No. 23A384

In the Supreme Court of the United States

UNITED STATES STEEL CORPORATION,
Applicant,

v.

ENVIRONMENTAL PROTECTION AGENCY, *et al.*,
Respondents.

ON EMERGENCY APPLICATION FOR STAY OF FINAL AGENCY ACTION TO THE HONORABLE JOHN G. ROBERTS, JR., CHIEF JUSTICE AND CIRCUIT JUSTICE FOR THE DISTRICT OF COLUMBIA CIRCUIT

PUBLIC INTEREST RESPONDENTS' RESPONSE IN OPPOSITION TO EMERGENCY APPLICATION FOR STAY OF FINAL AGENCY ACTION PENDING JUDICIAL REVIEW

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PARTIES TO THE PROCEEDINGS

In addition to the parties and related cases identified in the application, Air Alliance Houston, Appalachian Mountain Club, Center for Biological Diversity, Chesapeake Bay Foundation, Citizens for Pennsylvania's Future, Clean Air Council, Clean Wisconsin, Downwinders at Risk, Environmental Defense Fund, Louisiana Environmental Action Network, Sierra Club, Southern Utah Wilderness Alliance, and Utah Physicians for a Healthy Environment are Intervenors for Respondents in Case Nos. 23-1181, 23-1183, 23-1190, 23-1191, 23-1193, 23-1195, 23-1199, 23-1200, 23-1202, 23-1203, 23-1205, 23-1206, 23-1207, 23-1208, 23-1209, and 23-1211.

RULE 29.6 STATEMENT

Air Alliance Houston, Appalachian Mountain Club, Center for Biological Diversity, Chesapeake Bay Foundation, Citizens for Pennsylvania's Future, Clean Air Council, Clean Wisconsin, Downwinders at Risk, Environmental Defense Fund, Louisiana Environmental Action Network, Sierra Club, Southern Utah Wilderness Alliance, and Utah Physicians for a Healthy Environment are non-profit environmental and public health organizations. None of the organizations has any parent corporation or any publicly held corporation that owns 10% or more of its stock.

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TO THE HONORABLE JOHN G. ROBERTS, JR., CHIEF JUSTICE OF THE UNITED STATES, AS CIRCUIT JUSTICE FOR THE DISTRICT OF COLUMBIA CIRCUIT:

The Public Interest Respondents, intervenor parties in the court of appeals, respectfully submit this response in opposition to the application for a partial stay of EPA's Good Neighbor Rule, 88 Fed. Reg. 36,654 (June 5, 2023), as it applies to reheat furnaces and boilers at iron and steel mills.

INTRODUCTION

The Court should deny U.S. Steel Corporation's application.[1] A D.C. Circuit motions panel correctly and unanimously decided that U.S. Steel is not entitled to a stay. *See* Appl. App.266–67. Public Interest Respondents do not repeat here the arguments set forth in their October 30 combined response to the other three pending applications to stay the Rule, nor the arguments of EPA and State Respondents. Instead, they provide supplementary facts and context—including an additional declaration from James Staudt, Ph.D., an engineer and independent expert with decades of experience in air pollution control technologies and finance, *see* Staudt Decl. ¶¶ 1–2 (App. 1a)—specifically rebutting U.S. Steel's

[1] Ohio et al. (No. 23A349), Kinder Morgan et al. (No. 23A350), and American Forest & Paper Association et al. (No. 23A351) filed applications for a stay of the Rule on October 13. Public Interest Respondents responded separately to those Applications on October 30 urging the Court to deny them. That combined response is referenced herein as "Public Interest Oct. 30 Resp."

claim of irreparable harm and its contentions regarding the other equitable stay factors.

Public Interest Respondents show that U.S. Steel's estimates of costs from the Rule are not reliable. Moreover, any substantial costs associated with the Rule would arise after judicial review is complete, as the Rule's emissions-control requirements do not phase in for several years, with further deadline extensions available, if needed. But a stay would jeopardize iron and steel mills' timely emissions reductions, which are urgently needed to protect downwind States and people from those dangerous smog-forming emissions. No stay is warranted.

STATEMENT

Public Interest Respondents' statement of the case is set forth in their October 30 combined Response in Case Nos. 23A349, 23A350, and 23A351. *See* Public Interest Oct. 30 Resp. 3–11.

ARGUMENT

U.S. Steel does not meet its "heavy burden" to justify extraordinary relief from this Court. *Packwood v. Senate Select Comm. on Ethics*, 510 U.S. 1319, 1319–20 (1994) (Rehnquist, C.J., in chambers). In particular, putting aside U.S. Steel's failure below to demonstrate likelihood of success on the merits and its failure here even to attempt to identify any issue that might ultimately warrant a grant of certiorari,[2] the remaining three factors this Court considers when deciding whether to grant a stay—irreparable injury absent a stay, injury to other parties from a stay, and the public interest—weigh heavily against a stay here. *See Nken v. Holder*, 556 U.S. 418, 434 (2009).

I. U.S. STEEL HAS NOT SHOWN IT WILL SUFFER IRREPARABLE HARM WITHOUT A STAY.

U.S. Steel fails to show that it "will be irreparably injured absent a stay" pending review. *Nken*, 556 U.S. at 434. Mere "possibility of irreparable injury" does not suffice. *Id.* (cleaned up). Further, because a stay is an extraordinary remedy, an applicant must do more than point to ordinary compliance costs. *See Wis. Gas Co. v. FERC*, 758 F.2d 669, 674 (D.C. Cir. 1985) (movant for stay must demonstrate harm that is imminent, "certain and great," and "directly result[ing] from" the challenged action). U.S. Steel fails to clear that high bar. Its alleged compliance burdens while judicial review proceeds—and even after—are

[2] U.S. Steel offers claims of various fact-specific flaws in the Rule, none of which is likely to succeed and none of which warrants this Court's review. *See Hollingsworth v. Perry*, 558 U.S. 183, 190 (2010) (per curiam); *Does 1-3 v. Mills*, 142 S. Ct. 17, 18 (2021) (Barrett, J., concurring in the denial of application for injunctive relief) (in considering applications for extraordinary relief, the Court makes "a discretionary judgment about whether the Court should grant review in the case"). In particular, Respondents have fully rebutted U.S. Steel's unsupported lead claim that the Rule is now arbitrary due to partial judicial stays of a distinct agency action, Appl. 14–16. *See, e.g.*, Public Interest Oct. 30 Resp. 12–20. The same responses apply here: partial judicial stays of a different rule cannot, and do not, transform this well-supported and otherwise lawful Rule into arbitrary action.

exaggerated, and it has not identified any irreparable injury that warrants a stay. *See* Staudt Decl. ¶¶ 29–36, 49–51 (App. 13a–17a, 20a–21a).

First, U.S. Steel, which faces no emission-control requirements under the Rule *until 2026*, does not and cannot show that it will incur significant costs from the Rule before the end of this litigation. *See Wis. Gas Co.*, 758 F.2d at 674. U.S. Steel claims that it must spend "millions of dollars to prepare now" based on a projected compliance schedule, Appl. 24; Piscitelli Decl. ¶¶ 3, 6–10 (Appl. App.715, App.716–17), but this schedule is unnecessarily drawn-out. "[C]areful review of this schedule demonstrates that all of the activities [listed] can easily be completed" in less time. Staudt Decl. ¶ 8 (App. 3a); *see also id.* ¶¶ 9–13 (App. 3a–5a). With a realistic schedule and understanding that the substantial costs of equipment and installation come toward the end of air pollution control projects, it is clear that "most of the costs [for compliance by the steel industry] will be incurred in the second half of 2025 and into early 2026," with no significant costs before mid-2025 at the earliest—*i.e.*, *after* judicial review of the Rule is likely to be over. *See id.* ¶¶ 49–51 (App. 20a–21a).

Second, even U.S. Steel's long-term cost estimates are exaggerated. U.S. Steel alleges that the estimated capital costs for one of its facilities to comply with the Rule are between $28 and $46 million. Appl. 24; Piscitelli Decl. ¶ 15 (Appl. App.719). But that estimate is unsupported and excessive. *See* Staudt Decl. ¶¶ 30–

36 (App. 14a–17a). The data underlying the estimate "include large, unexplained items," *id.* ¶ 30 (App. 14a); are not accompanied by critical "supporting documents, such as vendor quotations," *id.* ¶ 31 (App. 14a); and are infected by numerous other technical errors, *see id.* ¶¶ 32–41 (App. 14a–18a). Overall, "[a] cost estimate that leaves out details or explanation of the largest cost item that amounts to over one-third of the total estimated costs … cannot be trusted." *Id.* ¶ 36 (App. 17a). EPA's more accurate estimate shows compliance costs that are modest for a large corporation like U.S. Steel. *See id*. ¶ 55 (App. 22a). EPA's estimates are broadly supported by its robust record, which identifies "readily available," "widely implemented," and cost-effective pollution-control measures for iron and steel mills. *See* 88 Fed. Reg. at 36,827; *see also id.* at 36,682.

Third, contrary to U.S. Steel's assertions that it cannot comply with the Rule even in 2026, Appl. 23–24, the Rule's compliance deadlines and emissions-control requirements for iron and steel mills are reasonable and achievable. U.S. Steel's speculations that one of its facilities may not be able to meet the Rule's 2026 deadline (Piscitelli Decl. ¶¶ 6–7 (Appl. App.716)) rest on a schedule riddled with unnecessary delay. Staudt Decl. ¶ 8 (App. 3a); *see also id.* ¶¶ 9–13 (App. 3a–5a). For one thing, the schedule (*see* Piscitelli Decl. ¶¶ 9–10 (Appl. App.716–17)) vastly overstates labor and vendor challenges. Staudt Decl. ¶¶ 14–20 (App. 5a–9a). Experience under prior Clean Air Act rulemakings shows that vendors and skilled labor respond swiftly to increases in demand. *See id.* ¶¶ 16–20 (App. 6a–9a). Industry should expect that "vendors, labor, and other resources necessary … to comply with the Rule will be available." *Id.* ¶ 20 (App. 9a). Furthermore, any required "outages will be modest and manageable." *Id.* ¶¶ 52–54 (App. 21a–22a). And U.S. Steel's claims that a 40% reduction in covered emissions may be infeasible, Piscitelli Decl. ¶ 12 (Appl. App.717–18), is contradicted by both EPA's thorough analysis and even U.S. Steel's own documentation. *See* Staudt Decl. ¶¶ 24–28 (App. 10a–13a) (explaining that EPA thoroughly considered emissions data from individual units as well as other jurisdictions' emissions limits for various types of reheat furnaces, and that even U.S. Steel's own vendor estimates show a 40% reduction is feasible).

In the unlikely event that U.S. Steel's predictions materialize, the Rule provides for possible one- and two-year extensions, and even exemptions in cases of extreme compliance hardship. *See id.* ¶¶ 21–22 (App. 9a–10a); 88 Fed. Reg. at 36,760, 36,818. A stay at this early juncture is plainly unwarranted.

II. A PARTIAL STAY WOULD SIGNIFICANTLY HARM OTHER PARTIES AND IS NOT IN THE PUBLIC INTEREST.

U.S. Steel is wrong that a stay of the Rule's requirements for iron and steel mills "will not impact emissions" or "air quality." Appl. 25. Any stay likely would result in increases in dangerous pollution in downwind communities, and therefore would be contrary to the public interest and Public Interest Respondents' interests. *See Nken*, 556 U.S. at 434; Public Interest Oct. 30 Resp. 31–33.

A stay substantially increases the risk that the Rule's emissions-reduction requirements, which as U.S. Steel acknowledges, Appl. 25, take force in May 2026, will be pushed back well past that date. History shows that after a stay, regulated entities regularly ask that compliance deadlines be tolled to "restart the clock," even where the challenged regulation is ultimately upheld. *See* Public Interest Oct. 30 Resp. 34–35 (describing tolling for some prior challenged interstate ozone rules). Here, U.S. Steel has already indicated that it will take that course if granted a stay. In recent comments to EPA, U.S. Steel argued that the Rule's compliance deadlines should be extended "at a minimum" by the amount of time that judicial stays are in effect.[3]

During that delay, iron and steel mills would operate without additional controls and continue to pollute the air. Iron and steel mills are among the nation's biggest industrial emitters of dangerous ozone-forming pollution. *See* Staudt Decl. ¶¶ 56–58 (App. 23a) (describing large amounts of harmful ozone-forming pollution from the steel industry). Any delay in significant reductions of iron and steel

[3] *See* Comments of U.S. Steel Corp. 8 (Aug. 30, 2023), Doc. ID No. EPA-HQ-OAR-2021-0668-1193 (commenting on EPA's response to judicial stays of certain State plan disapprovals).

mills' emissions would prolong harm to downwind States and people. *See* Southerland Decl. ¶¶ 9–40, 44 (Public Interest Oct. 30 Resp. 213a–227a, 228a) (describing health harms from ozone pollution exposure and benefits of the Rule's emissions-reduction requirements).

Delay also would perpetuate the interstate inequities that Congress sought to resolve through the Good Neighbor Provision. 42 U.S.C. § 7410(a)(2)(D)(i)(I). Congress repeatedly strengthened statutory provisions defining the duty of upwind States to control interstate pollution that significantly contributes to air quality problems in other States—and directing EPA to provide required protection when upwind States fail to. *See EPA v. EME Homer City Generation, L.P.*, 572 U.S. 489, 496–500, 509 (2014). Delay of the Rule's emissions-reduction requirements beyond 2026 would frustrate downwind States' efforts to attain the ozone standard by statutory deadlines, *see* Public Interest Oct. 30 Resp. 4–6, 8, and plainly be against the public interest in "expeditious[]" action to restore healthy air. 42 U.S.C. § 7511(a); *see also id.* § 7410(c)(1), (k)(1)–(4); *Union Elec. Co. v. EPA*, 427 U.S. 246, 258 (1976) (attainment deadlines are "central to the ... regulatory scheme").

U.S. Steel fails to demonstrate that any other considerations outweigh downwind States' and people's congressionally recognized interest in timely achievement of the benefits of healthy air. U.S. Steel's suggestion, Appl. 26, that the Rule's supposed effects on power reliability will harm the steel industry in some unspecified way is vague and unsupported. The Rule does not threaten power reliability, let alone during the pendency of judicial review. *See* Public Interest Oct. 30 Resp. 20–24. U.S. Steel further speculates about possible "compounding" effects on already "strain[ed]" domestic steel production (Appl. 25–26; *see also* Piscitelli Decl. ¶ 3 (Appl. App.715)), but it does not specify concrete threats from the Rule. In fact, the Rule's modest emissions-control requirements and reasonable compliance deadline will not substantially affect domestic steel industry operations. Staudt Decl. ¶ 55 (App. 22a).

Overall, the balance of equitable factors weighs strongly against a stay.

CONCLUSION

The application for a partial stay of the Rule should be denied.

November 2, 2023

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APPENDIX

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DECLARATION OF JAMES E. STAUDT, PH.D., CFA

1. I, James E. Staudt, declare under penalty of perjury that the following is true to the best of my knowledge, information and belief:

2. I am an engineer with a Chartered Financial Analyst (CFA) designation and decades of experience in all aspects of energy and air pollution control in the electricity generation (EGU) and non-EGU industrial sector, as reflected in my CV attached hereto as Exhibit 1. My graduate studies at MIT included research in combustion (how nitrogen oxides (NOx) are formed). I have been an expert on NOx emissions control since early in my career, at least since 1988 when I was a manager at Fuel Tech, a NOx control technology company and later as a manager of Research Cottrell's NOx control business. I have personally developed, designed, supplied, commissioned, and advised on NOx control technology utilized in a variety of industrial sectors. I have written numerous publications, reports for clients, and other documents on NOx control technology for various industrial applications. I have testified as an expert on the cost, installation (including scheduling and planning) and capabilities of emissions control technology, including NOx control. I have also published documents on the engineering and economic factors that impact the deployment of air pollution controls and the resources and time needed to meet regulatory requirements.

3. As a consultant, I have also advised facility owners, state and federal agencies, and suppliers of NOx control technology on the technical performance, cost, and application of NOx control technology to both non-EGU and EGU facilities. My relevant experience with the iron and steel industry includes advising Illinois Environmental Protection Agency and preparing its 2007 Technical Support Document for control of NOx emissions from Reheat,

Annealing, and Galvanizing Furnaces used at Iron and Steel Plants, evaluating Best Available Control Technology (BACT) permit applications for boilers at Illinois steel mills, and assisting US Environmental Protection Agency's (EPA) analysis of the iron and steel industry and development of US EPA's Industrial Sector Integrated Solutions model for the iron and steel industry.

4. With this background, I offer the following opinions regarding the declaration of Alexis Piscitelli in support of United States Steel Corporation's (U.S. Steel's) Motion for Stay.

I. U.S. STEEL INCORRECTLY STATES THAT THE COMPLIANCE TIMELINE FOR THE GOOD NEIGHBOR PLAN IS INSUFFICIENT.

5. U.S. Steel argues that a schedule that they present demonstrates that the EPA's Federal "Good Neighbor Plan" for the 2015 Ozone National Ambient Air Quality Standards, 88 Fed. Reg. 36,654 (June 5, 2023) (Rule) requirements cannot be met in time for 2026 ozone season compliance. Piscitelli ¶¶ 6-8. U.S. Steel further states that vendors and union labor are difficult to find. *Id.* ¶¶ 9-10. Both of these statements are incorrect.

A. U.S. Steel overestimates the time necessary to meet the requirements of the Rule.

6. U.S. Steel states that its installation of low NOx burners on four reheat furnaces will not be complete until May 2027. *Id.* ¶ 7. In support of its statement that the requirements cannot be met in time for May 2026 compliance, U.S. Steel offers a project schedule in Appendix A to Attachment 1 of its declaration.

7. I have personally directed the installation of emissions control equipment, including NOx control equipment, and I am very familiar with how these

projects can be managed. I have even testified as an expert witness on the ability of facilities to install pollution control equipment, and I have published reports on this. So, I am qualified to offer an opinion on this schedule.

8. The schedule offered by U.S. Steel assumes that installation must be performed in sequence while including unnecessary delays in several steps. The schedule ignores the ability to perform some steps in parallel, exaggerates the time necessary to perform certain steps, and unnecessarily delays several steps. A careful review of this schedule demonstrates that all of the activities on this schedule can easily be completed prior to May 2026.

9. The low NOx burner installation schedule shown for furnaces 1 through 4 assumes that no activities can be performed for the burners on furnace 2 until activities on furnace 1 are completed, little on furnace 3 can be done until work on furnace 2 is completed, and little on furnace 4 can be done until work on furnace 3 is completed. Having worked for decades deploying emission controls on industrial facilities, I know that this is not how such a program would normally be managed. While it is reasonable to stagger outages, many engineering and procurement activities can be performed concurrently for each of the furnaces. For example, it is not necessary to wait until furnace 1 emissions testing is complete to start fabrication for the burners for furnace 2, or postpone placing the installation purchase order (PO) for furnace 3 burners until after furnace 2 performance testing is completed. Engineering for each of these furnaces can be completed concurrently (or close to it), procurement can be performed concurrently, and other activities as well.

10. Notably, the schedule shows that the complete burner installation scope and specification is complete by June 2024 and purchase approved ("AR Approved" on schedule) by February 2025, but fabrication of the furnace 4

burners does not start until July 2026. This is an excessive and unnecessary seventeen-month delay. Even if the duration of the steps in this schedule is accepted, there is a great deal of opportunity to compress this schedule.

11. For example, all of the furnace burners can be fabricated at roughly the same time. Even if they are fabricated sequentially, U.S. Steel's schedule has a three-month delay between completion of fabrication of furnace 1 burners and commencement of fabrication of furnace 2 burners. U.S. Steel's schedule has a one-month delay between fabrication of furnace 2 burners and starting fabrication of furnace 3 burners and the same can be said for furnace 3 and furnace 4 burners. By overlapping fabrication of burners so that deliveries are staggered a month apart, eleven months can be saved in the schedule. There is no reason why all burners could not be on site by the end of 2025. Since performance testing can be complete within two months of having equipment on site (this is consistent with U.S. Steel's schedule), there is no reason why all four furnaces cannot be complete by the 2026 ozone season even with time between staggered outages.

12. The length of many of these steps appears excessive and some are unnecessarily delayed. For example, engineering for emissions sampling infrastructure is indicated as requiring five months to complete. Emission sampling infrastructure only involves addition of sample ports in appropriate locations, addition of personnel access for testing equipment, and identification (not procurement) of necessary equipment. The engineering associated with these steps is relatively minor and should not require this amount of time. It is also unclear why emission sampling infrastructure installation does not start until March 2025 under U.S. Steel's schedule, a year after completion of the engineering study. Air permit application preparations

only begin in February 2024. There is no reason for this delay. Simply put, there are several steps that could be shortened or expedited.

13. EPA examined the timeline for installation, engineering, and permitting and concluded 9 to 15 months is sufficient for low-NOx burner retrofits for both reheat furnaces and boilers.[1] For four units, the outages could be staggered and that should only add about three additional months.

B. It is highly unlikely that there will be a shortage of vendors and union workers.

14. I have personally been involved in the deployment of air pollution control technology and have written several reports for US EPA on resources needed for installation of air pollution control equipment.

15. I am confident that vendors will be available for this Rule. U.S. Steel claims that they reached out to eight selective non-catalytic reduction (SNCR) suppliers and only received complete responses from two firms. I spent a good deal of my career in NOx control and especially in deployment of SNCR systems. There are a number of SNCR suppliers in the United States. By far, the largest supplier of SNCR systems in the United States is Fuel Tech, who also has several licensees. Boiler suppliers and other companies may also install SNCR systems (sometimes under license from Fuel Tech).

16. Since I have personally been involved in the design and deployment of SNCR systems on both EGU and non-EGU applications, I am deeply familiar with this technology and what is entailed in deploying it. EGU SNCR applications

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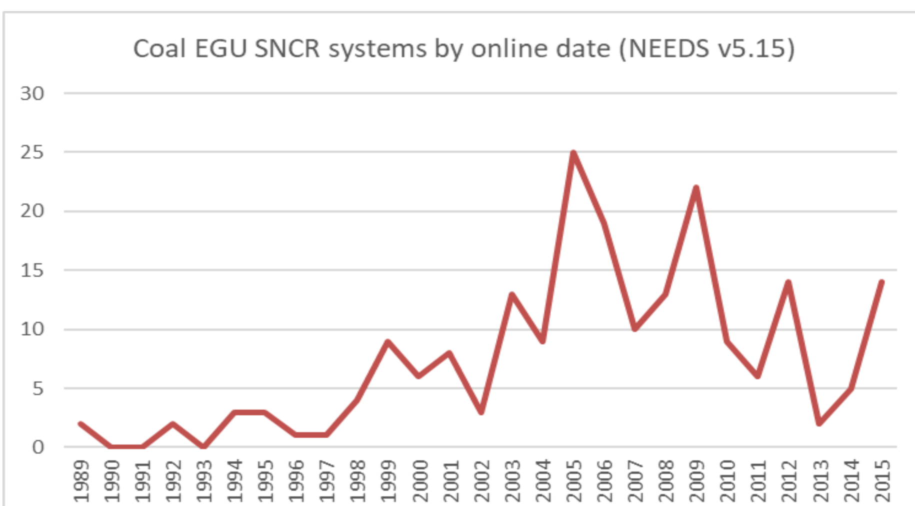
[1] EPA, *NOx Emission Control Technology Installation Timing for Non-EGU Sources* at 30 (2023), EPA-HQ-OAR-2021-0668-1077; *See also id.* at 34 (noting that "installation of LNB+FGR to boilers in the affected industries is estimated to be [9-15 months]").

are an order of magnitude more complex in scale and difficulty than non-EGU applications. There are many more injectors and injection levels, there are much larger pieces of equipment, and the challenges in designing the process for the narrow temperature window for SNCR in a coal fired EGU is much more difficult because EGUs vary load more frequently and over a wider range than industrial boilers. Yet, despite the much greater difficulty of these EGU projects, 25 coal-fired EGUs commissioned SNCR systems in 2005. Figure 1 is a graphical depiction of data from US EPA's National Electric Energy Database System (NEEDS) v.5.15, and shows the number of SNCR systems placed online within the units included in that database. As shown, there was a rapid ramp up in deployments that peaked in 2005. The SNCR suppliers (of which there were only two significant EGU suppliers in 2005) were able to respond very quickly to a rapid increase in demand. I can recall that they significantly increased their staffing to execute these projects, and they were able to fully meet the demands of the market.

Figure 1. Number of coal EGU SNCR systems by online date. (From NEEDS v5.15)



17. U.S. Steel claims that they have had difficulty in hiring skilled contractors to install the equipment. In the past, skilled labor has responded swiftly to increases in demand and will again in this case. Boilermakers are skilled laborers who play a key role in the installation of equipment on boilers and furnaces of all sorts, and they will have an important role in the installation of equipment for this rule.

18. For example, boilermakers were essential for the installation of the SCRs that peaked in the utility industry around 2003 and for scrubbers that peaked in installation after that in response to the NOx SIP Call, the Clean Air Interstate Rule, and the Cross-State Air Pollution Rule. In the 1990s the number of boilermakers dwindled as a result of low construction activities. But, as Figure 2 shows, construction boilermaker man-hours were closely related to installation of this equipment, and Figure 3 shows that boilermaker trade membership grew quickly between 1998 and 2002 as demand for boilermakers increased to meet the needs for coal EGU retrofits of SCR as well as rapid increases in the installation of gas-fired EGUs. This response in labor supply to demand demonstrates that the supply of labor responded well to the increase in demand over that period of time, and that arguments that the resources would not be available based upon boilermaker membership in the 1990s proved to be wrong.

19. I do not expect that the Rule will demand the level of resources—labor or material—that these prior rules (NOx SIP Call, Clean Air Interstate Rule, Cross-State Air Pollution Rule) required. Because of the industry's history of meeting the demands for air pollution control equipment, I am confident that the market will respond to the demand for skilled labor and resources that may result from this Rule.

Figure 2. Boilermaker man-hours and new scrubber and SCRs in service on coal EGUs[2]

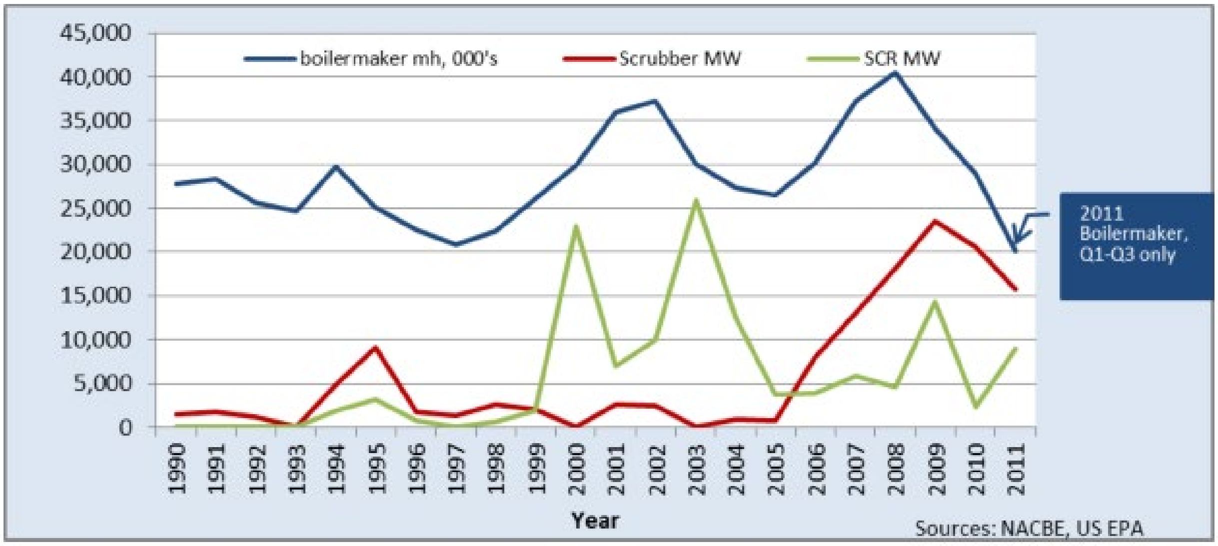
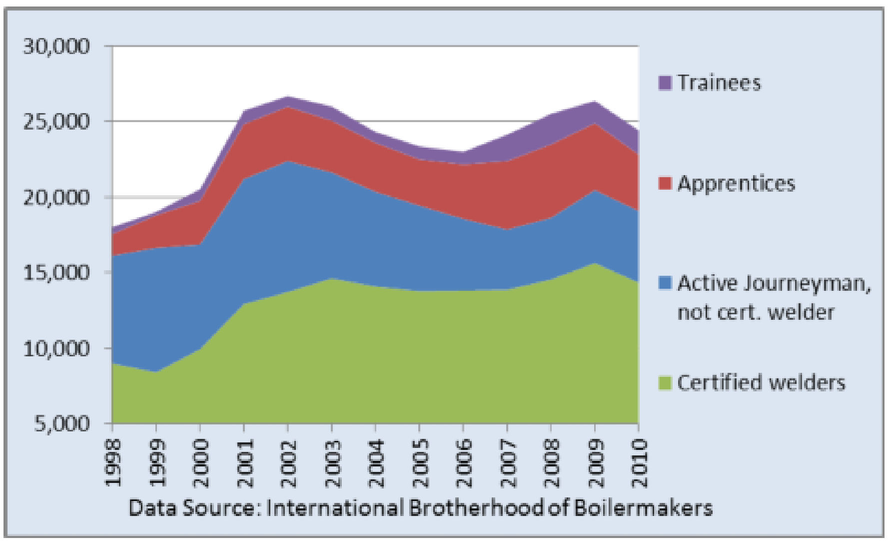


Figure 3. Construction boilermaker membership[3]



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[2] Staudt, J., "Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update", for US EPA Clean Air Markets Division, (Dec. 15, 2011) page 12, https://www.andovertechnology.com/wp-content/uploads/2020/07/9_2002_Update_12152011.pdf.
[3] *Id.* at 13.

20. The prior paragraphs explain why I believe that the vendors, labor, and other resources necessary to meet the needs of industry to comply with the Rule will be available. It is important to note that, while the installation data presented in the prior paragraphs are accepted and irrefutable historical data, when the rules that motivated those SNCR and SCR installations were being developed, and even after they were finalized, the EGU industry argued that the resources were not available to comply with the rules. Industry argued the unavailability of equipment and the unavailability of labor to install the equipment. However, the market for equipment and labor responded to install the equipment, and the EGU industry complied with the rules. As a result, I am confident that the non-EGU industries impacted by this Rule, including the iron and steel industry, will also be able to meet the requirements of the Rule.

C. The Good Neighbor Plan provides opportunities for extension, mitigating U.S. Steel's concerns about schedule.

21. EPA has incorporated a provision in the Rule to allow companies that make a good-faith effort to install controls a one-year extension in the event that circumstances prevent them from installing the equipment on time.[4] In addition, EPA may grant a second extension of up to two additional years "where a source owner/operator submits updated documentation showing that it is not possible to install and operate controls by the 2027 ozone season."[5]

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[4] 88 Fed. Reg. at 36,760.
[5] *Id.*

22. In addition, the Rule allows for a case-by-case emissions limit for industrial sources where control requirements are "technically impossible or impossible without extreme economic hardship."[6]

II. U.S. STEEL'S STATEMENTS THAT THE GOOD NEIGHBOR PLAN IS NOT FEASIBLE AND IMPOSES IMMEDIATE AND SIGNIFICANT COSTS ARE INCORRECT.

23. U.S. Steel claims that achieving the required emissions reductions will not be feasible, that there will be significant modifications needed for testing, that there will be a need for unnecessary outages and potential flaring of by-product fuels, and other statements regarding costs that they assert will lead to significant and irreparable harm. Piscitelli ¶¶ 11-20. For the reasons that follow, these assertions are incorrect.

A. U.S. Steel incorrectly states that the Rule's requirement for 40% NOx reduction may not be possible and does not consider all factors that impact performance.

24. Piscitelli's declaration (at ¶ 12) states that

> "the requirement to design to meet a minimum 40% reduction of NOx from baseline is not appropriate because it does not take into account what is achievable for each reheat furnace, including what the baseline value actually is – whether, for example, it is 0.12 lb/MMBtu or 0.24 lb/MMBtu, what limits there are on the type of NOx reduction technology that can be used, what fuels the reheat furnace uses, what other pollution control technologies are already in place, or other

[6] *Id.* at 36,818.

factors that may make a minimum 40% reduction on some units technically or economically infeasible."

25. This is not correct. First, EPA reviewed data from reheat furnaces and considered the level of emissions that are typical for reheat furnaces of different types and the level of NOx reduction that is possible.[7] Table 1 shows emissions from different types of reheat furnaces that EPA considered, including the level of NOx reduction. Table 2 shows the results of EPA's review of the RBLC Clearinghouse and state permits,[8] showing the permitted NOx emission rates for different types of controlled reheat furnaces. EPA also considered state NOx RACT rules and even regulations in the EU.[9]

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[7] EPA, *Non-EGU Sectors TSD*, EPA-HQ-OAR-2021-0668-0145 at 31, 34, 41 (proposed TSD); EPA, *Final Non-EGU Sectors TSD* (2023), EPA-HQ-OAR-2021-0668-1110, at 33 (final TSD incorporating discussion of NOx control technologies for steel industry by reference).

[8] EPA, *Final Non-EGU Sectors TSD*, *supra*, at 38 (citing state permits and RBLC); *see also* EPA, Clean Air Technology Center, RACT/BACT/LAER Clearinghouse (RBLC), https://www.epa.gov/catc/ractbactlaer-clearinghouse-rblc-basic-information.

[9] EPA, *Final Non-EGU Sectors TSD*, *supra*, at 38-39; EPA, *Non-EGU Sectors TSD*, *supra*, at 35-42.

Table 1. Controlled NOx emissions data for reheat and annealing furnaces[10]

Furnace Type	Control	Emissions (lb/MMBtu) Regenerative	Emissions (lb/MMBtu) Recuperative	Emissions (lb/MMBtu) Cold-Air	Percent Reduction
Reheat	LNB	0.27	0.068	0.046	66
	LNB + FGR	0.18	0.046	0.031	77
Annealing	LNB	0.48	0.20	0.07	50
	LNB + FGR	0.38	0.16	0.07	60
	SNCR	0.38	0.16	0.07	60
	SCR	0.14	0.06	0.02	85
	LNB + SNCR	0.19	0.08	0.03	80
	LNB + SCR	0.095	0.04	0.015	90

Reproduced from EPA, "Alternative Control Techniques Document – NOx Emissions from Iron and Steel Mills," EPA-453/R-94-065 (September 1994), at 2-8.

Table 2. Types of controlled reheat furnaces identified, NOx emission limits, furnace capacity, and applied controls[11]

Furnace Type	Count	NOx Limit (lb/MMBtu)	Capacity (MMBtu/hr)	Controls Applied
bar mill	1	0.13	228	LNB
Billet	7	0.073-0.10	77-350	LNB, LNB+FGR, ULNB
hot strip mill	3	0.35	630	LNB
reheat furnace	10	0.070-0.17	38-450	LNB, LNB+FGR, ULNB
Rotary	1	N/A	N/A	LNB
Slab	3	0.077-0.10	265-500	LNB, LNB+SCR
tunnel	2	0.1	103-150	LNB
walking beam	5	0.07-0.35	261-720	LNB, ULNB

Source: State permits and EPA RBLC.

26. In the Rule, EPA also considered whether low NOx burners were already installed, which would certainly impact whether additional reductions were possible through installation of low NOx burners.[12]

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[10] EPA, *Non-EGU Sectors TSD*, *supra*, at 34.
[11] EPA, *Final Non-EGU Sectors TSD*, *supra*, at 38.
[12] 88 Fed. Reg. 36,654, 36,879 (June 5, 2023).

27. If low NOx burners are already installed, the emissions unit is not subject to this Rule.[13]

28. Finally, two of the three low NOx burner vendors shown on page 1 of Appendix B of Attachment 1 to Piscitelli's declaration as responding to the reheat furnace project (including the lowest cost vendor) offered emissions control efficiency of 40% or greater. So, U.S. Steel's own documentation does not support its claims.

B. U.S. Steel incorrectly states that modifications for required testing are significant (Piscitelli ¶ 13).

29. Modifications may include the addition of sample points and addition of personnel access, such as scaffolding. Sample points amount to the addition of access points in exhaust ductwork. I have been involved in projects where such access has been necessary, and these are not expensive activities, on the order of a few thousand dollars per access point. Temporary scaffolding can be added to provide short term access. For permanent access, platforms and ladders may be added. None of this is unduly expensive or difficult—it is a small part of the total cost of the project, and this is what is included in the schedule of Appendix A of Attachment 1. A partial installation of emissions sampling infrastructure is scheduled for February through April of 2024. The schedule prepared by U.S. Steel shows completion of this activity to include permanent platforms and ladders March through July of 2025. The permanent platform and ladders are the largest portion of the cost and are incurred later. The total cost (equipment and installation) for all four boilers for this activity

[13] *See id.* (40 C.F.R. § 52.43(b)).

is estimated by U.S. Steel to be from $1.520 million to $1.585 million (out of U.S. Steel's claimed $18+ million capital expense).[14] U.S. Steel estimates the engineering for this adds roughly $180,000. No doubt, the large majority of the equipment and installation cost is experienced in the 2025 period when the permanent equipment is installed, meaning that the portion experienced in 2024 is a relatively small portion of the total cost.

C. U.S. Steel's cost estimates are excessive and include large costs without any explanation of what is included in those costs.

30. U.S. Steel's cost estimates, provided in Appendix B of Attachment 1 of the Piscitelli declaration, include large, unexplained items. The estimate for one furnace from Vendor #1 is shown below:

CAPITAL COSTS			
Direct Capital Costs			
Equipment	Refer to *Vendor Summary* tab for Details	$	2,229,625
Installation	Refer to *Vendor Summary* tab for Details	$	1,494,250
Engineering	Refer to *Vendor Summary* tab for Details	$	304,320
Start-up and Commissioning	Refer to *Vendor Summary* tab for Details	$	381,000
Capital Spares	Refer to *Vendor Summary* tab for Details	$	137,500
Non-Capital Spares	Refer to *Vendor Summary* tab for Details	$	90,000
Cost Work	Refer to *Vendor Summary* tab for Details	$	2,475,000
Total Capital Investment (TCI) = DC + IC		**$**	**7,111,695**

31. U.S. Steel did not provide supporting documentation, such as vendor quotations. So, it is not possible to verify these costs.

32. This first estimate was for ultra-low NOx burners that fit inside existing burner openings (see page 12 of Appendix B), which technically is a reasonable approach. U.S. Steel has also included labor and supervision and associated maintenance as direct operating costs. While it may be reasonable to include this when a new piece of equipment is being installed, it should not be

[14] Calculated from information on page 12-14 of Appendix B, Attachment 1, which shows the estimate for burner vendor number 1, 2, 3.

included when equipment is being *replaced*. In fact, new equipment is generally less expensive to maintain than old equipment. Because U.S. Steel already has burners that require labor, supervision and maintenance, I would expect little or no *additional* cost associated with labor, supervision and maintenance as a result of this Rule.

33. U.S. Steel has also included 2% of capital as an annual administrative cost. This 2% factor is identified in the EPA cost control manual: "Administrative charges cover sales, research and development, accounting, and other home office expenses."[15] While these costs are identified in the manual, in practice they should only be included if costs actually increase as a result of the pollution control equipment. It is unclear how the replacement of existing burners with newer, lower-emitting burners increases "sales, research and development, accounting, and other home office expenses." So, my opinion is that these costs should not be included. There are also other costs that are far higher and have no explanation. The single, largest line item of the above capital cost estimate, equal to $2.475 million and shown in highlight above, has a general description of "Cost Work" and says "Refer to Vendor Summary tab for Details." "Cost Work" totals $9.9 million for four furnaces. Although three burner vendor budgets are shown in pages 4, 7, 10 and 12-14 of Appendix B of Attachment 1, the "Cost Work" estimated cost does not vary based on the vendor estimate, which means that it is not related to any difference in technical scope for these three estimates. The pages that provide more detail for the costs provide detail for all items except "Cost Work," as

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[15] EPA, *EPA Control Cost Manual*, Section 2.6.5.8 at 2-35 (2002), EPA-HQ-OAR-2021-0668-0037.

shown below for all four furnaces and the Vendor #1 estimate. In effect, nearly $10 million of the $28 million total estimate for four furnaces (or, about 35% of the total estimate) shown here has no explanation. Also, while the $9.9 million shown below for all four furnaces ($2.475 million for a single furnace) is not included in the capital estimate shown below from page 12 of Attachment 1 Appendix B, it is included in capital cost in the above estimate from page 4 of Attachment 1 Appendix B. As will be shown in the following paragraphs, this also impacts the validity of U.S. Steel's cost-effectiveness calculation.

34. "Equipment and Installation" are reasonably expected to be the largest cost items. Other items such as "Engineering," "Start-up and Commissioning," "Capital Spares" and "Non-Capital Spares" are all expected costs.

35. The estimate shown here for Vendor 1 is the lowest of the three estimates. U.S. Steel offers two other estimates with similarly formatted vendor quotes that are unreliable for the same reasons.

Task	Item	Vendor	Estimate	Contingency		Amount
1000	**Equipment**					**$ 8,918,500**
	Burners	VENDOR 1	$ 7,320,000	5%	$ 366,000	$ 7,686,000
	Emissions Sampling/Testing Infrastructure		$ 400,000	20%	$ 80,000	$ 480,000
	Peripheral Control Equipment		$ 200,000	20%	$ 40,000	$ 240,000
	Refractory/Piping Materials		$ 300,000	20%	$ 60,000	$ 360,000
					$ 152,500	$ 152,500
1100	**Installation**					**$ 5,977,000**
	Burners		$ 3,800,000	20%	$ 760,000	$ 4,560,000
	Emissions Sampling/Testing Infrastructure		$ 850,000	30%	$ 255,000	$ 1,105,000
	Model/Pie Updates		$ 90,000	30%	$ 27,000	$ 117,000
	Level 1 Updates		$ 150,000	30%	$ 45,000	$ 195,000
2900	**Engineering**					**$ 1,217,280**
	Impact Analysis and Study		$ 53,600	5%	$ 2,680	$ 56,280
	Technical Support for Impact Study		$ 20,000	5%	$ 1,000	$ 21,000
	Detailed Furnace Study	VENDOR 1	$ 230,000	5%	$ 11,500	$ 241,500
	Design of Emissions Sampling/Testing Infrastructure		$ 150,000	20%	$ 30,000	$ 180,000
	Installation Specification Development		$ 150,000	20%	$ 30,000	$ 180,000
	Constructability		$ 60,000	20%	$ 12,000	$ 72,000
	Furnace Model Modifications	VENDOR 1	$ 60,000	20%	$ 12,000	$ 72,000
	Level I Design - Burners/Flame Safety/Consulting		$ 90,000	20%	$ 18,000	$ 108,000
	As-Built Drawings - MOC		$ 160,000	20%	$ 32,000	$ 192,000
	Drawing Management		$ 90,000	5%	$ 4,500	$ 94,500
2910	**Start-up and Commissioning**					**$ 1,524,000**
	Field Supervision	VENDOR 1	$ 780,000	20%	$ 156,000	$ 936,000
	Scheduling and Cost Control		$ 90,000	20%	$ 18,000	$ 108,000
	Construction Management		$ 400,000	20%	$ 80,000	$ 480,000
3000	**Capital Spares (>$10,000)**					**$ 550,000**
	Capital Spares		$ 500,000	10%	$ 50,000	$ 550,000
5000	**Non-Capital Spares (<$10,000)**					**$ 360,000**
	Spare Parts		$ 300,000	20%	$ 60,000	$ 360,000
6000	**Cost Work**					**$ 9,900,000**
	Cost Work		$ 8,250,000	20%	$ 1,650,000	$ 9,900,000

CAPITAL ESTIMATE	**$ 18,186,780**
EXPENSE ESTIMATE	**$ 10,260,000**
TOTAL ESTIMATE	**$ 28,446,780**

36. A cost estimate that leaves out details or explanation of the largest cost item that amounts to over one-third of the total estimated costs, and treats it as a capital cost in one respect and not capital in another respect, cannot be trusted. As a result, this is a very unreliable estimate of costs.

37. The cost effectiveness calculations include the unexplained "Cost Work" line items that contribute over a third of the capital cost for Vendor 1.[16] Annualized capital charges are the primary expense associated with low NOx burners. As

[16] *See* Appendix B at 1, 4. The cost work is $2.475 million for all three vendor estimates. *See id.* at 1, 4, 7, 10. This cost is 31% for vendor 2 of the total capital investment and 21% for Vendor 3. *Id.* at 7, 10.

a result, the cost effectiveness calculation results presented by U.S. Steel cannot be trusted and are likely excessively high.

38. Also, although the Low NOx burners will provide NOx reductions year-round, the cost effectiveness calculations presented by U.S. Steel only consider NOx reductions during the ozone season.

39. I have calculated the cost effectiveness for ozone season and annual reductions for vendor 1,[17] making the following adjustments:

- not including the unsupported "Cost Work" line item;
- with and without the 2% of capital cost annual administrative fee; and
- not including the operating labor and maintenance because of the existence of current burners that already require operating labor and maintenance.

40. Not including the 2% administrative fee, the calculations showed cost effectiveness of $4,287/ton on an annual basis and $9,906/ton when dividing total costs by only ozone season emission reductions. See Exhibit 2 in the Appendices to this declaration.

41. Including the 2% administrative fee, the calculations showed cost effectiveness of $4,923/ton on an annual basis and $11,376/ton when dividing total costs by only ozone season emission reductions. See Exhibit 2 in the Appendices to this declaration.

[17] Vendor 1 is selected because it is the lowest cost and can achieve a 40 percent emissions reduction.

D. U.S. Steel makes an incorrect comparison of its calculated cost per ton to other cost averages discussed in the Rule, some of which are irrelevant.

42. As previously noted, U.S. Steel's calculated cost per ton of NOx is incorrect, and overestimates cost per ton.

43. U.S. Steel compares their calculated cost per ton of NOx reduction to EPA's to the $3,656 average cost per ton for reheat furnaces, the "marginal cost threshold" of $7,500, the average cost-per-ton for the range of different non-EGU industries, the cost per ton for the EGU industry. Piscitelli ¶ 16.

44. Cost per ton for the EGU industry is not relevant here.

45. While EPA calculated the $3,656 average cost per ton for reheat furnaces, this is simply an average and some facilities will have higher costs than this average while others will have lower costs.

46. In the final rule, EPA utilized the $7,500 marginal cost/ton "as a relative, representative cost/ton level," and further noted that "this threshold is not intended to represent the maximum cost any facility may need to expend but is rather intended to be a representative figure for evaluating technologies to allow for a relative comparison between different levels of control stringency. The value was used to identify potentially cost-effective controls for further evaluation."[18]

47. EPA recognized in the final rule that the "$7,500/ton threshold does not reflect the full range of cost-effectiveness values that are likely present across the many different types of non-EGU industries and emissions units assessed."[19]

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[18] 88 Fed. Reg. at 36,733.
[19] *Id*. at 36,746.

EPA determined that: "In the final analysis, we find that the average cost-per-ton of emissions reductions across all non-EGU industries in this rule generally ranges from approximately $939/ton to $14,595/ton, with an overall average of approximately $5,339/ton."[20] Clearly, EPA identified non-EGU applications that had costs in excess of $7,500/ton and included those sources in the rule. As I demonstrated earlier in this declaration, when properly performed, the cost estimate for retrofitting U.S. Steel's reheat furnaces with low NOx burners is within this range of costs.

48. In effect, comparing U.S. Steel's estimated costs to many of the costs thresholds and averages cited in paragraph 16 of the Piscitelli declaration is an "apples to oranges" comparison.

E. The Good Neighbor Plan will not impose significant costs on industry until around mid-2025 at the earliest.

49. I have personally been involved in the deployment of air pollution control systems at industrial sites. I worked for several years as a technology supplier. Later in my consulting practice, I advised industrial clients who deployed air pollution control technologies as well as regulators. As such, I am very familiar with how these projects are executed and how costs are realized over the course of a project.

50. Air pollution control projects are conducted over a period of time where the greatest costs are realized in the latter portion of the project. Before any equipment can be ordered, it is necessary to perform sufficient engineering to ensure that equipment that will be ordered is specified correctly. For this

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[20] *Id.*

reason, in the first months to a year, most of the costs will be associated with engineering and permitting, which are generally a small portion of the total project cost. The largest cost items are equipment and installation, as demonstrated by U.S. Steel's cost estimates.

51. Although U.S. Steel claims that they have started some activities to comply with the Rule, these are lower cost activities. The greatest portion of the costs are associated with purchasing equipment and installing that equipment. And, even with the less-staggered plan that I describe in paragraphs 9-12 of this declaration that will meet the 2026 ozone season compliance date, most of the costs will be incurred in the second half of 2025 and into early 2026.

F. U.S. Steel claims that the Rule will require unnecessary outages of boilers and furnaces and lead to unnecessary by-flaring of product (Piscitelli ¶¶ 18-19); however, any outages will be modest and manageable.

52. It is true that some outages will be necessary for the boilers and furnaces subject to the Good Neighbor Plan. However, outages will be modest and manageable. For example, only one reheat furnace need be out of service at any time. That is the case with the example U.S. Steel has provided, or a schedule that is designed to meet the 2026 ozone season compliance date. Although the schedule provided by U.S. Steel shows one-month outages, this is likely longer than necessary. For a well-planned project, installation of low NOx burners on gaseous fuel facilities typically takes a few weeks, even on much larger, utility-scale projects. I would therefore expect the outages to perhaps be two weeks or so in duration.

53. U.S. Steel claims that having a boiler out of service may result in flaring product gases (such as coke oven or blast furnace gas that might otherwise be

burned in the boiler) and purchasing electric power that might otherwise be generated on site. Indeed, this may or may not occur, depending upon the operations of the steel mill at the time. In any event, the outages for the boilers are expected to be only two weeks long or so, making this, at most, a manageable short-term issue.

54. U.S. Steel's statement that, without a stay, it will incur significant costs in reconfiguring the hot strip mill at Gary Works to allow for Baseline performance testing is incorrect. *See* Piscitelli ¶ 20. The costs for these performance tests are typically very modest and are not an undue burden. Modifications typically entail the addition of testing access ports, which are also modest in cost.

III. THE GOOD NEIGHBOR PLAN WILL NOT HAVE A SUBSTANTIAL IMPACT ON U.S. STEEL OPERATIONS.

55. As U.S. Steel notes, the domestic steel industry is responsible for over $520 billion in economic output. According to its Annual Report, U.S. Steel's total revenues for the period ending December 31, 2022 were more than $21 billion. For an industry of this size and a company of this size, the costs of complying with the rule are quite modest. For the Rule, EPA estimated annual costs (2016$) of $3.58 million for reheat furnaces and $8.84 million for boilers.[21] These are very modest costs for such a large industry.

[21] EPA, *Regulatory Impact Analysis for Final Federal Good Neighbor Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard,* 171 tbl,4-19 (Mar. 2023), EPA-HQ-OAR-2021-0668-1115.

IV. THE STEEL INDUSTRY, AND PARTICULARLY REHEAT FURNACES AND BOILERS, ARE RESPONSIBLE FOR A LARGE AMOUNT OF HARMFUL POLLUTION.

56. EPA has estimated that 404 tons of NOx emissions will be reduced during the ozone season from control of an estimated 19 reheat furnaces and 440 tons of NOx will be reduced during the ozone season from control of an estimated 151 iron and steel facility boilers.[22]

57. To put this in perspective, I will compare this to large EGUs. A well-controlled 600 MW_e coal-fired electric utility boiler equipped with SCR may emit roughly 0.05 lbs of NOx per million Btu. Assuming a heat rate of 10,000 Btu/kWhr and a capacity factor of 80%, it would emit about 440 tons of NOx over an ozone season.[23] The reductions being asked of the iron and steel industry are roughly equivalent to the total emissions of two large, coal-fired EGUs operating at a high capacity factor. In other words, two large, high capacity factor coal units would need to eliminate their emissions entirely to achieve the same level of emission reduction as what EPA has estimated for the iron and steel industry. Therefore, these are large emission reductions.

58. Notably, the steel industry is part of Tier 1 industries, which are particularly important to control because Tier 1 industries each (1) have a maximum contribution to any one receptor of >0.10 ppb <u>*and*</u> (2) contribute >= 0.01 ppb to at least 10 receptors. As Tier 1 industries, they have an important impact.

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[22] *Id.* at 170-171, tbls.4-18, 4-19.

[23] 600 MW * 1000 kW/MW * 10,000 Btu/kW * (1 MMBtu/1,000,000 Btu) * 0.05 lb/MMBtu * 3672 hrs/ozone season * (1 ton/2000 lbs).

Respectfully submitted:

Date: September 22, 2023

James E. Staudt

V. APPENDICES

EXHIBIT 1

A. Curriculum Vitae

James E. Staudt, Ph.D., CFA

Summary: Currently a consultant with decades of experience assisting companies and government agencies in the energy and environmental industries. Possess deep knowledge of business, finance and technology relating to these industries.

2019: Adjunct Professor, University of Massachusetts, Lowell

Teaching undergraduate engineering courses

2018: Adjunct Professor, Merrimack College

Developed syllabus and taught a new course in Engineering Economics for students in the Master of Science in Engineering Management program administered by the Mechanical Engineering department. Also taught Materials Science.

2013 – Present

Volunteer reviewer for the Mass Ventures START venture funding program for the Commonwealth of Massachusetts. START is a program funded by the Commonwealth of Massachusetts to assist Massachusetts-based companies that have been successful in the Federal Small Business Innovation Research (SBIR) program.

1997 – Present

President, Andover Technology Partners

Provided consulting services to

- United States and state government agencies in development of clean air and clean energy regulations. Regulatory actions that were developed using Dr. Staudt's analysis include
    - US EPA NESHAP: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review
    - US EPA Affordable Clean Energy Rule
    - US EPA Clean Power Plan
    - US EPA NOx SIP Call
    - US EPA Clean Air Interstate Rule
    - US EPA Clean Air Mercury Rule
    - US EPA Regional Haze Rule

    - Illinois Mercury Rule and NOx RACT rule
    - Consent Decree between US EPA, State of North Carolina and Tennessee Valley Authority
    - US EPA Cross State Air Pollution Rule
    - US EPA Mercury and Air Toxic Standards
    - National Emission Standards for Control of Hazardous Air Pollutants (NESHAP) for
        - Portland Cement Kilns
        - Industrial Boilers
        - Pulp and Paper Mills
        - Iron and Steelmaking Facilities
- Developers of air pollution control or clean air or clean energy technologies
    - Market and industry strategy analysis
- Owners of industrial facilities
    - Assisting clients in implementing and maintaining compliance with air emission regulations
- Investors in companies in clean air or clean energy technology space
    - Assisting clients with evaluating investments in clean energy or clean air technology companies

1995-1997

Senior Vice President, Spectrum Diagnostix (a subsidiary of Physical Sciences, Inc.) - Managed technology development and commercial operations for developer of diode laser based optical process instrumentation. Company was sold in 1997.

1990-1995

Product Director, NOx Control, Research-Cottrell – Managed engineering, operations, and sales of pollution control technologies to power plants and large industrial facilities

1990

Physical Sciences, Inc. – Managed a US Department of Energy research program on energy. Developed business plan for what would later become Spectrum Diagnostix.

1988-1990

Programs Manager, Fuel Tech, Inc., Managed technology process engineering and commercial demonstration programs for NOx control technology used at power plants and large industrial facilities.

1987-1988

Project Manager, Northern Research and Engineering Corporation. – Project manager for a turbomachinery design company owned by Ingersoll Rand.

1984-1987

Graduate student, Massachusetts Institute of Technology

1979-1984

US Naval Officer – Navy nuclear program

Publications

Dr. Staudt has published over 60 papers, journal articles or reports. In addition, he has also authored many reports for US EPA and other clients as part of his consulting practice that have been released to the public.

Education and Professional Credentials

- B.S. in Mechanical Engineering from the U.S. Naval Academy (1979)
- M.S. (1986) in Engineering from the Massachusetts Institute of Technology (M.I.T.)
- Ph.D. (1987) in Engineering from the Massachusetts Institute of Technology (M.I.T.) with a minor in Business Management
- Chartered Financial Analyst (CFA) designation (2001)
- US Navy Chief Engineer, nuclear power (1983)

Awards

2007 US Environmental Protection Agency Science and Technology Achievement Award

- *Providing the Public with a Comprehensive Summary of Technologies for Control of Mercury Emissions from Electric Utility Boilers*

1994 and 2010 Institute of Clean Air Companies (ICAC) Special Achievement Awards

Professional Associations

- Member, CFA Institute

Military Service

From 1979 to 1984 Dr. Staudt served as a commissioned officer in the U.S. Navy in the Engineering Department of the nuclear-powered aircraft carrier USS ENTERPRISE (CVN-65), attaining the rank of Lieutenant (O-3) prior to leaving the service.

B. Publications

Staudt, J., Assessment of Potential Revisions to the Mercury and Air Toxics Standards, for Center for Applied Environmental Law and Policy, June 15, 2023

Staudt, J., Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants – Addendum, Analysis of the Cost of Complying with Lower Hg Emissions Levels, for Center for Applied Environmental Law and Policy (CAELP), January 5, 2023

Staudt, J. Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants, for Center for Applied Environmental Law and Policy (CAELP), April 5, 2022

Staudt, J., *Natural Gas Cofiring for Coal-Fired Utility Boilers*, for Center for Applied Environmental Law and Policy (CAELP), February 12, 2022, available at: https://www.andovertechnology.com/articles-archive/

Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants*, for Center for Applied Environmental Law and Policy (CAELP), August 19, 2021; available at: https://www.andovertechnology.com/articles-archive/

Staudt, J., and Glesmann, S., White Paper – "The Past, Present, and Future of Smart Building Management", May 2020, available at: https://www.andovertechnology.com/articles-archive/

Staudt, J., "Heat rate measurement using Continuous Emission Monitoring Systems (CEMS) and comparison with fuel use data", Electric Power Research Institute (EPRI) Meeting on Continuous Emission Monitoring Systems, May 2-3, 2018, Saint Louis

Staudt, J., "Using Publicly Available Heat Rate Data", Electric Power Research Institute (EPRI) Meeting on Improving Power Plant Heat Rate, February 21-23, Atlanta

Staudt, J., "Examination of uncertainty in heat rate determinations", Presented at the Power Plant Pollutant Control "MEGA" Symposium, August 16-18, 2016, Baltimore, MD

Staudt, J., "Natural Gas Conversion and Cofiring for Coal-Fired Utility Boilers", for Environmental Defense Fund, November 2014

Staudt J., Macedonia, J., "Evaluation of Heat Rates of Coal Fired Electric Power Boilers", Presented at the Power Plant Pollutant Control "MEGA" Symposium, August 19-21, 2014 , Baltimore, MD

Staudt, J. "Assessment of Bias in Measurement of Mercury Emissions from Coal Fired Power Plants – Comparison of Electronic CEMS and Sorbent Traps",

Presented at the 10th Annual 10th IEA Mercury Emission from Coal Workshop, Clearwater, FL, April 23-25, 2014

Staudt, J., "Candidate SO_2 Control Measures for Industrial Sources in the LADCO Region", for Lake Michigan Air Director's Consortium, January 24, 2012.

Staudt, J., "Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update", for US EPA Clean Air Markets Division, December 15, 2011

Staudt, J., "Air Pollution Compliance Strategies for Coal Generation", EUCI, Arlington, VA, December 5-6, 2011 available at www.AndoverTechnology.com

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C. Government and Public Sector Consulting Projects

Title: Support to US EPA – Clean Air Markets Division
Client: EPA Clean Air Markets Division through ERG
Scope: Supporting US EPA, performing various analysis as needed.
Period of Performance: 2019-present

Title: Assistance on Affordable Clean Energy Plan
Client: EPA Clean Air Markets Division through ERG
Scope: Performed analysis of labor impacts of heat rate improvements and clean energy technologies.
Period of Performance: 2018-2019

Title: Assistance on Clean Power Plan
Client: Navajo Nation, through Navajo Tribal Utility Authority
Scope: Assisting Navajo Nation with technical analysis of Clean Power Plan proposal, to include interaction with electric utility companies, analysis of compliance options and meetings with EPA Assistant Administrator for Air and Radiation.
Period of Performance: 2014-2015

Title: Impact to Labor Demand from Heat Rate Improvements on Existing Fossil Power Plants
Client: EPA Clean Air Markets Division through ICF International
Scope: A review of technical methods and potential labor impacts of heat rate improvements that might result from EPA regulation of Greenhouse Gases (GHGs) from existing fossil power plants.
Period of Performance: 2013-2014

Title: Best Available Retrofit Technology (BART) analysis and BART related support
Client: EPA Regions 8 and 9 - through EC\R and ICF International, respectively
Scope: Performed BART technology and cost analysis for industrial sources and electric generating units (visibility analysis performed by others). Also assisted EPA regions respond to comments, as needed. Industrial sources included industrial boilers, cement kilns, lime kilns, combustion turbines, and reciprocating internal combustion engines.
Period of Performance: 2012-2016

Title: Candidate Control Measures for SO_2 Control from Industrial Sources
Client: Lake Michigan Air Directors Consortium (LADCO)
Scope: Performed a study and published a report that evaluated candidate SO2 control measures for a wide range of industrial sources in the LADCO region, to include: Industrial Boilers, Cement Kilns, Lime Kilns, Iron and Steel Mills, Refineries, Chemical Plants, Glass furnaces, and others. A report was published and is available on the LADCO website:
Period of Performance: 2011/2012

Title: Control Technologies to Reduce Conventional and Hazardous Air Pollutants from Coal-Fired Power Plants
Client: MJ Bradley and Associates and Northeast States for Coordinated Air Use Management
Scope: Prepared a report in collaboration with MJ Bradley and Associates on the topic of control technologies for control of NOx, SO2, and Air Toxics (particle matter, acid gases, mercury, etc.) for coal fired power plants and the application of these technologies for compliance with US EPA rules. A report was published by the Northeast States for Coordinated Air Use Management (NESCAUM).
Period of Performance: 2011

Title: Greenhouse Gas Mitigation Options Database (GMOD)
Client: US EPA (through Eastern Research Group and RTI International)
Scope: Developed Greenhouse Gas Technology Database for US EPA for power plants and cement kilns. Effort includes collection and analysis of data on performance and cost of various greenhouse gas control technologies including CO2 capture, IGCC, and others.
Period of Performance: Spring 2009-2010

Title: Emissions Control for Power Plants
Client: US EPA (through ICF Consulting)
Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from power plants and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the Integrated Planning Model. Assisted EPA with analysis for Mercury and Air Toxic Standards, to include analysis of Information Collection Request (ICR) Data to determine emission levels and controls needed for different sources. Also analyzed the availability of

and demand for labor and other resources necessary for compliance with the MATS and Cross State Air Pollution Rule (CSAPR).

Period of Performance: Fall 2009-2012

Title: Emissions Control for Cement Kilns

Client: US EPA (through ICF Consulting and Eastern Research Group)

Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from cement kilns, and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the US EPA Industrial Source Integrated Solutions (ISIS) Model.

Period of Performance: 2008-2010

Title: Emissions Control for Iron and Steel Mills

Client: US EPA (through Eastern Research Group)

Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from Iron and Steel Mills, and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the US EPA ISIS Multi-Sector Model.

Period of Performance: 2009-2010

Title: Emissions Control for Pulp and Paper Mills

Client: US EPA (through RTI International)

Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from Pulp and Paper Mills, and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the US EPA ISIS Multi-Sector Model.

Period of Performance: 2009-2010

Title: NOx Control – NOx RACT

Client: State of Illinois, Environmental Protection Agency, Bureau of Air (Contract with Lake Michigan Air Director's Consortium)

Scope: Providing technical support to the Illinois Environmental Protection Agency's Bureau of Air in developing rules for control of NOx at electric generating units, gas turbines and reciprocating engines and steel mills, cement plants, glass-manufacturing plants, refineries, and other industrial facilities.

Period of Performance: 2007-2009

Title: Best Available Retrofit Technology for EGU's in Illinois

Client: State of Illinois, Environmental Protection Agency, Bureau of Air (Contract with Lake Michigan Air Director's Consortium)

Scope: Providing technical support to the Illinois Environmental Protection Agency's Bureau of Air in evaluating BART for specific IL EGUs.

Period of Performance: 2007-2008

Title: Air Pollution Reduction at Tennessee Valley Authority Plants

Client: Attorney General of North Carolina

Scope: Providing expert witness analysis of methods to reduce air pollution from TVA coal power plants.

Period of Performance: 2006-2008

Title: NOx and SO_2 Cost of Control under the Clean Air Act Amendments

Client: US Environmental Protection Agency and ICF Consulting

Scope: Providing technical support to the US EPA Clean Air Markets Division and analyzing the cost of compliance with Title IV (NOx and SO_2 Acid Rain provisions) of the Clean Air Act Amendments (CAAA) and the NOx SIP Call and OTC NOx Budget Rule that were issued under Title I of the CAAA.

Period of Performance: 2006

Title: Mercury Emissions Control

Client: State of Illinois, Environmental Protection Agency, Bureau of Air (Contract with Lake Michigan Air Director's Consortium)

Scope: ATP provided technical support to the Illinois Environmental Protection Agency's Bureau of Air in developing a rule to meet the Illinois Governor's proposed reduction in Illinois power plant mercury emissions.

Period of Performance: 2006 - completed

Title: Update of Coal Utility Environmental Cost (CUECost) Model

Client: US EPA and ARCADIS, P.O. Box 13109, Research Triangle Park, NC 27709

Scope: ATP developed cost and performance algorithms for mercury emissions control including cobenefits, powdered activated carbon and halogenated powdered activated carbon. Also developed SO_2 control cost and performance algorithms. These and other updates were incorporated into EPA's CUECost model.

Period of Performance: 2005-2006

Title: SO_2 Control Cost and Performance

Client: US EPA and ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 (703) 934-3071

Scope: ATP supported ICF Consulting and US EPA in developing cost and performance models for limestone forced oxidation (LSFO) and Spray Drier Absorber technology that will be incorporated into the Integrated Planning Model. Reviews of installed installation data and vendor quotes was used to develop algorithms.

Period of Performance: 2005

Title: NOx Control Workshop, Dalian, China

Client: US Department of Energy, National Energy Technology Laboratory, and Arcadis

Scope: ATP developed and taught a workshop on NOx control methods, especially post combustion controls for coal-fired power plants, to Chinese delegates.

Period of Performance: 2005

Title: Reliability of Selective Catalytic Reduction (SCR) and Flue Gas Desulfurization (FGD) Systems for High Pollutant Removal Efficiencies on Coal Fired Utility Boilers

Client: US Environmental Protection Agency and ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 (703) 934-3071

Scope: ATP evaluated the reliability of recently installed SCR systems designed for very high removal efficiencies (over 90%) and also FGD technologies.

Period of Performance: 2004

Title: Performance and Cost of Mercury and Multipollutant Emission Control Technology Applications on Electric Utility Boilers, EPA-600/R-03/110 issued October 2003

Client: US EPA and ARCADIS, P.O. Box 13109, Research Triangle Park, NC 27709

Scope: ATP was the principal subcontractor to ARCADIS in evaluating the performance and cost of mercury and multipollutant control methods (NOx, SOx, PM, Hg) for the US EPA. ATP developed cost and performance models to assess the emission control strategies for control of mercury, NOx, SO_2 and PM and other pollutants for about 50 model plants. Results are documented in EPA report EPA-600/R-03/110 issued October 2003, which may be downloaded from EPA's web site.

Period of Performance: 2002-2003

Title: Cost and Performance of Pollution Controls

Client: US EPA and ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 (703) 934-3071

Scope: As a subcontractor to ICF Consulting, ATP has evaluated the cost and performance of state-of-the-art combustion NOx controls and the cost and performance experienced with Selective Catalytic Reduction systems installed in response to the NOx SIP Call. Project entailed review of public information and interviews with industry contacts to collect cost and performance information, and reporting of the information to EPA and ICF.

Period of Performance: fall 2002 – fall 2003

Title: Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies, EPA-600/R-02/073, October 2002

Client: US EPA and ARCADIS, P.O. Box 13109, Research Triangle Park, NC 27709

Scope: As a subcontractor to ARCADIS, ATP analyzed the feasibility of complying with Multipollutant Control programs under evaluation by EPA. Report examined the feasibility of mercury, SO_2, and NO_X control technology implementation based upon forecasted technology installation schedules for the Clear Skies Initiative.

Period of Performance: Fall 2001 - Spring 2002

Title: Status Report on NOx Controls for Gas Turbines, Cement Kilns, Industrial Boilers, Internal Combustion Engines – Technologies and Cost Effectiveness

Client: Northeast States for Coordinated Air Use Management

Scope: Comprehensive report on technologies, performance and cost effectiveness of methods to control NOx from gas turbines, cement kilns, industrial boilers, and internal combustion engines.

Period of Performance: released December 2000

Title: Status Report on NOx Control Technologies and Cost Effectiveness for Utility Boilers

Client: Northeast States for Coordinated Air Use Management

Scope: Comprehensive report on technologies, performance and cost effectiveness of methods to control NOx from utility boilers.

Period of Performance: released December 2000

D. Industrial Consulting Projects

Client: Constellation Energy
Scope: Advised client on air pollution control technologies for use at Constellation power plants.
Period of Performance: 2006 - 2009

Client: Chase Power
Scope: Advised client on emission control technologies for use at proposed 1200 MW petroleum coke fired power plant.
Period of Performance: 2007/8

Client: Arizona Public Service Company
Scope: Advised client on emission control technologies for use at Arizona Public Service utility coal plants.
Period of Performance: 2003/2004

Client: GE Contract Services, Newington Energy, Newington, NH
Scope: Advised client on emission control technology issues relating to combined-cycle power plant with two GE Frame 7F combined cycle.
Period of Performance: 2003/2004

Client: Dick Corp. at AES Granite Ridge, Londonderry, NH
Scope: Advised client on emission control technology issues relating to combined-cycle power plant with two Siemens Westinghouse 501G combined cycle turbines.
Period of Performance: 2003/2004

Client: Wyeth Biopharma, One Burtt Road, Andover, MA 01810
Scope: Advised client on emission control technologies associated with client's gas turbine cogeneration facility equipped with Solar Taurus combined cycle turbines.
Period of Performance: fall 2000 - spring 2001

Client: Allegheny Energy
Scope: Advised client on cost-effectiveness of various methods of complying with emission control requirements at a PURPA Qualifying Facility in the Allegheny system. Support included technical evaluation of alternatives and economic analysis of alternative, including evaluation of allowance trading.

Services included expert witness testimony in an arbitration hearing.
Period of Performance: spring 2000

Client: Texas Industries
Scope: Performed a comprehensive technical analysis on the NOx emission reduction process that is used on TXI and other cement kilns to increase production and reduce air pollution. Also advised TXI regarding emissions control methods for cement kilns.
Period of Performance: Fall 1999

Client: NRG Somerset Operations, 1606 Riverside Avenue, Somerset, MA 02726
Scope: Optimization of client's emission control system on coal-fired electric utility boiler. Significant improvements in system operation resulted from this program.
Period of Performance: 1999 through 2001

Client: Conectiv, Wilmington, DE
Scope: Optimization of client's emission control system on coal-fired electric utility boiler, including combustion tuning and consulting on SNCR operation.
Period of Performance: 1997, 1998, 2001, 2002

Client: PG&E Generating, 7500 Old Georgetown Road, Bethesda, MD 20814
Scope: Advised PG&E Generating on expected environmental upgrade costs on several electric generating plants that PG&E Generating was considering for acquisition.
Period of Performance: Spring 1999

E. Non Government Organizations

Client: Center for Environmental Law and Policy

Scope: Prepared reports on gas cofiring on coal-fired boilers, methods to improve PM and Hg emissions from coal-fired boilers, and methods to improve acid gas emissions from coal-fired utility boilers

Period of Performance: 2020-2022

Client: Environmental Defense Fund

Scope: Various reports and engineering studies, to include gas conversion of coal-fired utility boilers.

Period of Performance: 2010-2021

Client: Natural Resources Defense Council

Scope: Various engineering studies to examine heat rate improvements on power plants, commenting on EPA regulations.

Period of Performance: 2010-2018

Client: Sierra Club

Scope: engineering studies to include evaluation of SO2 methods on select power plants.

Period of Performance: roughly 2018

EXHIBIT 2

Good Neighbor Plan NOx Evaluation			
Appendix B - NOx Control - Low NOx Burners (LNB) Vendor 1			
84" Hot Strip Mill Reheat Furnaces No. 1 through No. 4			
CAPITAL COSTS			
Direct Capital Costs			
Equipment	Refer to *Vendor Summary* tab for Details		$2,229,625
Installation	Refer to *Vendor Summary* tab for Details		$1,494,250
Engineering	Refer to *Vendor Summary* tab for Details		$304,320
Start-up and Commissioning	Refer to *Vendor Summary* tab for Details		$381,000
Capital Spares	Refer to *Vendor Summary* tab for Details		$137,500
Non-Capital Spares	Refer to *Vendor Summary* tab for Details		$90,000
Cost Work	Refer to *Vendor Summary* tab for Details		$0
Total Capital Investment (TCI) = DC + IC			**$4,636,695**
OPERATING COSTS			
Direct Annual Operating Costs, DC			
Operating Labor			
Operator	73.79	$/Hr, 0.1 hr/8 hr shift, 8100 hr/yr	0
Supervisor	15%	15% of Operator Costs	0
Maintenance (2)			0
Maintenance Labor	73.79	$/Hr, 0.5 hr/8 hr shift, 8100 hr/yr	0
Maintenance Materials	100% of maintenance labor costs		0
Utilities, Supplies, Replacements & Waste Management			
NA	NA		-
NA	NA		-
Total Annual Direct Operating Costs			**0**
Indirect Operating Costs			
Overhead		60% of total labor and material costs	0
Administration (2% total capital costs)	2% of total capital costs (TCI)		92,734
Property tax (1% total capital costs)	1% of total capital costs (TCI)		71,117
Insurance (1% total capital costs)	1% of total capital costs (TCI)		71,117
Capital Recovery		10.41% for a 20- year equipment life and a 8.30% interest rate	482,849
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	**717,817**
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**717,817**

U. S. Steel Gary Works							
Good Neighbor Plan NOx Evaluation							
Appendix B - NOx Control - Low NOx Burners (LNB) Vendor 1							
84" Hot Strip Mill Reheat Furnaces No. 1 through No. 4							
Note: emissions and costs are for each furnace individually							
			3672				
Desgin Capacity	600	MMBtu/hr					
Expected Utiliztion Rate	100%						
Expected Ozone Season Operating Hours	3,395	Hours					
Annual Interest Rate	8.30%		CRF				
Expected Equipment Life	20	yrs	10.41%				
	CONTROL EQUIPMENT COSTS						
Capital Costs							
	Total Capital Investment (TCI) = DC + IC						**4,636,695**
Operating Costs							
	Total Annual Direct Operating Costs	Labor, supervision, materials, replacement parts, utilities, etc.					0
	Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost				717,817
	Total Annual Cost (Annualized Capital Cost + Operating Cost)						**717,817**
	EMISSION CONTROL COST EFFECTIVENESS						
		Baseline	**Cont. Emis.**	**Cont Emis**	**Reduction**	**Cont Cost**	
Pollutant		**Emis. T/yr**	**lb/MMBtu**	**T/yr**	**T/yr**	**$/Ton Rem**	
PM10					-	NA	
Total Particulates					-	NA	
	Nitrous Oxides (NOx)	152.8	0.09	89.6	63.1	$11,376	
	Sulfur Dioxide (SO2)				-	NA	
Notes & Assumptions							
1	Refer to the *Vendor Summary* tab for Details						
2	Assumed 0.1 and 0.5 hr/shift respectively for operator and maintenance labor						
3	Controlled emission factor based on vendor estimated burner performance						
		Baseline		**Cont Emis**	**Reduction**	**Cont Cost**	
Annual Estimate	oper hrs	**Emis. T/yr**		**T/yr**	**T/yr**	**$/Ton Rem**	
	8100	364.5		218.7	145.8	$4,923	

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U. S. Steel Gary Works			
Good Neighbor Plan NOx Evaluation			
Appendix B - NOx Control - Low NOx Burners (LNB) Vendor 1			
84" Hot Strip Mill Reheat Furnaces No. 1 through No. 4			
CAPITAL COSTS			
Direct Capital Costs			
Equipment	Refer to *Vendor Summary* tab for Details		$2,229,625
Installation	Refer to *Vendor Summary* tab for Details		$1,494,250
Engineering	Refer to *Vendor Summary* tab for Details		$304,320
Start-up and Commissioning	Refer to *Vendor Summary* tab for Details		$381,000
Capital Spares	Refer to *Vendor Summary* tab for Details		$137,500
Non-Capital Spares	Refer to *Vendor Summary* tab for Details		$90,000
Cost Work	Refer to *Vendor Summary* tab for Details		$0
Total Capital Investment (TCI) = DC + IC			**$4,636,695**
OPERATING COSTS			
Direct Annual Operating Costs, DC			
Operating Labor			
Operator	73.79	$/Hr, 0.1 hr/8 hr shift, 8100 hr/yr	0
Supervisor	15%	15% of Operator Costs	0
Maintenance (2)			0
Maintenance Labor	73.79	$/Hr, 0.5 hr/8 hr shift, 8100 hr/yr	0
Maintenance Materials	100% of maintenance labor costs		0
Utilities, Supplies, Replacements & Waste Management			
NA	NA		-
NA	NA		-
Total Annual Direct Operating Costs			**0**
Indirect Operating Costs			
Overhead		60% of total labor and material costs	0
Administration (2% total capital costs)	2% of total capital costs (TCI)		0
Property tax (1% total capital costs)	1% of total capital costs (TCI)		71,117
Insurance (1% total capital costs)	1% of total capital costs (TCI)		71,117
Capital Recovery	10.41% for a 20- year equipment life and a 8.30% interest rate		482,849
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	**625,083**
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**625,083**

U. S. Steel Gary Works							
Good Neighbor Plan NOx Evaluation							
Appendix B - NOx Control - Low NOx Burners (LNB) Vendor 1							
84" Hot Strip Mill Reheat Furnaces No. 1 through No. 4							
Note: emissions and costs are for each furnace individually							
			3672				
Desgin Capacity	600	MMBtu/hr					
Expected Utiliztion Rate	100%						
Expected Ozone Season Operating Hours	3,395	Hours					
Annual Interest Rate	8.30%		CRF				
Expected Equipment Life	20	yrs	10.41%				
	CONTROL EQUIPMENT COSTS						
Capital Costs							
	Total Capital Investment (TCI) = DC + IC						**4,636,695**
Operating Costs							
	Total Annual Direct Operating Costs		Labor, supervision, materials, replacement parts, utilities, etc.				0
	Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost				625,083
	Total Annual Cost (Annualized Capital Cost + Operating Cost)						**625,083**
	EMISSION CONTROL COST EFFECTIVENESS						
		Baseline	**Cont. Emis.**	**Cont Emis**	**Reduction**	**Cont Cost**	
Pollutant		**Emis. T/yr**	**lb/MMBtu**	**T/yr**	**T/yr**	**$/Ton Rem**	
PM10					-	NA	
Total Particulates					-	NA	
	Nitrous Oxides (NOx)	152.8	0.09	89.6	63.1	$9,906	
	Sulfur Dioxide (SO2)				-	NA	
Notes & Assumptions							
1	Refer to the *Vendor Summary* tab for Details						
2	Assumed 0.1 and 0.5 hr/shift respectively for operator and maintenance labor						
3	Controlled emission factor based on vendor estimated burner performance						
		Baseline		**Cont Emis**	**Reduction**	**Cont Cost**	
Annual Estimate	oper hrs	**Emis. T/yr**		**T/yr**	**T/yr**	**$/Ton Rem**	
	8100	364.5		218.7	145.8	$4,287	