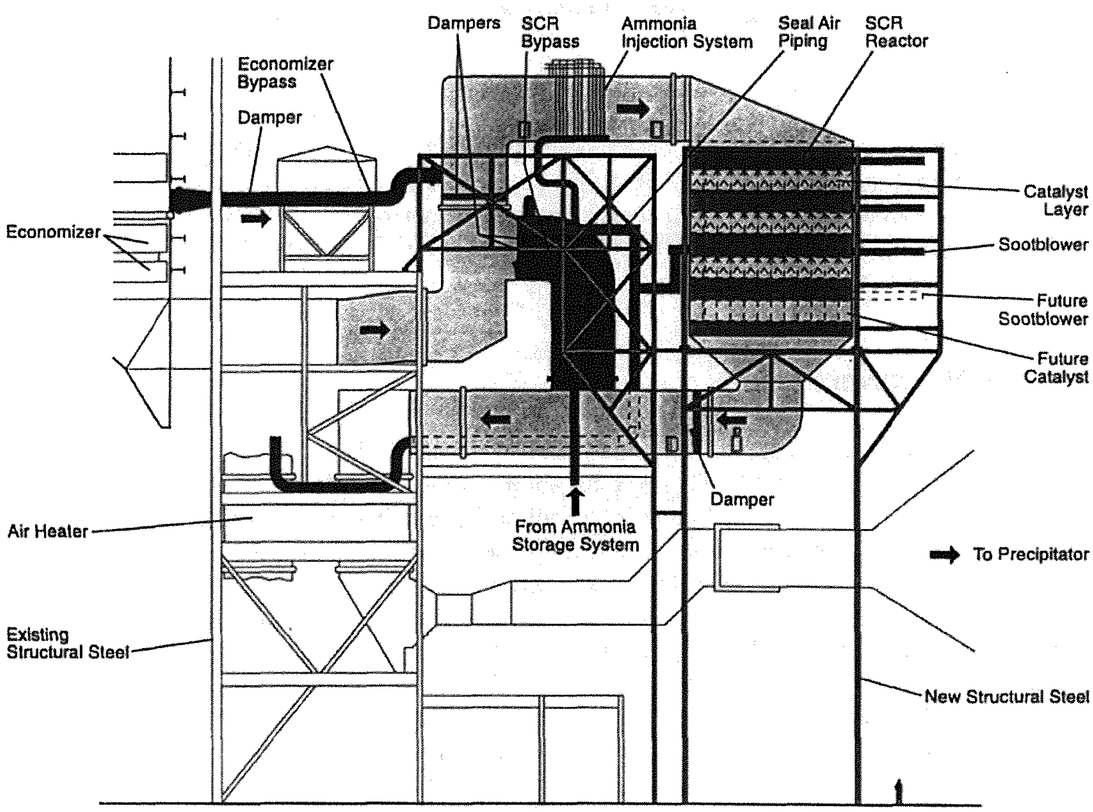


Figure 3-2. SCR installation at 675 MW_e AES Somerset Station.[19]

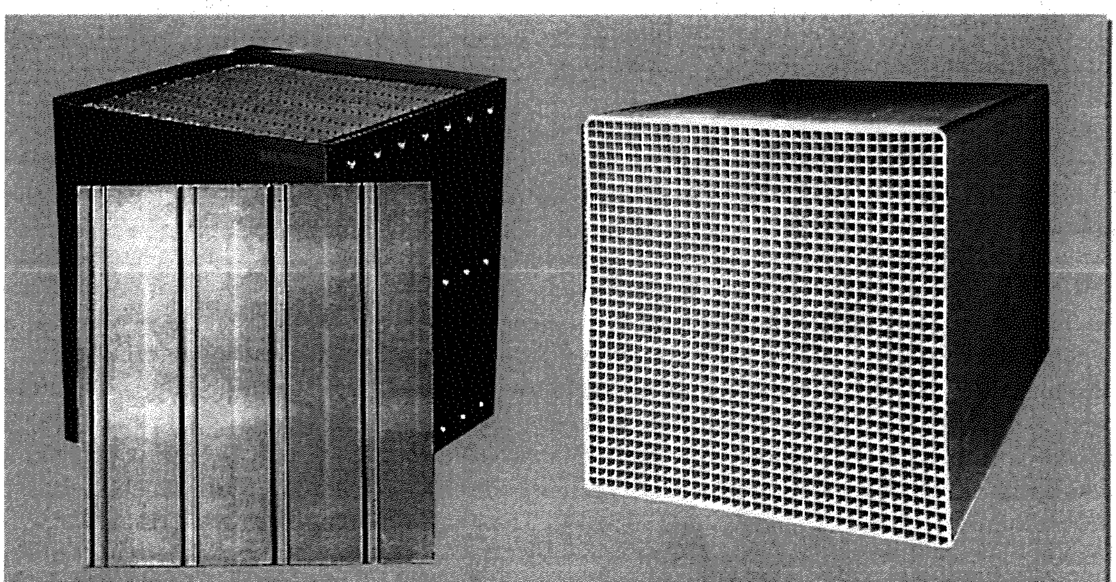
The SCR system reduces NO_X through a reaction of ammonia and NO_X in the presence of oxygen and a catalyst at temperatures around 315 to 370 °C (600 to 700 °F). The products of this reaction are water vapor and nitrogen. The catalyst is mounted inside an expanded section of ductwork and is configured for the gas to pass through it as in Figure 3-2.

The major components of an SCR system include:

- Ammonia or urea storage
- Ammonia vaporization system (if aqueous ammonia is used)
- Urea to ammonia converter (if urea is used)
- Ammonia or urea metering and controls
- Dilution air blowers
- Ammonia injection grid
- Catalyst
- Catalyst reactor, ductwork and support steel
- Catalyst cleaning devices (soot blowers, sonic horns, etc)
- Instrumentation

Except for the catalyst, most of the material/equipment used to assemble an SCR system is either standard mechanical and electrical components (pumps, blowers, valves, piping, heaters, pressure vessels, temperature and pressure sensors, etc.) or is largely manufactured for other power plant applications and has been adopted for use in SCR systems (cleaning devices such as soot blowers or sonic horns, gas analyzers, etc.). The catalyst, however, is a specialized product designed specifically for this purpose.

The catalyst is typically a ceramic material that, in most cases, is either extruded into a ceramic honeycomb structure or is coated onto plates, as shown in Figure 3-3. The catalyst is assembled into modules at the factory. The modules are shipped to the site and installed into the SCR reactor in layers. Each layer of catalyst is comprised of several individual modules that are installed side-by-side.



The catalysts used for selective catalytic reduction are mainly parallel-flow catalysts, of which there are two types, plates or extruded.

Figure 3-3. Plate and honeycomb catalyst.[20]

The material used in the largest quantity, aside from a catalyst or reagent, is steel. The amount of steel required for an SCR in the range of 300-500 MW_e is about 800 to 1200 tons,[20] or about 2.4 to 2.6 tons per MW_e. About 4,000 tons of steel is necessary for retrofit of two 900 MW_e units (1,800 MW_e total),[20] or about 2.2 tons per MW_e. The steel used for an SCR includes large structural members, plates, and sheets. These steel pieces are used to fabricate the catalyst reactor, the ductwork, and the support steel. There is typically less of a requirement for corrosive resistant alloys for an SCR installation when compared to a scrubber installation. Steel is also needed for boiler modifications. In this case, large pieces of steam piping or other large steel boiler components may need to be replaced. The catalyst reactor is often fabricated on-site. Sections of the catalyst reactor and ductwork may be fabricated off-site and shipped in pieces to the site for final assembly, or they may be fabricated on-site into subassemblies and lifted into place during erection.

If more than one boiler at a facility is to be retrofit with SCR, then some, but not all, equipment can be made common. For example, it may be possible, and is probably preferable, to have a common ammonia or urea storage facility. Reagent storage is probably the only major equipment item that lends itself to sharing between adjacent boilers. Therefore, there is some gained efficiency in the use of equipment at a site with multiple units. However, this gain in efficiency is generally small compared to the total project. The major synergy will be in construction equipment and in labor, as will be discussed in Sections 3.3 and 3.5, respectively.

3.2 Catalyst and Reagents

An SCR system requires an initial and ongoing supply of catalyst. It also requires reagent. The reagent can be ammonia or urea. Most facilities to date have used ammonia; however, urea is becoming an increasingly popular reagent due to its inherent safety and the recent availability of systems to convert urea to ammonia on-site.

Catalyst

The amount of catalyst required for an SCR system is directly proportional to the capacity (or gas flowrate) of the facility, if all other variables are equal. The actual amount of catalyst for any specific plant depends upon several parameters; in particular, the amount per MW_e (measured in m^3 per MW_e) for a given level of reduction and lifetime will fall within a general range. Therefore, it is possible to make an estimate of how much catalyst would be necessary to retrofit a particular facility or a large number of facilities if the total capacity is known. It is assumed that most SCR systems to be retrofit onto electric utility boilers will be designed for about 90 percent reduction. For most boilers, this level of reduction may initially require about 0.90 to 1.3 m^3 of catalyst for each MW_e of coal-fired boiler capacity.[18,21,22] For example, a 500 MW_e plant would be expected to have about 450 to 650 m^3 of catalyst. The amount of catalyst for a particular situation will vary somewhat depending on the catalyst supplier and the difficulty of the application. At the 675 MW_e AES Somerset Boiler, 90 percent NO_X reduction was achieved with SCR using 897 m^3 of plate catalyst,[19] or about 1.33 m^3 per MW_e. This unit fires 2.5 percent sulfur coal. At each of the 745 and 755 MW_e Montour Units 1&2, 671 m^3 of ceramic catalyst were used,[22] or about 0.89 m^3 per MW_e. This unit fires 1.5 percent sulfur coal that can have arsenic levels as high as 100 ppm (limestone injection is used to reduce gaseous arsenic concentration in the furnace). The amount of catalyst will tend to be lower in situations that are less challenging, such as with lower sulfur coals or situations expected to have lower gaseous arsenic concentration (gaseous arsenic is a catalyst poison that originates in the coal; it will reduce the lifetime of the SCR catalyst). Hence, less than 0.90 m^3 per MW_e may be sufficient in some cases.

The catalyst is typically loaded in three or more layers. This permits replacement of sections of the catalyst as activity is reduced. The advantage of this approach is that it permits lower overall catalyst usage over the economic lifetime of the plant. Normally, room for an extra layer is provided, so a fourth layer can be added, if necessary. At the first catalyst addition (typically, after about 24,000 operating hours), the fourth layer will be filled or half filled. Once the SCR reactor is full, layers of catalyst are replaced after catalyst activity drops to a minimum level. At the first catalyst replacement, new catalyst will replace the original first layer; at the next catalyst replacement, new catalyst will replace the original second layer, and so on. EPA modeling projections conservatively assumed that one layer of catalyst is replaced for every 15,000 – 20,000 hours of operation for coal-fired units. Therefore, after the initial installation, there is a need to replace roughly one fourth of the total catalyst reactor volume every 24- 32 months or so – or conservatively about $^1/_8$ of the installed volume should be replaced each year for the coal-fired installations.

The catalyst may also be regenerated rather than replaced.[23] This will reduce the amount of new catalyst that must be purchased. However, due to the limited experience with this method, it will be assumed that the catalyst is replaced according to the catalyst management plan.

Reagents

The amount of reagent consumed in the SCR process is directly proportional to the amount of NO_X reduced. Although ammonia is the chemical that actually participates in the chemical reaction, some suppliers have developed equipment to convert urea to ammonia on-site. According to one supplier of urea-to-ammonia converters, each mole of urea within the conversion system is converted to two moles of ammonia.[24] For example, reducing one pound of NO_X will require roughly 0.176 kg of ammonia or about 0.312 kg of urea. This includes a ½ percent increase in reagent demand due to ammonia slip and a five percent increase to account for a small amount of nitrogen dioxide (NO_2) in the flue gas.

Therefore, for any given plant size, the amount of catalyst and reagent consumption can be estimated. For a 500 MW_e plant reducing NO_X from 0.50 lb/MMBtu to 0.05 lb/MMBtu and 85 percent capacity factor (this is conservatively high for most coal boilers), approximately 3,400 tons/yr of ammonia (anhydrous equivalent) or about 6,100 tons/yr of urea (as 100 percent urea) would be needed. The same 500 MW_e plant would have around 450-650 m^3 of catalyst with roughly 120-160 m^3 replaced about every three years. This is, if a third of the initial catalyst loading must be replaced, on average, every 15,000 to 20,000 operating hours, then 0.015 to 0.0289 cubic meters per MW_e per 1000 hours must be replaced.

3.3 Construction Equipment

Construction equipment needed for installation of an SCR includes standard construction equipment – welders, excavation equipment, concrete pouring equipment, cranes, etc. In some cases, installers may use tall-span heavy-lift cranes. These cranes are capable of lifting heavy loads, as much as 100 tons or more, several hundred feet. The advantage of this crane type is realized when lifting assembled sections of catalyst reactor or other large pieces high off the ground. If lower capacity cranes are used, smaller pieces must be lifted, which means that less pre-fabrication is possible and more assembly must be done in place. Less pre-fabrication could lengthen the necessary boiler outage somewhat. Although the availability of the largest cranes is reported to about 60 or more, about 12 new cranes can be supplied every six months.[25] It has been reported that, in some cases, it has been necessary to go further away from the plant to source cranes with adequate lift and reach capacity. In other cases, engineers found that by changing the design/fabrication method to meet the available crane, the project could be managed with lower capacity cranes (lifting smaller pieces).[26,27] If more than one boiler is retrofit at one facility, then the crane can be used for both boilers, saving cost and time when compared to boilers retrofit separately. It is important to note that in many cases the erection method is not limited by the available crane, but is limited by the access to the plant (For example, can large sections be delivered by barge, rail, or roadway?) and by the available lay-down area for material and construction equipment on site. At many facilities, there is inadequate area to prefabricate large sections. In some instances, transportation routes to the facility do not permit transporting large, pre-assembled equipment to the site. In such cases, it will not be possible to do much pre-assembly, and a smaller, less expensive crane may be adequate. As a result, the type of crane that is best for a particular SCR installation frequently is not the largest crane available. The crane selected for a project will be determined as part of an overall construction plan developed to optimize all of the available resources – labor, material, and equipment - for a particular project.

The need to lift material to high elevations is a result of the location of the SCR – often above existing ductwork and adjacent to existing equipment. Figure 3-2 provided one good example of this. It may be necessary to move existing equipment, such as the air preheater, in order to accommodate the addition of the SCR reactor. As a result, every retrofit is a custom fit. However, engineers have been very innovative when installing these systems, even on facilities that apparently had little room available for the SCR. Hence, the physical size of the technology has not been limiting.

3.4 Installation Time

Implementation of a NO_X control technology at a plant involves several activities contingent upon each other. These activities may be grouped under the following phases of an implementation project: (1) conducting an engineering review of the facility and awarding a procurement contract; (2) obtaining a construction permit; (3) installing the control technology; and (4) obtaining an operating permit.

Exhibit A-3 in Appendix A depicts the timeline expected for completing a single unit installation of SCR. Completion of some of the activities is contingent upon completion of some other activities. For example, construction activities cannot commence until a construction permit is obtained. In general, the SCR implementation timeline appears to be driven primarily by the engineering activities (i.e., design, fabrication, and construction).

Engineering Review

As shown in Exhibit A-3 in Appendix A, an engineering review and assessment of the combustion unit is conducted in the first phase of technology implementation to determine the preferred compliance alternative. During this phase, the specifications of the control technology are determined, and bids are requested from the vendors. After negotiating the bids, a contract for implementing the NO_X control technology is awarded. The time necessary to complete this phase is approximately four months for SCR.

Construction Permit

Before the actual construction to install the technology can commence, the facility must receive a construction permit from the applicable state or local regulatory authority. The construction permit process requires that the facility prepare and submit the permit application to the applicable state or local regulatory agency. The state or local regulatory agency then reviews the application and issues a draft approval. This review and approval process is estimated to take about six months. The draft construction permit is then made available for public comment. After any necessary revisions, a final construction permit is issued. The actual time needed will depend on the size and complexity of the project and the local procedures for issuing a permit. Exhibit A-3 in Appendix A shows that nine months are allowed for the construction permit. This is expected to be ample time. In one case, only about 4-5 months were needed for obtaining the construction permit,[26] and only six months were needed to obtain the construction permit for retrofit of two 900 MW_e boilers in another case.[21] Shorter periods for construction permit authorization would allow earlier commencement of construction activities and could potentially shorten the overall schedule.

Control Technology Installation

In the second phase, the control technology is installed. This installation includes designing, fabricating, and installing the control technology. In addition, compliance testing of the control technology is also completed in this phase. Most of the construction activities, such as earthwork, foundations, process electrical and control tie-ins to existing items, can occur while the boiler is in operation. The time needed to complete this phase of an implementation project is about 17 months for SCR.

An important element of the overall control technology implementation is the time needed to connect, or hook up, the control technology equipment to the combustion unit because the boiler typically must be shut down for this period. SCR connection can occur in a three to five week outage period.[28] In some cases longer outages are needed. When Babcock & Wilcox retrofitted the 675 MW_e AES Somerset boiler, the outage began on May 14, and the boiler was returned to service on June 26 – about a six-week outage.[19] One major SCR system supplier in the U.S. stated that they would want in the range of one to two months of boiler down time and have never required more than two months.[27] Difficulty is increased as the extent of boiler modifications necessary to fit the SCR into the facility is increased. A German SCR system supplier installed SCR on a significant portion of the German capacity within outage periods consisting of less than four weeks.[11] Based upon outages in this time range for SCR connection, electricity-generating facilities would normally be able to plan the SCR connection to occur during planned outages to avoid additional downtime. Some facility owners have been innovative in their construction plans to minimize down time. At the Tennessee Valley Authority's (TVA's) 700 MW_e Paradise Unit 2, it was necessary to demolish the existing ESP with the unit on line. TVA installed a construction bypass to send gas from the air preheater outlet directly to the FGD, while the ESP was being demolished and the SCR reactor erected in its place.[11] However, in more difficult retrofits, down time might be impacted in a significant way. In some cases it may be desirable to plan a brief outage in advance of the hook-up to install structural steel through sleeves placed in existing equipment, such as the ESP, or to relocate existing equipment that would otherwise interfere with erection of the SCR. This permits erection of the catalyst reactor above existing equipment while the unit is on line.[26] However, because an SCR project is expected to extend close to two years (see Exhibits A-3 and A-4 in Appendix A), it should be possible to incorporate this work into planned outages, which would have occurred regardless of whether an SCR was to be installed.

Operating Permit

Facilities will also need to modify their Title V operating permit to incorporate the added control devices and the associated reduced emission limits. In some states, an interim air-operating permit may need to be obtained until the Title V permit is modified. The operating permit modification process consists of preparation and submission of the application to the applicable state or local regulatory agency. As shown in Exhibit A-3 in Appendix A, this process can occur simultaneously with the processing of the construction permit application. The process of transitioning from the construction permit to the operating permit varies among states and appears to be somewhat unclear due to the infancy of the Title V operating permit process. Nonetheless, based on discussions with several states, the application review process is estimated to take approximately 9-11 months. The Title V operating permit must also be made available for public comment. Following public comment, the Title V operating permit is not made final until compliance testing on the control device is completed. Therefore, the total estimated time to modify the Title V operating permit is about 17 months, plus the additional time to complete compliance testing.[10]

Based on the estimated time periods needed to complete each of the four phases described above, the estimated time period to complete the implementation of SCR on one combustion unit is about 21 months. This time period is shown in Exhibit A-3 in Appendix A. However, depending upon the specifics of the project, the time needed could vary by a couple of months. For example, at AES Somerset station, the time to complete the retrofit from the point of contract award was nine months.[19] Assuming four months of work prior to contract award, a total elapsed time of 13 months would have been necessary to retrofit this 675 MW_e boiler. Another facility, Reliant Energy's Keystone plant, has two 900 MW_e, 8-corner, T-fired combustion engineering units that burn approx 1.5 percent sulfur bituminous coal. Reliant intends to reduce the NO_X from a baseline of 0.40 lb/MMBtu to 0.04 lb/MMBtu. The permit to construct was received in approximately six months. The time from placing the order to completion of commissioning activities is 46 weeks for both units. However, preliminary engineering was accomplished earlier. Even if preliminary engineering and contract negotiation took as long as six to eight months, the total time for completing two 900 MW_e units would be about 17 to 19 months.[21] For the New Madrid plant, units 1 & 2 (600 MW_e each), the specifications were released to turnkey contractors in February 1998, the project specification was released in March 1998, the contract was awarded on June 26, 1998, and the first unit was in operation by February 2000. In this project, an option for a second unit was available (and was exercised), and air preheaters were replaced.[29] Therefore, 21 months should be a reasonable, and in some cases a conservative estimate of the total time necessary to retrofit a single utility boiler.

Under the Clear Skies Act, EPA does not expect that SCR will be implemented at every facility. For those plants where EPA projects SCR retrofits will occur, EPA's projections reflect that these facilities will typically have 1 to 4 boilers retrofit per site. However, for one facility, seven SCR retrofits are projected to be installed by 2020. Exhibit A-4 in Appendix A examines a schedule for retrofitting a facility with multiple (seven) SCR retrofits. This examines the installation of the control device hook-up on a sequential basis. Installation is staggered by two to three months between sequential units to enable more efficient utilization of manpower and project management than if multiple units were connected at one time. This approach also assures that at least about 83 percent of the plant capacity is available at any given time (only one boiler is shut down), and during most of the time there is no impact to the plant availability at all. This approach requires a total time of 35 months for seven SCR retrofits. An alternative approach might be to schedule outages to avoid any outage during high electricity demand periods. This might extend the total elapsed time by about four months. However, because there is a substantial amount of work that can be accomplished with the boiler on line, the additional time would be much less than the number of high electricity demand months that are accommodated by this approach. Another alternative approach would involve retrofit of more than one unit at a time during low-demand periods and avoiding any outage during high demand periods. This alternative could result in a faster project completion, but would have less even labor utilization, which is an important cost-benefit tradeoff.[30]

In summary, the total time needed to complete the design, installation, and testing at a facility with one SCR unit is about 21 months; at a facility with multiple SCR (seven) units, total time is approximately 35 months. Based on these timelines, it is estimated, in principal, that the NO_X controls needed to comply with a multipollutant strategy can be met provided that: (1) an adequate supply of materials and labor is available, and (2) the control technology implementation process begins at least about 35 months prior to the date controls must be in place. However, ideally, longer than 35 months would allow for all of the retrofits to occur over a period of several years so that facility owners can properly plan outages and suppliers can properly plan for resource availability.

3.5 Labor

The installation of an SCR system requires a significant amount of labor. Most of the labor is necessary for the construction of the facility. However, engineering and project management labor are also needed for the project. The total construction labor for an SCR system of 500 MW_e is in the range of 333,000 to 350,000 man-hours.[22,27] Typically, approximately 40-50 percent of the labor is for boilermakers.[31] However, the percent of labor for boilermakers will vary from one project to another, with 40-50 percent