United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued December 3, 2015 Decided July 29, 2016

No. 11-1108

UNITED STATES SUGAR CORPORATION,
PETITIONER

v.

ENVIRONMENTAL PROTECTION AGENCY,
RESPONDENT

AMERICAN CHEMISTRY COUNCIL, ET AL.,
INTERVENORS

Consolidated with 11-1124, 11-1134, 11-1142, 11-1145, 11-1159, 11-1165, 11-1172, 11-1174, 11-1181, 13-1086, 13-1087, 13-1091, 13-1092, 13-1096, 13-1097, 13-1098, 13-1099, 13-1100, 13-1103

On Petitions for Review of Final Action of the
United States Environmental Protection Agency

William L. Wehrum Jr., *David M. Friedland*, and *Douglas A. McWilliams* argued the causes for Industry Petitioners. With them on the briefs were *Allen A. Kacenjar*, *Katy M. Franz*, *Lisa Marie Jaeger*, *Sandra Y. Snyder*, *Peter*

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H. Wyckoff, *Claudia M. O'Brien*, *Stacey L. VanBelleghem*, *Eli Hopson*, *Jane C. Luxton*, *Lauren E. Freeman*, *Elizabeth L. Horner*, *William F. Lane*, *Alan H. McConnell*, *Timothy S. Bishop*, *Kevin G. Desharnais*, *Chad M. Clamage*, *Ronald A. Shipley*, *Quentin Riegel*, *Linda E. Kelly*, and *Jeffrey A. Knight*. *Rachel Brand*, *Leslie A. Hulse*, *Harry M. Ng*, *Scott J. Stone*, *John P. Wagner*, and *Lee B. Zeugin* entered appearances.

James S. Pew and *Sanjay Narayan* were on the briefs for Environmental Petitioners. *Neil Gormley* entered an appearance.

Perry M. Rosen and *Norman L. Rave, Jr.*, Attorneys, U.S. Department of Justice, argued the causes for respondent. With them on the brief was *John C. Cruden*, Assistant Attorney General, and *Norman L. Rave, Jr.*, Attorney. *Sam Hirsch* and *Madeline P. Fleisher*, Attorneys, entered appearances.

James S. Pew and *Neil Gormley* argued the causes for Environmental Respondent-Intervenors. With them on the briefs was *Sanjay Narayan.*

William L. Wehrum, *Quentin Riegel*, *Linda E. Kelly*, *Patrick Forrest*, *Douglas A. McWilliams*, *Peter H. Wyckoff*, *Jeffrey A. Knight*, *Claudia M. O'Brien*, *Stacey L. VanBelleghem*, *Lisa Marie Jaeger*, *Sandra Y. Snyder*, *David M. Friedland*, *William F. Lane*, *Alan H. McConnell*, *Ronald A. Shipley*, *Carol F. McCabe*, *Suzanne Ilene Schiller*, *Michael Dillon*, *Charles Howland Knauss*, *Shannon S. Broome*, *Timothy S. Bishop*, *Kevin G. Desharnais*, *Chad M. Clamage*, *Lauren E. Freeman*, *Elizabeth L. Horner*, *Larry B. Alexander*, and *Leslie A. Hulse* were on the brief for Industry Intervenor-Respondents. *Allen A. Kacenjar Jr.*, *Rachel L. Brand*, *Harry M. Ng*, *Scott J. Stone*, *John P. Wagner*, and *Lee B. Zeugin* entered appearances.

No. 11-1125

AMERICAN FOREST & PAPER ASSOCIATION, ET AL.,
PETITIONERS

v.

ENVIRONMENTAL PROTECTION AGENCY,
RESPONDENT

AMERICAN CHEMISTRY COUNCIL, ET AL.,
INTERVENORS

Consolidated with 11-1140, 11-1144, 11-1154, 11-1155, 11-1161, 11-1171, 11-1173, 11-1180, 11-1183, 11-1188, 13-1111, 13-1113, 13-1114, 13-1116, 13-1118, 13-1119, 13-1120, 13-1121, 13-1123, 13-1124, 13-1127

On Petitions for Review of a Final Action of the
United States Environmental Protection Agency

William L. Wehrum, *Douglas A. McWilliams*, and *Jason T. Morgan* argued the causes for Industry Petitioners. On the briefs were *Richard G. Stoll*, *Leslie A. Hulse*, *Lisa Marie Jaeger*, *Sandra Y. Snyder*, *Peter H. Wyckoff*, *Jeffrey A. Knight*, *David M. Friedland*, *Jessalee Landfried*, *Michael B. Wigmore*, *Ronald A. Shipley*, *Chet M. Thompson*, *Linda E. Kelly*, *Quentin Riegel*, *William F. Lane*, *Alan H. McConnell*, *Carol F. McCabe*, *Suzanne Ilene Schiller*, and *Michael Dillon*. *David Y. Chung*, *Rachel L. Brand*, *Julia L. German*, *Jeffrey W. Leppo*, and *Jane C. Luxton* entered appearances.

Neil Gormley and *James S. Pew* argued the causes and filed the briefs for Environmental Petitioners.

Perry M. Rosen and *Norman L. Rave, Jr.*, Attorneys, U.S. Department of Justice, argued the causes for respondent. With them on the brief was *John C. Cruden*, Assistant Attorney General. *Madeline P. Fleisher*, Attorney, entered an appearance.

James S. Pew and *Neil Gormley* argued the causes and filed the briefs for Environmental Respondent-Intervenors.

David M. Friedland and *William L. Wehrum* argued the causes for Industry Intervenor-Respondents. With them on the briefs were *Jessalee Landfried*, *Leslie A. Hulse*, *Richard G. Stoll*, *Ronald A. Shipley*, *William F. Lane*, *Alan H. McConnell*, *James T. Morgan*, *Lisa Marie Jaeger*, *Sandra Y. Snyder*, *Jeffrey A. Knight*, *Shannon S. Broome*, *Carol McCabe*, *Suzanne Ilene Schiller*, *Michael Dillon*, *Linda E. Kelly*, *Quentin Riegel*, and *Charles H. Knauss*. *Scott J. Stone*, *Lori A. Rubin*, and *Jeffrey W. Leppo* entered appearances.

No. 11-1141

AMERICAN CHEMISTRY COUNCIL,
PETITIONER

v.

ENVIRONMENTAL PROTECTION AGENCY,
RESPONDENT

AMERICAN FOREST & PAPER ASSOCIATION, ET AL.,
INTERVENORS

Consolidated with 11-1182, 11-1207, 11-1208, 13-1105, 13-1107

On Petitions for Review of a Final Action of the United States Environmental Protection Agency

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William L. Wehrum and *David M. Friedland* argued the causes for Industry Petitioners. On the briefs were *Lisa Marie Jaeger*, *Sandra Y. Snyder*, *Jeffrey A. Knight*, *Quentin Riegel*, and *Leslie A. Hulse*. *Harry M. Ng*, *Scott J. Stone*, and *John P. Wagner* entered appearances.

Neil Gormley argued the cause for Environmental Petitioners. With him on the briefs was *James S. Pew*.

Perry M. Rosen and *Norman L. Rave, Jr.*, Attorneys, U.S. Department of Justice, argued the causes for respondent. With them on the brief was *John C. Cruden*, Assistant Attorney General. *Madeline P. Fleisher*, Attorney, entered an appearance.

David M. Friedland and *William L. Wehrum* argued the causes for Industry Intervenor-Respondents. With them on the briefs were *Lisa Marie Jaeger*, *Sandra Y. Snyder*, *Jeffrey A. Knight*, *William F. Pedersen*, *Pamela A. Lacey*, *William F. Lane*, *Linda E. Kelly*, *Quentin Riegel*, *James W. Conrad*, *Jr.*, and *Leslie A. Hulse*. *Harry M. Ng*, *Scott J. Stone*, *John P. Wagner*, and *Nidhi J. Thakar* entered appearances.

James S. Pew and *Neil Gormley* were on the brief for Environmental Respondent-Intervenors.

Before: HENDERSON, BROWN, and GRIFFITH, *Circuit Judges*.

PER CURIAM: In these consolidated petitions for review, we address approximately thirty challenges to three regulations promulgated by the United States Environmental Protection Agency (EPA or Agency): (1) the "Major Boilers Rule,"[1] (2) the "Area Boilers Rule,"[2] and (3) the "Commercial/Industrial Solid Waste Incinerators (CISWI) Rule."[3] Collectively, these rules—all promulgated under the Clean Air Act (CAA or Act), 42 U.S.C. §§ 7401 *et seq*.—set emissions limits on certain combustion machinery known to release hazardous air pollutants (HAPs). Roughly one-half of

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[1] National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (2011 Major Boilers Rule), 76 Fed. Reg. 15,608 (Mar. 21, 2011), *as amended*, National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (2013 Major Boilers Rule), 78 Fed. Reg. 7,138 (Jan. 31, 2013).

[2] National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers (2011 Area Boilers Rule), 76 Fed. Reg. 15,554 (Mar. 21, 2011), *as amended*, National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers (2013 Area Boilers Rule), 78 Fed. Reg. 7,488 (Feb. 1, 2013).

[3] Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incinerator Units (2011 CISWI Rule), 76 Fed. Reg. 15,704 (Mar. 21, 2011), *as amended*, Commercial and Industrial Solid Waste Incineration Units: Reconsideration and Final Amendments; Non-Hazardous Secondary Materials that Are Solid Waste (2013 CISWI Rule), 78 Fed. Reg. 9,112 (Feb. 7, 2013).

the challenges are advanced by a group of municipal-electric organizations, industrial-trade associations, oil-and-gas industry representatives, and other entities that own and operate boilers, process heaters, and incinerators (Industry Petitioners). The other one-half are pressed by organizations interested in safeguarding the environment (Environmental Petitioners).

I. BACKGROUND

The three rules at issue address a common phenomenon: when combustion occurs, emissions result. The emissions include numerous materials, some of which pose risks to the environment in general and to human health in particular. Because combustion is an inevitable occurrence in the machinery that helps to power modern society, the Congress has authorized the EPA to provide for a regulatory framework that minimizes the deleterious effects of the incineration industry while simultaneously allowing it to operate.

In 2013, the EPA finalized its efforts to do so for discrete types of combustion machinery: boilers, process heaters, and incinerators. Two of the three rules at issue—the Major Boilers Rule and the Area Boilers Rule—govern boilers and process heaters. The former are enclosed devices that use a controlled flame to heat water and convert it into steam or hot water. 40 C.F.R. § 63.11237. The latter are also enclosed devices that use a controlled flame but, instead of generating steam, they indirectly heat a "process material," whether liquid, gas, or solid, or a "heat transfer material" like glycol or a mixture of glycol and water. *Id.* For simplicity, our use of "boilers" covers both machinery types.

The two boiler-specific rules further divide the machinery into three categories: industrial, commercial, and

institutional. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,557. Industrial boilers are used for manufacturing, processing, mining, refining, and other similar operations. *See id.* Commercial boilers are used by shopping malls, laundromats, apartment complexes, restaurants, and hotels. *See id.* And institutional boilers include those used by, *e.g.*, medical centers, schools, churches, prisons, and courthouses. *See id.* Collectively, over 200,000 boilers at over 100,000 separate facilities must comply with the standards set out in the Major Boilers Rule or the Area Boilers Rule.

The third rule that we address—the CISWI Rule—governs combustion machinery known as "solid waste incineration unit[s]." 42 U.S.C. § 7429. The Act defines an incinerator as a "distinct operating unit of any facility" that burns solid waste from either commercial establishments, industrial establishments, or the general public. *Id.* § 7429(g)(1). An incinerator subjects "waste material" to "high temperatures until it is reduced to ash." Incinerator, NEW OXFORD AMERICAN DICTIONARY 853 (2d ed. 2005). Incinerators fall into different subcategories and, in the past, the EPA has issued rules governing many of them, including, *e.g.*, municipal solid-waste incinerators, medical-waste incinerators, and sewage-sludge incinerators.[4] At issue in the CISWI Rule are incinerators located in commercial or industrial facilities that combust solid waste as defined in the Resource Conservation Recovery Act (RCRA), 42 U.S.C. §§ 6901 *et seq*. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,706.

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[4] *See, e.g.*, 40 C.F.R. pt. 60, subpts. Cd, Ce, Eb, AAAA, BBBB, EEEE, FFFF, LLLL, MMMM.

A. THE CLEAN AIR ACT, 42 U.S.C. §§ 7401 *ET SEQ.*

Enacted "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), the Act has been amended several times since the Congress first attempted to control air pollution via legislation in 1963. In 1970, the Congress required the EPA to identify and publish a list of HAPs, which the CAA defined as substances that increase "mortality," "serious irreversible" illness, or "incapacitating reversible" illness. Clean Air Amendments of 1970, Pub. L. No. 91-604, § 4(a), 84 Stat. 1676, 1685 (1970). The EPA had to set emission limits for every HAP based on the *risk* it posed to human health. *See Sierra Club v. EPA (Sierra Club I)*, 353 F.3d 976, 979 (D.C. Cir. 2004). In other words, the EPA was to "consider[] levels of HAPs at which health effects are observed, factor[] in an ample margin of safety to protect the public health, and set emission restrictions accordingly." *Id.* (quotation marks omitted).

The risk-focused approach to capping HAP emissions left something to be desired. "In light of unrealistic time frames and scientific uncertain[t]y over which substances posed a threat to public health," the EPA "only listed eight pollutants as hazardous between 1970 and 1990," *Nat. Res. Def. Council v. EPA (NRDC II)*, 529 F.3d 1077, 1079 (D.C. Cir. 2008), and set "emission standards for [only] seven of them," *Sierra Club I*, 353 F.3d at 979; *see also* S. REP. NO. 101-228, at 3 (1989) ("Very little has been done since the passage of the 1970 Act to identify and control hazardous air pollutants."). After twenty years of the risk-based approach, the Congress went back to the drawing board and, via the 1990 CAA Amendments, Pub. L. No. 101-549, 104 Stat. 2399 (1990),

established the *technology-based* approach that governs today. *See Sierra Club I*, 353 F.3d at 979.

1. 42 U.S.C. § 7412—"Hazardous Air Pollutants"

The 1990 CAA Amendments overhauled the Act's "Hazardous Air Pollutants" provision, codified at 42 U.S.C. § 7412. Although earlier iterations of the Act had assigned HAPs-identification responsibility to the EPA, the slow pace at which the EPA discharged its duty prompted the Congress to create a list of pollutants itself.[5] *See Sierra Club I*, 353 F.3d at 979-80 (citing 42 U.S.C. § 7412(b)). After identifying nearly two hundred HAPs that warranted emissions restrictions, *see* 42 U.S.C. § 7412(b)(1), the Congress directed the EPA, first, to identify the sources of each HAP, *see id.* § 7412(c). The Agency then was to set emissions limits for each source that result in HAPs reduction to the greatest extent achievable by current technology. *See generally Nat'l Ass'n for Surface Finishing v. EPA*, 795 F.3d 1, 4 (D.C. Cir. 2015) (citing 42 U.S.C. § 7412(b)(1), (c), (d)).

a. Identifying and Categorizing HAP Sources

The EPA's first task is to create HAP-source categories and subcategories. *See* 42 U.S.C. § 7412(c). The Act distinguishes "major" from "area" sources, defining the former as "any stationary source or group of stationary sources" that neighbor each other, share common control, and emit (or have the potential to emit) either ten tons per year or more of any single HAP or twenty-five tons per year or more

[5] The EPA must keep the HAPs list current. *See* 42 U.S.C. § 7412(b)(2), (3).

of any HAP combination.[6] *Id.* § 7412(a)(1). The latter are sources that do not emit enough HAPs to qualify as "major." *Id.* § 7412(a)(2). Although the EPA must set stringent restrictions on major sources, it has discretion to set more lenient emissions caps on area sources. *See id.* § 7412(d)(5).

Apart from the statutory distinction between major and area sources, the EPA has discretion to differentiate "among classes, types, and sizes of sources within a category or subcategory." *Id.* § 7412(d)(1). Once the EPA finalizes HAPs-source categories and subcategories, the CAA mandates that it draw one final dividing line—between "new" sources and "existing" sources. *See id.* § 7412(d)(3). "New" sources are those "on which construction begins after EPA publishes emission standards," *Cement Kiln Recycling Coal. v. EPA*, 255 F.3d 855, 858 (D.C. Cir. 2001); most of the others are "existing" sources, *see* 42 U.S.C. § 7412(a)(10). But if an existing source experiences either a physical change or a change in operation method *and* the change increases HAP emissions by more than a *de minimis* amount, the Act mandates that the source meet the standards set for new sources. *See id.* § 7412(a)(5), (g).

b. Setting Emission Standards for Major Sources—the "MACT" Standard

After the EPA identifies HAP-source categories and subcategories, it then sets emissions limits for each. *See id.* § 7412(d)(2). "[W]henever . . . feasible," the caps must use numeric HAPs limits. *Id.* § 7412(h)(4). The size of the

[6] The CAA defines "stationary source" as "any building, structure, facility, or installation which emits or may emit any air pollutant." 42 U.S.C. § 7411(a)(3).

source—either "major" or "area"—dictates whether the EPA must set the numeric limit at the most stringent level that current technology allows or at the level set by "generally available control technologies." *Id.* § 7412(d)(5). For major sources, the CAA directs the EPA to establish emissions caps that result in the "the maximum degree of reduction in emissions" that the EPA determines is "achievable." *Id.* § 7412(d)(2). We refer to an emissions cap that reflects the current "maximum achievable control technology" as a "MACT" standard. *See NRDC II*, 529 F.3d at 1079. Setting a MACT standard is a two-step process.

First, the EPA establishes a "MACT floor" for each category or subcategory. *Sierra Club I*, 353 F.3d at 980. The MACT floor ensures that all HAPs sources "at least clean up their emissions to the level that their best performing peers have shown can be achieved." *Id.* For new sources—those built after promulgation of a HAPs limit, *see* 42 U.S.C. § 7412(a)(4)—the MACT floor cannot be less stringent than the emissions levels achieved by the best performing similar source. *Id.* § 7412(d)(3). For existing sources in categories or subcategories that have thirty or more sources, the MACT floor cannot be less stringent than the average emissions limits achieved by the best performing 12 per cent of existing sources in that category or subcategory. *Id.* § 7412(d)(3)(A). And for existing sources in categories or subcategories with fewer than thirty sources, the MACT floor cannot be less stringent than the average emissions achieved by the best performing five sources. *Id.* § 7412(d)(3)(B). When setting the MACT floor, the EPA considers *only* the performance of the cleanest sources in a category or subcategory; it does not take into account other factors, including the cost of putting a source in line with its better-performing counterparts. *See Cement Kiln*, 255 F.3d at 857-58 (citing *Nat'l Lime Ass'n v.*

EPA, 233 F.3d 625, 629 (D.C. Cir. 2000), *as amended on denial of reh'g*, No. 99-1325 (D.C. Cir. Feb. 14, 2001)).

Second, the EPA must determine whether current technology makes it possible for a source to perform even better than the best performing similar source or sources. In other words, the CAA directs the EPA to consider whether it should set a "beyond-the-floor" MACT standard. *Nat'l Lime Ass'n*, 233 F.3d at 629. In determining whether a beyond-the-floor standard is "achievable," the Agency must consider additional factors like "the cost of achieving such emission reduction," "any non-air quality health and environmental impacts" and "energy requirements." 42 U.S.C. § 7412(d)(2). It has broad discretion in its determination. *See id.*; *cf. Nat'l Ass'n of Clean Water Agencies v. EPA (NACWA)*, 734 F.3d 1115, 1157 (D.C. Cir. 2013) (noting, in section 7429 case, that "Congress gave EPA broad discretion in considering whether to go beyond-the-floor").

c. Setting Emission Standards for Area Sources—the "GACT" Standard

Although the EPA must cap HAP emissions from *major* sources at the "maximum degree of reduction," *see* 42 U.S.C. § 7412(d)(2), it has discretion to set less stringent caps on emissions from *area* sources. Indeed, the EPA need not list categories of area sources at all unless: (A) it finds that the sources in that category or subcategory "present[] a threat of adverse effects" to the environment or human health, *see id.* § 7412(c)(1), (3); or (B) control of a particular area source category or subcategory is necessary to ensure that sources accounting for at least 90 per cent of the aggregate emissions of the thirty HAPs the EPA believes "present the greatest threat to public health in the largest number of urban areas"

are subject to CAA control, *id.* § 7412(c)(3), (k)(3)(B). If it finds that controlling emissions from a particular area source subcategory is necessary to achieve a 90 per cent reduction in the aggregate emissions of any of seven CAA-enumerated HAPs, section 7412(c)(6) requires the Agency to impose MACT caps on that subcategory. *See id.* § 7412(c)(6).

With the exception of section 7412(c)(6)'s MACT-standard requirement, the EPA need not cap emissions from area sources at the MACT level. Instead, it may set more lenient emissions limits based on "generally available control technologies." *Id.* § 7412(d)(5). We refer to these caps as GACT standards. The Act provides no guidance for setting GACT standards but the legislative history of the 1990 CAA Amendments describes GACT "as methods, practices and techniques [that] are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems." S. REP. NO. 101-228, at 171 (1989). According to the EPA, it can and will consider the following in setting a GACT standard:

- "costs and economic impacts . . . , which [are] particularly important when developing regulations for source categories that may have many small businesses . . . ";
- "the control technologies and management practices that are generally available to the area sources in the source category";
- "the standards applicable to major sources in the analogous source category to determine if

the control technologies and management practices are transferable and generally available to area sources"; and

- "technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source categories at issue."

2011 Area Boilers Rule, 76 Fed. Reg. at 15,556. And, unlike the EPA's duty to consider a beyond-the-floor MACT standard, it need not consider a more stringent GACT standard.

d. Work-Practice and Management-Practice Standards

Although the CAA requires numeric emission standards where possible, the EPA can "promulgate a design, equipment, work practice, or operational standard, or combination thereof" if it determines that a numeric limit is "not feasible." 42 U.S.C. § 7412(h)(1). In other words, the EPA can require that all sources in a given category or subcategory take a certain action (*e.g.*, conduct a periodic tune-up) or install certain emissions-control technology (*e.g.*, install a fabric filter). Although the EPA has discretion to impose a work-practice standard, the Act limits it by defining the operative phrase "not feasible" narrowly to mean:

(A) a hazardous air pollutant or pollutants cannot be emitted through a conveyance designed and constructed to emit or capture such pollutant, or that any requirement for, or use of, such a conveyance would be inconsistent with any Federal, State or local law, or

> (B) the application of measurement methodology to a particular class of sources is not practicable due to technological and economic limitations.

Id. § 7412(h)(2).

Similarly, for area sources, the EPA can impose a "management-practice standard" in lieu of a numeric GACT standard. *See id.* § 7412(d)(5). A management-practice GACT standard is like a work-practice MACT standard in all ways but one—the EPA need not consider feasibility when setting management-practice standards. *Compare id.* § 7412(d)(2), *with id.* § 7412(d)(5).

2. 42 U.S.C. § 7429—"Solid Waste Combustion"

In addition to amending the Act's "Hazardous Air Pollutants" provision, *see id.* § 7412, the 1990 CAA Amendments added to the U.S. Code section 7429, titled "Solid Waste Combustion." Section 7429 regulates "solid waste incineration units" generally, *see id.* § 7429(a)(1)(A), and CISWI specifically, *see id.* § 7429(a)(1)(D). Although section 7412 requires the EPA to control emissions of nearly two hundred HAPs, *see id.* § 7412(d)(1), section 7429 mandates that the EPA control emissions from only nine specific pollutants (as well as opacity, where appropriate), none of which the Congress included on its initial section 7412 list, *see id.* § 7429(a)(4); *see also Nat. Res. Def. Council v. EPA (NRDC I)*, 489 F.3d 1250, 1256 (D.C. Cir. 2007). We have held that this difference "makes promulgating . . . standards under [section 7412] and [section 7429] mutually exclusive." *NACWA*, 734 F.3d at 1119. In other words, if a source (or facility) is considered a CISWI

and, therefore, regulated under section 7429, it cannot be regulated under section 7412. *See id*.

Whether a source falls under section 7412 or section 7429, "the statutory directive on setting MACT standards is virtually identical." *Id.*; *see also Nat'l Lime Ass'n*, 233 F.3d at 631. That said, regulation under one section instead of the other "has practical consequences." *NACWA*, 734 F.3d at 1120. For example, section 7412 allows the EPA to impose a GACT standard for area sources only but section 7429 requires the EPA to impose MACT standards for *all* covered units, regardless of their size. *Compare* 42 U.S.C. § 7412(d)(1), (5), *with id.* § 7429(a)(1)(A); *see also NRDC I*, 489 F.3d at 1256. Moreover, section 7412 mandates that the EPA control HAP emissions from "major source[s]," which the Act defines broadly to include "*group[s]* of stationary sources located within a contiguous area and under common control." 42 U.S.C. § 7412(a)(1) (emphasis added). Section 7429, in contrast, mandates that the EPA control emissions from "solid waste incineration *unit[s]*," which the Act defines more narrowly as "a *distinct operating unit* of any facility which combusts any solid waste material," 42 U.S.C. § 7429(g)(1) (emphases added). And finally, section 7429 does not provide for work-practice standards.

3. 42 U.S.C. §§ 7661 *et seq.*—"Title V Permits"

Finally, the 1990 CAA Amendments added a provision to Title V of the Act that requires all owners and operators of HAP sources to obtain operating permits. *See id.* § 7661a. Title V does no more than consolidate "existing air pollution requirements into a single document, the Title V permit, to facilitate compliance monitoring" without imposing any new substantive requirements. *Sierra Club v. Leavitt*, 368 F.3d

1300, 1302 (11th Cir. 2004). The legislative history of the 1990 CAA Amendments indicates that the Congress required the "Title V permits" so that the public might "better determine the requirements to which the source is subject, and whether the source is meeting those requirements." S. REP. NO. 101-228, at 347. Although owners and operators of all major HAP sources must obtain Title V permits, *see generally* 42 U.S.C. § 7661a(a), the EPA has discretion to exempt certain area source categories if it "finds that compliance with such requirements is impracticable, infeasible, or unnecessarily burdensome," *id.*

B. THE MAJOR BOILERS, AREA BOILERS, AND CISWI RULES

On March 21, 2011, the EPA issued the first iteration of all three rules under review. That same day, however, the EPA announced that it intended to reconsider certain aspects of each rule. Not long after, multiple parties filed the petitions for review that we now address. Earlier, the EPA had concluded its reconsideration and issued the most recent iteration of the three rules. Because of this procedural quirk, each "rule" we address is in fact two separate rules—the EPA's "final" 2011 version and its "final" 2013 version. The EPA's analyses remained mostly consistent from 2011 to 2013 and we indicate, where necessary, the instances in which the EPA changed course in a significant way.

1. The Major Boilers Rule

The Major Boilers Rule sets HAPs emission caps for all industrial, commercial, and institutional boilers that emit a large volume of HAPs. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,611. The EPA further divided the major boiler categories into subcategories based on the primary fuel

combusted by the boilers in the subcategory (*e.g.*, coal, biomass, gas, *etc*.) and, for some subcategories, based on the method used to "feed" the fuel into the boiler. *See* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,144. For most of the subcategories, the EPA set a numeric MACT standard for four different HAPs: particulate matter (PM); hydrogen chloride (HCl); mercury (Hg); and carbon monoxide (CO). *See id*. at 7,142 tbl.3; No. 11-1108 EPA Br. 9. The EPA used some of these HAPs—particularly CO—as a surrogate (or proxy) to set emissions limits for others on the section 7412(b) HAPs list. *See* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,144-45. For the other major boiler subcategories, the EPA set a work-practice standard (specifically, a tune-up requirement) in lieu of numeric MACT standards. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613.[7] The EPA also established a tune-up work-practice standard to control for dioxin/furan emissions across all major boiler subcategories. 2013 Major Boilers Rule, 78 Fed. Reg. at 7,138.

In addition to these emission standards, the Major Boilers Rule includes several other provisions relevant to the current petitions for review.

a. The "Upper Prediction Limit"

Several factors complicate the process of setting MACT floors. The first is the CAA itself, which mandates that all MACT floors (1) must be *achievable*, *see* 42 U.S.C.

[7] The four major boiler subcategories for which the EPA established work-practice standards include "[n]ew and existing units that have a designed heat input capacity of less than 10 MMBtu/hr, and new and existing units in the Gas 1 (natural gas/refinery gas) subcategory and in the metal process furnaces subcategory." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613.

§ 7412(d)(2); (2) must ensure *continuous* regulation of the covered sources, *see id*. § 7602(k); and (3) must be *no less stringent* than the emissions levels being achieved by the best-controlled sources, *see id*. § 7412(d)(3). The second is that no source emits any HAP at a constant level; rather, HAP emissions fluctuate over time and for many reasons, including, *e.g.*, "operation of control technologies, variation in combustion materials and combustion conditions, variation in operation of the unit itself, and variation associated with the emission measurement techniques." Memorandum from Stephen D. Page, EPA Director of Air Quality Planning and Standards, EPA's Response to Remand of the Record for Commercial and Industrial Solid Waste Incineration Units (Page Mem.) (July 14, 2014), at 3 (No. 11-1125 J.A. 1316). Finally, most sources do not measure their HAP emissions at all times and under all conditions.[8] *Id.* at 6. Instead, data are usually gathered when a source conducts a "three-run stack test." *Id.* This test provides three "snapshots" of a source's emissions in a limited set of conditions and, accordingly, it fails to demonstrate accurately a source's emissions during all times and under all conditions. *Id.*

To compensate for the lack of adequate emissions data, the EPA uses a statistical tool known as the "upper prediction limit" (UPL) to account for the expected variability in emissions levels. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,630. The UPL, in turn, allows the Agency to set a MACT floor that is continuously achievable. *Id.* We discuss the UPL mechanics at greater length below, *see infra* § IV.C, but, in short, the EPA: (1) ranks all sources in a given

[8] As discussed below, however, the EPA does allow sources to demonstrate MACT compliance by use of "continuous monitors." *See infra* § IV.I.

category based on their three-run stack-test data; (2) determines the HAP emissions level of the "best controlled similar source" to establish standards for *new* sources, 42 U.S.C. § 7412(d)(3), and determines the average HAP emissions levels of the best performing 12 per cent of sources to establish standards for *existing* sources, *id*. § 7412(d)(3)(A); and then (3) applies the UPL methodology to provide the cushion necessary to account for the expected peaks and valleys in HAP emissions not reflected in the three-run stack-test "snapshots." *See* Page Mem. 4, 6.

b. The "Pollutant-By-Pollutant" Approach

In identifying the best performing sources in a given category, often the EPA could not identify a single source that controlled *all* HAPs better than *all* other sources. Instead, the EPA found that one source effectively controlled emissions from one HAP but was nonetheless one of the worst-performing sources at controlling emissions from a different HAP. For this reason, the EPA adopted a "pollutant-by-pollutant" approach in setting MACT floors for major boiler subcategories. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,622-23. That is, instead of identifying the one source that, on balance, best controlled *all* HAPs in the aggregate, the EPA used one source to set the MACT floor for, *e.g.*, PM, and used a different source to set the MACT floor for, *e.g.*, HCl. For at least two subcategories of major boilers—new heavy oil-fired units and existing stoker coal-fired units—the EPA's pollutant-by-pollutant approach resulted in MACT floors that no source had achieved *in toto*.

c. Startups, Shutdowns, and Malfunctions

The EPA found it difficult to account for HAP emissions when sources start up, shut down, and malfunction. All three

occurrences alter HAP emissions and, historically, the EPA exempted sources from normal numeric MACT-standard compliance when these events occurred. *See, e.g.*, Standards of Performance for New Stationary Sources, 42 Fed. Reg. 57,125 (Nov. 1, 1977). Nevertheless, concluding that the Act "require[s] that there must be *continuous* section [7412]-compliant standards" and observing that the exemption meant that "no section [7412] standard governs these events," in 2008 we vacated the exemption for startups, shutdowns, and malfunctions when the issue arose in a case challenging a different rule. *Sierra Club v. EPA (Sierra Club III)*, 551 F.3d 1019, 1027-28 (D.C. Cir. 2008) (emphasis added).

In response to the *Sierra Club III* vacatur, the EPA established a work-practice standard in lieu of a numeric MACT standard during startup and shutdown periods (but not during malfunctions) when it promulgated the Major Boilers Rule. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613.[9] It did so after determining that the "physical limitations and the short duration of startup and shutdown periods" made it technologically infeasible to conduct the requisite testing for numeric emissions limits. *Id.* A work-practice standard sufficed, in the EPA's view, because "[p]eriods of startup, normal operations, and shutdown are all predictable and routine aspects of a source's operations." *Id*.

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[9] Specifically, the startup and shutdown work-practice standard requires a source to follow "the manufacturer's recommended procedures for minimizing periods of startup and shutdown." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613. "If manufacturer's recommended procedures are not available," the Major Boilers Rule provided that "sources must follow recommended procedures for a unit of similar design for which manufacturer's recommended procedures are available." *Id.* at 15,642.

But because a malfunction is "sudden, infrequent, and not reasonably preventable," *id*. (quoting 40 C.F.R. § 63.2), the EPA declined to treat a malfunction as a "distinct operating mode," *id*. As a result, the EPA did not account for malfunctions when it set the MACT floors and it required sources to comply with all MACT floors even during periods of malfunction. *Id*. At the same time and recognizing that even the best equipment can fail and that such failure can spike emissions, the EPA added to the Major Boilers Rule "an affirmative defense to civil penalties for exceedances of numerical emission limits that are caused by malfunctions." *Id.* In reviewing a challenge to a different EPA rule, however, we vacated a materially identical affirmative-defense provision and held that the EPA has no power under the CAA to create a defense to civil liability. *See Natural Res. Def. Council v. EPA (NRDC III)*, 749 F.3d 1055, 1062-64 (D.C. Cir. 2014). Here, the EPA defends its decision not to address malfunctions by asserting that it will use its enforcement discretion regarding malfunctions on a case-by-case basis.

d. The One-Time Energy Assessment

The EPA also promulgated a "beyond-the-floor" requirement for all facilities with existing major boilers. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613. Specifically, the Major Boilers Rule mandates a "a one-time energy assessment . . . on the affected boilers and facility to identify any cost-effective energy conservation measures," *id.*, which assessment includes, *inter alia*, a review of fuel usage, energy management practices, and conservation measures, *see* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,198-99. In some respects, the energy assessment is limited: it (1) need occur only one time, *see* 40 C.F.R pt. 63, subpt. DDDDD tbl.3; (2) is "based on energy use by discrete

segments of a facility and not by a total aggregation of all individual energy using elements of a facility," 2013 Major Boilers Rule, 78 Fed. Reg. at 7,146; and (3) does not require an owner or operator to implement any of the energy-saving findings the assessment makes. In one respect, however, it is expansive—it requires owners and operators to assess not only the boilers themselves but also other components "located on the site of the affected boiler that use energy provided by the boiler," including "compressed air systems" as well as "facility heating, ventilation, and air conditioning systems." 40 C.F.R. § 63.11237.

e. The Health-Based Emissions Limits for HCl

Although the EPA set numeric MACT standards to control HCl emissions, *see* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,193-98 tbls.1 & 2, in an earlier iteration of the Major Boilers Rule, the EPA did not set MACT standards for HCl. *See* National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters (2004 Boilers Rule), 69 Fed. Reg. 55,218, 55,227 (Sept. 13, 2004). Instead, the Agency opted for a less stringent health-based emissions limit under section 7412(d)(4). *See id.* The EPA changed course after concluding that HCl emissions posed health concerns the Agency had not previously considered—in particular, the EPA feared the "potential *cumulative* public health and environmental effects" of HCl emissions, 2011 Major Boilers Rule, 76 Fed. Reg. at 15,643-44 (emphasis added)—and after recognizing that it did not have the requisite data to weigh adequately the newly identified health risks.

2. The Area Boilers Rule

In the Area Boilers Rule, the EPA set emissions limits for the same three boiler categories it controlled in the Major Boilers Rule, *see supra* § I.B.1: industrial, commercial, and institutional boilers. *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,488. It further split the categories into seven subcategories, *see id.*, and set emissions limits for three of them, *see id.* at 7,517-18 tbls.1 & 2.[10] These include: (1) coal-fired boilers (*i.e.*, "any boiler that burns any solid fossil fuel and no more than 15 percent biomass," 40 C.F.R. § 63.11237); (2) oil-fired boilers (*i.e.*, "any boiler that burns any liquid fuel and is not in either the biomass or coal subcategories," *id.*); and (3) biomass-fired boilers (*i.e.*, "any boiler that burns any" "biomass-based solid fuel that is not a solid waste" and "is not in the coal subcategory," *id.*). *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,517-18 tbls.1 & 2.

For these subcategories, the EPA set emissions limits for three HAPs: Hg, PM, and CO, with PM functioning as a surrogate for non-Hg urban metals and CO functioning as a surrogate for polycyclic organic matter (POM). *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,586. Because Hg and POM are both listed in section 7412(c)(6), the EPA had to set MACT standards for Hg and for CO (as surrogate for POM) for any area source category that, in the EPA's view, required

[10] As noted above, *see supra* § I.A.1.a, the EPA has some discretion in promulgating emissions limits for area HAP sources. Exercising its discretion, the EPA had previously determined that natural gas-fired area boilers did not emit HAPs at a level necessitating regulation. *See* National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers (2010 Proposed Area Boilers Rule), 75 Fed. Reg. 31,896, 31,900 (June 4, 2010).

MACT control to assure a 90 per cent reduction in the aggregate emissions of these two HAPs. *See* 42 U.S.C. § 7412(c)(6). The Agency complied, setting numeric MACT standards for Hg and CO emissions from *large* coal-fired boilers and a MACT work-practice standard (specifically, a tune-up requirement) for emissions from *small* coal-fired boilers. *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,488, 7,517-18.[11] It did not, however, set MACT standards for Hg and POM emissions from *biomass* or *oil*-fired boilers, finding it unnecessary to assure a 90 per cent reduction in aggregate emissions of those two HAPs. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,566.

Thus, with the exception of Hg and CO emissions from coal-fired boilers, the EPA had discretion to promulgate GACT standards for all other HAPs in all other source subcategories. *See* 42 U.S.C. § 7412(d)(5). Exercising this discretion resulted in the following standards:

[11] As used in the Area Boilers Rule, the difference between "large" and "small" units depends on the heat-input capacity of the unit. *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,488. It is not the same as the difference between "major" and "area" sources, which is based on the volume of HAPs a source emits. *See* 42 U.S.C. § 7412(a).

Boiler Subcategory	Size	Age	Hg Limit	Hg Type
Coal	Large	New	Numeric	MACT
		Existing	Numeric	MACT
	Small	New	Tune-Up	MACT
		Existing	Tune-Up	MACT
Biomass	Large	New	---	---
		Existing	---	---
	Small	New	---	---
		Existing	---	---
Oil	Large	New	---	---
		Existing	---	---
	Small	New	---	---
		Existing	---	---

Boiler Subcategory	Size	Age	CO Limit	CO Type
Coal	Large	New	Numeric	MACT
		Existing	Numeric	MACT
	Small	New	Tune-up	MACT
		Existing	Tune-up	MACT
Biomass	Large	New	Tune-up	GACT
		Existing	Tune-up	GACT
	Small	New	Tune-up	GACT
		Existing	Tune-up	GACT
Oil	Large	New	Tune-up	GACT
		Existing	Tune-up	GACT
	Small	New	Tune-up	GACT
		Existing	Tune-up	GACT

Boiler Subcategory	Size	Age	PM Limit	PM Type
Coal	Large	New	Numeric	GACT
		Existing	Tune-up	GACT
	Small	New	Tune-up	GACT
		Existing	Tune-up	GACT
Biomass	Large	New	Numeric	GACT
		Existing	Tune-up	GACT
	Small	New	Tune-up	GACT
		Existing	Tune-up	GACT
Oil	Large	New	Numeric	GACT
		Existing	Tune-up	GACT
	Small	New	Tune-up	GACT
		Existing	Tune-up	GACT

2013 Area Boilers Rule, 78 Fed. Reg. at 7,488-89, 7,517-19.

The Area Boilers Rule shares many of the same features as the Major Boilers Rule; for example, the Area Boilers Rule treats startups, shutdowns, and malfunctions in the same fashion as the Major Boilers Rule, *see supra* § I.B.1.c—*i.e.*, the Area Boilers Rule creates work-practice (or management-practice) standards for startup and shutdown periods but does not account for malfunctions at all, save for the Agency's commitment to consider malfunctions on a case-by-case basis. *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,496; 2011 Area Boilers Rule, 76 Fed. Reg. at 15,560-61. Additionally, the Area Boilers Rule imposes the same one-time energy-assessment requirement for existing large area boilers that the Major Boilers Rule imposes for existing major boilers. *See supra* § I.B.1.d; *see also* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,500; 2011 Area Boilers Rule, 76 Fed. Reg. at

15,560, 15,567-68. There are, however, two unique features of the Area Boilers Rule that warrant brief discussion.

a. Exclusion of "Temporary Boilers"

After the EPA promulgated the 2011 Area Boilers Rule but before it promulgated the 2013 version, it proposed an amendment to 40 C.F.R. § 63.11195 that added temporary boilers to the list of those boilers *not* regulated by section 7412. *See* National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers (2011 Proposed Area Boilers Rule on Reconsideration), 76 Fed. Reg. 80,532, 80,535 (Dec. 23, 2011). The EPA created the exclusion because, in its view, temporary boilers are "insignificant sources[] and were not included in the EPA's analysis of the source category." *Id.* The Agency eventually defined "temporary boiler" as "any gaseous or liquid fuel boiler that is designed to, and is capable of, being carried or moved from one location to another by means of, for example, wheels, skids, carrying handles, dollies, trailers, or platforms." *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,491 (quoting 40 C.F.R. § 63.11237).

b. Title V Permit Exemption for Synthetic Area Sources

As noted, *see supra* § I.A.3, Title V of the CAA imposes a permit requirement on all owners and operators of major and area HAP sources. *See* 42 U.S.C. § 7661a. The EPA, however, can exempt an area source subcategory if it finds "that compliance with such requirements is impracticable, infeasible, or unnecessarily burdensome on such categories." *Id.* § 7661a(a). When it proposed the Area Boilers Rule in 2010, the EPA considered exempting some area sources because, in its view, the existing restrictions on those sources

made Title V duplicative. *See* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,910-13. At the time, the EPA announced that it did not intend to exempt "synthetic" area sources (*i.e.*, area sources that, but for existing air-pollution controls, would be considered major sources). *Id.* at 31,913. In so doing, the EPA reasoned that synthetic area sources: (1) more closely resemble major sources than area sources, (2) are often located in populous areas, and (3) have high HAP emissions potential when uncontrolled. *Id.*

But in the 2011 Area Boilers Rule, the EPA changed course and exempted synthetic area sources from the Title V permitting requirement. *See* 76 Fed. Reg. at 15,578. It reasoned that the "observations and data . . . relied upon in other rulemakings for distinguishing between sources that became synthetic area sources due to controls and other synthetic and natural area sources did not necessarily apply to this source category." *Id*. In its view, it no longer had "sufficient information" to distinguish synthetic area sources from the others it exempted and, accordingly, "the rationale for exempting most area sources subject to this rule . . . is also now relevant for" synthetic area sources. *Id.*; *see also* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,497.

3. The CISWI Rule

In the CISWI Rule, the EPA created four CISWI subcategories: (1) incinerators (*i.e.*, "units designed to burn [solid] waste materials for the purpose of disposal"); (2) small, remote incinerators ("SRIs") (*i.e.*, units that burn small waste batches); (3) energy recovery units ("ERUs") (*i.e.*, units that would be classified as boilers but for the fact they combust solid waste); and (4) waste-burning kilns (*i.e.*, units that would be classified as cement kilns if they did not

burn solid waste). 2013 CISWI Rule, 78 Fed. Reg. at 9,118. Initially, the EPA proposed a fifth subcategory—burn-off ovens—but eliminated burn-off ovens after comments revealed that it had greatly underestimated the number of units in that subcategory (36 versus 15,000) and that it lacked the requisite data to set limits for the units. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,734. Of the four CISWI subcategories, the EPA further divided the ERU subcategory (for CO emissions only) into coal-fired, biomass-fired and oil/gas-fired ERUs and it further divided the waste-burning kiln subcategory (again, for CO emissions only) into long and preheater/precalcinator kilns. *See* 2013 CISWI Rule, 78 Fed. Reg. at 9,118 tbl.2.

The EPA then set numeric MACT limits for the section 7429(a)(4) pollutants.[12] *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,709-10 tbl.1. Unlike the Major Boilers Rule and the Area Boilers Rule, the CISWI Rule contains no beyond-the-floor MACT standards. The EPA also declined to promulgate work-practice standards, concluding that it had no authority to do so because section 7429 includes no work-practice standard provision similar to that in section 7412. *See id.* at 15,721.

The CISWI Rule shares several features with the Major Boilers Rule. In the CISWI Rule, for instance, the EPA also used the UPL, *see id.* at 15,722-27, as well as the pollutant-by-pollutant approach, *see id.* at 15,719-21, in setting MACT floors. Based in part on the differences between section 7412

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[12] These pollutants are (1) PM, (2) sulfur dioxide (SO_2), (3) HCl, (4) nitrogen oxide (NO_x), (5) CO, (6) lead (Pb), (7) cadmium (Cd), (8) Hg, (9) dioxins and dibenzofurans, and (10) opacity (where appropriate). 42 U.S.C. § 7429(a)(4).

and section 7429, the CISWI rule has four unique characteristics we briefly describe.

a. Startups, Shutdowns, and Malfunctions

As discussed, *see supra* § II.B.1.c, the EPA imposed a work-practice standard for major and area source boilers during periods of startup and shutdown but declined to make any regulatory modification for malfunctions. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613; 2011 Area Boilers Rule, 76 Fed. Reg. at 15,560-61. The CISWI Rule, however, makes no modification for *any* of these periods, mandating instead that the numeric MACT standards "apply at all times," even when CISWI units are starting up or shutting down. 2011 CISWI Rule, 76 Fed. Reg. at 15,711, 15,737-38. The Agency concluded that it had no legal authority under section 7429 to impose anything but a numeric MACT standard on CISWI units. *See id.* at 15,709 tbl.1; *see also id.* at 15,737-38.

b. The Record-Keeping Requirement

Whether the EPA considers a combustion unit to be a boiler (and thus subject to section 7412) or a CISWI (and thus subject to section 7429) turns entirely on whether the unit combusts "solid waste." *See id.* at 15,709. The term "solid waste" is defined in RCRA, 42 U.S.C. §§ 6901 *et seq*., and clarified by EPA regulation, *see* Identification of Non-Hazardous Secondary Materials that Are Solid Waste (NHSM Rule), 76 Fed. Reg. 15,456, 15,457 (Mar. 21, 2011). *See also* 2011 CISWI Rule, 76 Fed. Reg. at 15,709. If the unit combusts solid waste, it is a CISWI. *Id.*

The source owner or operator initially decides whether the material its combustion unit burns meets the definition of

solid waste. *See id.* at 15,740. For this reason, the CISWI rule requires that the owner or operator of a combustion unit that burns materials "not clearly listed as traditional fuels" keep records explaining how the materials meet the regulatory definition of "non-solid waste." *Id.*; *see also* 40 C.F.R. § 60.2175(v). Failure to do so means, for the purposes of the EPA, that "the operating unit is a CISWI unit." 40 C.F.R. § 60.2265; *see also* 2013 CISWI Rule, 78 Fed. Reg. at 9,188.

c. Emissions Averaging

During the notice-and-comment period, certain industry entities urged the EPA to allow a facility containing more than one CISWI unit to demonstrate compliance with the CISWI MACT standards by averaging the HAP emissions of all units in the facility. *See* Commercial and Industrial Solid Waste Incineration Units: Reconsideration and Proposed Amendments; Non-Hazardous Secondary Materials that Are Solid Waste (2011 Proposed CISWI Rule on Reconsideration), 76 Fed. Reg. 80,452, 80,463 (Dec. 23, 2011). Although it allowed facility-wide averaging in the Major Boilers Rule, the Agency declined to allow it for facilities with CISWI units. *See id.* The EPA explained, first, that "[t]he applicability of CISWI is such that each unit is an affected facility." *Id.* In response to further comments, the EPA subsequently explained that it did "not believe [it had] the legal authority to allow emissions averaging in CISWI or under section [7429] generally because each individual unit is an affected facility." Summary of Public Comments and Responses for Commercial and Industrial Solid Waste Incineration Units (CISWI Rule—Responses to Comments), EPA-HQ-OAR-2003-0119-2638-A2 (Dec. 2012), at 195.

d. Treatment of Units that Begin Combusting Solid Waste

Finally, in the preamble to the 2011 CISWI Rule, the EPA stated broadly that "[u]nits that begin combusting solid waste are considered *existing* sources under CISWI." 76 Fed. Reg. at 15,714 (emphasis added). This categorical pronouncement drew objections from commentators who insisted that, if such units experienced an increase in HAP emissions, the units would meet the statutory definition of "modified solid waste incineration unit[s]," *see* 42 U.S.C. § 7429(g)(3), and would, accordingly, be subject to the MACT standards for *new* units, *see id.* § 7429(g)(2). In the subsequent proposed CISWI Rule, the EPA clarified that "[a]n existing source will not be considered a new source *solely* due to a combustion material switch. Assuming new source applicability is not triggered, existing sources that change fuels or materials are considered existing sources . . . ." 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,459.

II. STANDARD OF REVIEW

For each issue, the Petitioners argue that the EPA either misinterpreted the CAA, acted arbitrarily and capriciously, or both. We review the EPA's construction of the statute under the two-part framework established in *Chevron, U.S.A., Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837 (1984). At *Chevron* step 1, we ask whether the Congress "has directly spoken to the precise question at issue"; if it has, we "must give effect to [its] unambiguously expressed intent." *Id.* at 842-43. In so doing, we examine the CAA's text, structure, purpose, and legislative history to determine if the Congress has expressed its intent unambiguously. *See Bell Atl. Tel. Co. v. FCC*, 131 F.3d 1044, 1047 (D.C. Cir. 1997). If the statute

is "silent or ambiguous with respect to the specific issue," we proceed to *Chevron* step 2 and defer to the EPA's interpretation so long as it is "based on a permissible construction of the statute." *Chevron*, 467 U.S. at 842-43.

The CAA authorizes the Court to "reverse any [EPA] action found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 42 U.S.C. § 7607(d)(9)(A). Our review is "narrow" and we will "not . . . substitute [our] judgment for that of the agency." *Motor Veh. Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co. (State Farm)*, 463 U.S. 29, 43 (1983). We "must uphold an agency's action where [the agency] 'has considered the relevant factors and articulated a rational connection between the facts found and the choice made,' and has not 'relied on [improper] factors.'" *Nat'l Ass'n of Clean Air Agencies v. EPA (NACAA)*, 489 F.3d 1221, 1228 (D.C. Cir. 2007) (citations omitted) (quoting *Allied Local & Reg'l Mfrs. Caucus v. EPA*, 215 F.3d 61, 68 (D.C. Cir. 2000), and *State Farm*, 463 U.S. at 43). A rule is arbitrary and capricious if the agency: (1) "has relied on factors which Congress has not intended it to consider," (2) "entirely failed to consider an important aspect of the problem," (3) "offered an explanation for its decision that runs counter to the evidence before the agency," or (4) "is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *State Farm*, 463 U.S. at 43.

We review the EPA's factual determinations for substantial evidence. 5 U.S.C. § 706(2)(E). We also "owe[] particular deference to EPA when its rulemakings rest upon matters of scientific and statistical judgment within [its] sphere of special competence and statutory jurisdiction." *Am. Coke & Coal Chems. Inst. v. EPA*, 452 F.3d 930, 941 (D.C.

Cir. 2006). But "[w]e are hesitant to rubber-stamp EPA's invocation of statistics without some explanation of the underlying principles or reasons why its formulas would produce an accurate result." *NACWA*, 734 F.3d at 1145.

III. INDUSTRY PETITIONERS' CHALLENGES

A. STARTUPS, SHUTDOWNS, AND MALFUNCTIONS

Industry Petitioners raise two sets of challenges to startup, shutdown, and malfunction periods: (1) a challenge to the EPA's failure to take malfunctions into account in the Major Boilers and Area Boilers Rules and (2) a challenge to EPA's failure to take into account periods of startup, shutdown, and malfunction in the CISWI Rule. For the reasons that follow, we reject all of the Industry Petitioners' claims related to startups, shutdowns, and malfunctions.

1. Periods of Malfunction in the Major Boilers and Area Boilers Rules

First, Industry Petitioners challenge the Major Boilers and Area Boilers Rules' failure to take malfunctions into account in setting MACT floors. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613; 2011 Area Boilers Rule, 76 Fed. Reg. at 15,560-61. The EPA defends its refusal to account for malfunctions on the basis of (1) the impracticability of accounting for events that are necessarily unpredictable, and (2) the EPA's assertion that it will use its prosecutorial discretion to determine on a case-by-case basis whether an exceedance of emission standards is attributable to an excusable malfunction or whether applicable regulatory penalties should be imposed instead. *See* No. 11-1108 EPA Br. 38; No. 11-1141 EPA Br. 29.

Both sides agree that malfunctions are inevitable in the operation of area and major boilers. According to the EPA, "even equipment that is properly designed and maintained can sometimes fail and . . . such failure can sometimes cause an exceedance of the relevant emission standard." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613; 2011 Area Boilers Rule, 76 Fed. Reg. at 15,561. Thus, the EPA defined a malfunction as a "sudden, infrequent, and not reasonably preventable failure of air pollution control and monitoring equipment, process equipment or a process to operate in a normal or usual manner." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613 (citing 40 C.F.R. § 63.2); 2011 Area Boilers Rule, 76 Fed. Reg. at 15,560 (same). In attempting to write rules to account for emissions, however, the EPA faced an intractable problem: how to account for a malfunction which is, by definition, unpredictable in terms of timing, duration, magnitude, and effect. While the existence of malfunctions is entirely predictable, the nature of those malfunctions is not, and it is the malfunction's nature that affects emissions and thus is relevant to the application of emission limits.

At first glance, the EPA's chosen approach to malfunctions may seem counterintuitive, as the Agency appears to have several reasonable alternatives: it could exempt periods of malfunction entirely from the application of the emission standards; or it could apply the standards to malfunctions while giving boiler owners the opportunity to defend against a penalty by demonstrating they were not at fault for the malfunction. But the EPA has previously been stymied in its attempts to implement either of these solutions, as this court has concluded neither approach is consistent with the Agency's enabling statutes. For instance, in *Sierra Club III*, the EPA attempted to exempt major sources from complying with emission standards during start up, shut

down, and malfunction. *See* 551 F.3d at 1027-28. This court rejected that approach because the Congress "required that there must be continuous section 112-compliant standards" and so the EPA lacked discretion to exempt certain periods from compliance, regardless of their unpredictability. *Id.* at 1027. In *NRDC III*, this court considered a challenge to the affirmative defense provision the EPA adopted for persons defending against civil suits under 42 U.S.C. § 7604(a), which allows "any person" to "commence a civil action on his own behalf" against any entity alleged to be in violation of an emission standard or limitation. The affirmative defense provision was meant to shield alleged violators from liability for certain emissions violations caused by "unavoidable" malfunctions; under the provision, therefore, "the district court [could] assess penalties only if violators fail[ed] to meet [their] burden of proving all of the requirements in the affirmative defense." *NRDC III*, 749 F.3d at 1062 (internal quotation omitted). The court rejected this provision as an impermissible intrusion on the judiciary's role. *See id.* at 1063 ("[U]nder this statute, deciding whether penalties are 'appropriate' in a given private civil suit is a job for the courts, not for EPA.").

Faced with an obvious dilemma, the EPA arrived at the approach it defends today. Malfunctions receive no special treatment and the EPA instead exercises "its enforcement discretion to address exceedances of emission limits that may be caused by such uncertain, unpredictable events, on a case-by-case basis." No. 11-1108 EPA Br. 38; *see also* No. 11-1141 EPA Br. 29. The EPA's current treatment of malfunctions thus differs from its invalid affirmative defense provision because the Agency is exercising its *own* regulatory enforcement power on an ad hoc basis outside the context of citizen suits. When an exceedance occurs during a

malfunction, the EPA determines what enforcement action—if any—it should take by considering "the good faith efforts of the source to minimize emissions during malfunction periods, including preventative and corrective actions, as well as root cause analyses to ascertain and rectify excess emissions." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613; *see also* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,561 (same). The EPA also considers whether the exceedance was in fact "not reasonably preventable" or whether it was "caused in part by poor maintenance or careless operation." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613 (citing 40 C.F.R. § 63.2); *see also* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,561 (same).

For our purposes, we need not (indeed, must not) evaluate the policy implications of the EPA's regulatory choice because our review is confined to determining whether the EPA's regulation reflects a permissible reading of the applicable statute under *Chevron*. Here, we conclude that it does. The relevant statute requires only that the EPA set "achievable" standards, 42 U.S.C. § 7412(d)(2), and it defines achievability to be no less "than the emission control that is achieved in practice by the best controlled similar source," 42 U.S.C. § 7412(d)(3). The "best controlled similar source," however, is unlikely to be a malfunctioning source, and the EPA is bound to enact a standard in keeping with emission limits achieved by that "best controlled similar source." If anything, then, the statutory language on its face prevents the EPA from taking into account the effect of potential malfunctions when setting MACT emission standards. At the very least, the language permits the EPA to ignore malfunctions in its standard-setting and account for them instead through its regulatory discretion. Our *Sierra Club III* decision confirms this. *See* 551 F.3d at 1027-28. Because the

EPA had no option to exclude these unpredictable periods, its approach is reasonable. We therefore reject Industry Petitioners' argument that the EPA either misinterpreted the CAA or acted arbitrarily and capriciously in failing to account for malfunctions when setting MACT floors in the Major and Area Boilers Rules.

Nor do we agree with the Industry Petitioners' secondary argument that the EPA acted arbitrarily and capriciously by failing to set a work-practice or a GACT management-practice standard for malfunction periods. First, the statute makes clear that these kinds of standards are to be set at the discretion of the EPA, so it would be difficult to interpret the statute consistently with its text while holding that the text's *permissive* language in fact sets out a *requirement* that the Agency set work-practice or GACT management-practice standards. As to work-practice standards, "[t]he Administrator may, in lieu [of a numeric standard], promulgate a design, equipment, work practice, or operational standard, or combination thereof," and any such standard set must "in the Administrator's judgment [be] consistent with the provisions of subsection (d)." 42 U.S.C. § 7412(h)(1). As to GACT management-practice standards, "the Administrator may . . . elect to promulgate" such standards with respect to certain "categories and subcategories of area sources." *Id.* § 7412(d)(5). It should go without saying that "may means may." *McCreary v. Offner*, 172 F.3d 76, 83 (D.C. Cir. 1999) (internal quotations omitted).

Second, the Petitioners have not demonstrated and the EPA does not concede that setting work-practice or GACT management-practice standards would even be feasible for periods of malfunction. As for work-practice standards, the EPA would have to conceive of a standard that could apply

equally to the wide range of possible boiler malfunctions, ranging from an explosion to minor mechanical defects. Any possible standard is likely to be hopelessly generic to govern such a wide array of circumstances. Similar problems exist for setting GACT management practices. These management practices would also need to apply to the wide range of possible malfunctions, and the EPA would need to determine that the standard would "reduce emissions of hazardous air pollutants," an evidence-based standard that is difficult (perhaps impossible) to apply to the unpredictable circumstances of malfunctions. 42 U.S.C. § 7412(d)(5). Thus, we reject the Industry Petitioners' argument that the EPA was required to set a work-practice or GACT management-practice standard for malfunction periods.

In doing so, we are mindful that the EPA is not the only entity able to bring enforcement actions under the CAA, but that private citizens are also empowered to enforce emission standards by filing suit in district court. 42 U.S.C. § 7604(a). Assurances that the EPA will use its prosecutorial discretion to account for malfunctions would mean little if private citizens could seek strict enforcement of those same standards. But as we stated in *NRDC III*, "the Judiciary, not any executive agency, determines 'the scope'—*including the available remedies*—'of judicial power vested by' statutes establishing private rights of action." 749 F.3d at 1063 (quoting *City of Arlington v. FCC*, 133 S. Ct. 1863, 1871 (2013)). Accordingly, in citizen suits under the CAA, "the courts determine, on a case-by-case basis, whether civil penalties are 'appropriate.'" *Id*. Boiler operators can argue that penalties should not be assessed because of an unavoidable malfunction, and they can support that argument with other relevant facts, "such as the defendant's 'full

compliance history and good faith efforts to comply.'" *Id.* (quoting 42 U.S.C. § 7413(e)(1)). The EPA can also provide supporting argumentation as intervenor or amicus. *Id.* Courts should not hesitate to exercise their judicial authority to craft appropriate civil remedies in the case of emissions exceedances caused by unavoidable malfunctions.

2. Periods of Startup, Shutdown, and Malfunction in the CISWI Rule

In the CISWI Rule, the EPA made no modification for periods of startup, shutdown, or malfunction. The Industry Petitioners argue that failing to account for these periods violated the EPA's statutory instruction to set "achievable" standards. Additionally, the Industry Petitioners claim it was arbitrary and capricious for the EPA to set work-practice standards for startup and shutdown periods under the Major Boilers Rule but not under the CISWI Rule. Both arguments are without merit.

First, the EPA's emission standards for small incinerators do take into account periods of shutdown and startup. The EPA based its standards for these machines on "short term stack tests for pollutants," in which incinerators are monitored during the course of normal operation, which includes daily startup and shutdown periods. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,738. Thus, startup and shutdown times are already incorporated into the standards the EPA set, and what is more, nearly all pollutants are present in smaller numbers during startup and shutdown anyway, when incinerators are burning fuels alone rather than fuels and solid waste. *See* Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units (2010 Proposed CISWI Rule),

75 Fed. Reg. 31,938, 31,964 (June 4, 2010). Given this reality, the CISWI Rule satisfies the statutory standard of "achievability" and is not arbitrary and capricious.

Second, as to periods of malfunctions, the same analysis applies to the CISWI Rule as applies to the Boilers Rules. The EPA adopted a reasonable interpretation of the CAA when it excluded periods of malfunction from its calculations of achievability given that malfunction periods are by their very nature unpredictable in terms of their effect on emissions. The EPA's decision to account for malfunctions in its discretion is likewise a reasonable interpretation of 42 U.S.C. § 7412(d)(2) and (3).

For these reasons, we reject the Industry Petitioners' challenges to the EPA's regulatory choices with regard to periods of startup, shutdown, and malfunction.

B. THE POLLUTANT-BY-POLLUTANT APPROACH

The EPA must look to the performance of the best major boilers and CISWI incinerators when setting MACT floors for a pollutant. As described above, for new units, the EPA must set floors at the level achieved by the best similar unit in each subcategory. For existing units, the Agency must set floors at the level achieved by the best 12 per cent of similar units in each subcategory. 42 U.S.C. §§ 7412(d)(3)(A), 7429(a)(2). As a result, the EPA had to identify the best performing units in each subcategory when setting the MACT floors for the Major Boilers and CISWI Rules. But the EPA often could not identify a single unit or set of units that controlled *all* HAPs better than the other units in the subcategory. Instead, the EPA sometimes found that a unit might rank among the best

in its subcategory at controlling emissions of one HAP, but among the worst at controlling emissions of a different HAP.

To address this problem, the EPA adopted a "pollutant-by-pollutant" approach in setting the MACT floors: instead of identifying the unit or units that best controlled *all* HAPs in the aggregate, the EPA used one unit or set of units to set the MACT floor for, *e.g.*, PM, and used a different unit or set of units to set the MACT floor for, *e.g.*, HCl. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,621-23; 2011 CISWI Rule, 76 Fed. Reg. at 15,720-21. For at least two subcategories of major boilers—new heavy oil-fired units and existing stoker coal-fired units—the EPA's pollutant-by-pollutant approach resulted in MACT floors that no unit in the subcategory had achieved *in toto*. Similarly, for small, remote incinerators (SRIs), the approach resulted in standards for existing units that only two of the 28 SRI units had met *in toto*, and standards for new units that no existing SRI had met *in toto*.

The Industry Petitioners challenge the EPA's use of the pollutant-by-pollutant approach. According to the Industry Petitioners, the CAA's plain language requires the Agency to identify the best *overall* unit or set of units—not the best unit or set of units for a particular pollutant—in each subcategory when setting MACT floors. They further claim the EPA's pollutant-by-pollutant approach was unreasonable with regard to SRIs because it resulted in a set of emission standards that no single unit in the subcategory had achieved in practice. We disagree, and conclude that the EPA's pollutant-by-pollutant approach is a reasonable interpretation and application of the statute.

For the purposes of this challenge, the MACT floor provisions for major boilers and CISWI units are identical.

Under both provisions, the EPA must set emission standards for *new* units based on "the emissions control that is achieved in practice by the best controlled similar unit, as determined by the Administrator." 42 U.S.C. § 7429(a)(2) (CISWI); *see also id.* § 7412(d)(3) (major boilers). For *existing* units, the MACT floor is based on "the average emissions limitation achieved by the best performing 12 percent of units in the category." *Id.* § 7429(a)(2) (CISWI); *see also id.* § 7412(d)(3)(A) (major boilers).

The Industry Petitioners claim this language unambiguously forecloses the EPA's pollutant-by-pollutant approach. For new units, they assert, the statute requires the EPA to find the single unit that performs best overall and use this unit—and only this unit—to set standards for all regulated pollutants. For example, if Incinerator 3 were deemed the best overall performer in a subcategory, then the EPA would use Incinerator 3's emissions levels to set standards for PM, CO, and each of the other regulated pollutants. This would be true even if Incinerator 1 in the same subcategory had lower CO emissions and Incinerator 2 had lower PM emissions. The Industry Petitioners also make this argument for existing sources. For these units, under their interpretation, the mandate to identify the "best performing 12 percent of units" required the EPA to use data from the 12 per cent of sources with the lowest overall emissions in the subcategory. In short, the Industry Petitioners argue that the best "unit" referred to by the provision cannot be a "hypothetical composite" of multiple units that result in standards for new units that no actual unit has met in practice with regard to every pollutant, or standards for existing units that 12 per cent of actual units have not met with regard to every pollutant.

The Industry Petitioners read too much into the statutory language. It is true that the statute requires the EPA to base MACT standards on what is "achieved" by the best "unit" or "12 percent of units." But, as the EPA argues, the statute says nothing about how the Agency should determine which units are the best. *Cf. Sierra Club v. EPA*, 167 F.3d 658, 661 (D.C. Cir. 1999) (noting that section 7429(a) "on its own says nothing about how the performance of the best units is to be calculated"). Both the industry-favored method of choosing the best overall unit and the EPA's method of choosing the best unit as to each particular pollutant facially comport with the statute's mandate to determine which units are best. Because the statute is ambiguous as to how the EPA should identify those units, we must defer to the Agency's choice so long as it is reasonable. *See Sierra Club I*, 353 F.3d at 990.

Here, the EPA's choice is reasonable. The statute provides that emission standards shall reflect "the maximum degree of reduction in emissions of [regulated pollutants] that the Administrator . . . determines is achievable for new or existing units in each category." 42 U.S.C. § 7429(a)(2); *see also id.* § 7412(d)(2). It then provides that the "degree of reduction in emissions that is deemed achievable for new units in a category shall not be less stringent than the emissions control that is achieved in practice by the best controlled similar unit, as determined by the Administrator." *Id.* § 7429(a)(2); *see also id.* § 7412(d)(3). Reading these provisions together, they support a pollutant-by-pollutant approach. The "best controlled similar unit" language does not exist in a vacuum; rather, it exists to measure the "degree of reduction in emissions that is deemed achievable." *Id.* § 7429(a)(2); *see also id.* § 7412(d)(3). That "reduction in emissions" is the reduction in emissions of *each* pollutant listed in sections 7429(a)(4) and 7412(b)(1). The EPA's

approach to setting standards on a pollutant-by-pollutant basis thus comfortably fits within this statutory scheme.

Moreover, the Industry Petitioners have not explained how their preferred approach would better comport with the statute. Were the EPA required to determine which units perform best "overall," we see at least two possibilities for how it could do so: First, the EPA could calculate a unit's average emissions for each pollutant in consistent units of measurement, add these emissions together, and then choose the unit with the smallest overall sum in each subcategory. But this approach could produce arbitrary results, because the "best performing" overall unit might emit unusually low quantities of some pollutants and unusually high quantities of others. This would mean the emission standards for some pollutants would be lenient while others would be stringent, with no principled reason for the difference. Alternatively, the Agency could identify which source is best overall based on which emits the lowest level of the riskiest pollutants. But this approach would require the Agency to rank pollutants' relative risks without any congressional guidance on how to do so. This approach would also contravene our previous understanding of the congressional intent behind the MACT floor provisions. As we have explained, the MACT floors "are to be based not on an assessment of the risks posed by [pollutants], but instead on the maximum achievable control technology (MACT) for sources in each category." *Sierra Club I*, 353 F.3d at 980.

The Industry Petitioners nevertheless argue that the CAA's legislative history supports their preferred approach. In particular, they point to the floor comments of Senator Durenberger discussing the potential impact on MACT floors of mutually incompatible control technologies. 136 Cong.

Rec. S17,238 (daily ed. Oct. 26, 1990) (statement of Senator Durenberger). Mutually incompatible control technologies cannot be used at the same time and therefore present regulators with a dilemma. For example, say Technology 1 and Technology 2 cannot be used together. If Technology 1 is better at reducing PM than Technology 2, and Technology 2 is better at reducing CO than Technology 1, the EPA would have to choose which of the two technologies to factor into emission standards. In such situations, Senator Durenberger anticipated that the "EPA should judge MACT to be the technology which best benefits human health and the environment on the whole." *Id.* The Industry Petitioners argue this statement demonstrates that Congress intended the EPA to make an overall determination of which units are the best performing "on the whole."

Senator Durenberger's statement does not support this broad principle. The statement merely explains that, where two technologies cannot be used together, the EPA should base MACT standards on the technology it considers best overall. Here, the Industry Petitioners do not identify any relevant control technologies that are mutually incompatible. Indeed, the EPA found in the CISWI Rule that "there is no technical reason why [the] air pollution control systems cannot be combined." 2011 CISWI Rule, 76 Fed. Reg. at 15,721; *see also* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,623 ("All available data for boilers and process heaters indicate that there is no technical problem achieving the floor levels contained in this final rule for each HAP simultaneously, using the MACT floor technology."). There is thus no reason to believe that the EPA's current MACT floor standards cannot be achieved. Instead, the Industry Petitioners merely insist that no units *currently* meet the EPA's new unit standards with regard to every regulated

pollutant in certain subcategories, and only a few sources meet all of the standards for existing units in the same subcategories. But, if the statute permits the EPA to determine which units are best on a pollutant-by-pollutant basis—and it does—then the EPA's choice to adopt that approach does not become unlawful merely because few or no units have achieved those standards for all pollutants.

Finally, the Industry Petitioners argue that even if the pollutant-by-pollutant approach is reasonable in some circumstances, it is arbitrary and capricious as applied to certain SRIs because it exacerbates certain problems posed by the "batch" nature of SRIs. As explained at *infra* § III.E, SRIs burn waste in small batches. According to the Petitioners, this means that the SRIs that the EPA identified as best performing were, in reality, burning cleaner waste at the time emissions testing was done; they were not actually better than other units at removing or destroying waste. The pollutant-by-pollutant approach, the Industry Petitioners argue, "simply captures the results from units that happened to be burning wastes with low levels of that particular pollutant during testing," and this reality makes it harder for SRI units to meet emission standards for all pollutants at the same time. No. 11-1125 Indus. Pet'rs' Reply Br. 8 (emphasis omitted).

This argument fails because the Industry Petitioners have not demonstrated that the Agency considered impermissible factors, failed "to consider important aspect[s] of the problem," or offered an unreasonable explanation for its decision when setting the MACT floors for SRIs. *See State Farm*, 463 U.S. at 43. Rather, their argument is a back-door attempt to challenge the Agency's alleged failure to consider waste inputs, which we reject below at *infra* § III.E.

Petitioners have also not shown that it is infeasible for the SRI units to meet the MACT floor standards or that any individual pollutant standard was not achieved in practice by an existing SRI unit. They merely assert, without evidence, that no existing unit burning high sulfur garbage can match the SO_2 performance achieved by the unit the EPA used to set SO_2 standards because that latter unit was burning low sulfur waste at the time of the emissions testing. But MACT floors are not unreasonable simply because they are difficult to achieve in practice. As such, we find the EPA's pollutant-by-pollutant approach to be a reasonable interpretation and application of the statute, and deny the Industry Petitioners' challenge to the EPA's use of this approach.

C. THE ENERGY-ASSESSMENT REQUIREMENT

The Major Boilers Rule and the Area Boilers Rule generally require sources with existing boilers to perform a one-time energy assessment. In the assessment, facilities must "identify energy conservation measures"—such as "process changes or other modifications to the facility"—"that can be implemented to reduce the facility energy demand," thereby "reduc[ing] fuel use." 2011 Area Boilers Rule, 76 Fed. Reg. at 15,573; *see also* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,632. While facilities must conduct the assessment, they need not implement its conclusions. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,573; 2011 Major Boilers Rule, 76 Fed. Reg. at 15,632.

The logic behind the assessment is straightforward. Boilers produce HAP emissions when fuel is combusted. Less combustion means fewer emissions. The EPA primarily justified the assessment as a beyond-the-floor MACT requirement under section 7412(d)(2). *See* 2011 Area Boilers

Rule, 76 Fed. Reg. at 15,573; 2011 Major Boilers Rule, 76 Fed. Reg. at 15,632. With respect to certain biomass and oil-fired boilers located at area sources, the assessment was justified as a GACT management practice under section 7412(d)(5). *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,567.

Industry Petitioners raise three principal challenges to the energy-assessment requirement, none of which have purchase. The first challenge claims that the energy assessment regulates aspects of facilities that are off limits to the EPA—namely, the energy needs supplied by regulated boilers. Petitioners point to the language of the CAA, which requires the EPA to "list . . . categories and subcategories of major sources and area sources" of enumerated air pollutants. 42 U.S.C. § 7412(c)(1). "For the categories and subcategories the Administrator lists, the Administrator" must set "emissions standards under" section 7412(d). *Id.* § 7412(c)(2). As relevant here, the EPA defined the source categories to include "industrial boilers and commercial and institutional boilers." 2011 Area Boilers Rule, 76 Fed. Reg. at 15,557; 2011 Major Boilers Rule, 76 Fed. Reg. at 15,608. To the extent the assessment concerns parts of the facility other than the boiler itself, the Industry Petitioners claim it exceeds the EPA's authority.

The Industry Petitioners misapprehend both the scope of the assessment and the CAA. The assessment requires facilities to evaluate energy systems "located on the site of the affected boiler," including "[p]rocess heating[,] compressed air systems[,] . . . facility heating, ventilation, and air conditioning systems," and "[o]ther systems that use steam, hot water, process heat, or electricity, provided by the affected boiler." 40 C.F.R. § 63.11237; *see id.* § 63.7575. Based on

that evaluation, facilities must compile a "comprehensive report detailing the ways to improve efficiency, the cost of specific improvements, [anticipated] benefits, and the time frame for recouping those investments." 40 C.F.R. pt. 63, subpt. JJJJJJ tbl.2; *id.* pt. 63, subpt. DDDDD tbl.3.

Contrary to the Industry Petitioners' argument, the EPA has not "regulate[d] virtually every piece of equipment at all affected facilities." No. 11-1141 Indus. Pet'rs' Br. 19. Only "energy use systems" that "us[e] energy *clearly* produced by affected boilers" must be evaluated; facilities need not review the "total aggregation of all individual energy using segments of a facility." 2013 Area Boilers Rule, 78 Fed. Reg. at 7,493 (emphasis added); *see also* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,188. The assessment focuses on "discrete segments of a facility," such as "production area[s] or building[s]" associated with a particular boiler. 2013 Area Boilers Rule, 78 Fed. Reg. at 7,493; *see* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,188. Energy requirements satisfied by other sources—not by a HAP-emitting boiler—fall outside of that mandate. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,573 (limiting the assessment to "specific portions of the source that directly affect emissions from the affected boiler"). And regulated facilities are under no obligation to implement the results they reach. In essence, rather than setting inflexible and generally applicable beyond-the-floor numeric limits, the EPA required facilities to take stock of the actual energy demands placed on their boilers. By reducing energy demands and associated fuel consumption, facilities could reduce HAP emissions. That requirement is more measured than the Industry Petitioners contend.

And that measured requirement falls within the EPA's statutory authority. The CAA authorizes the EPA to regulate

"major sources and area sources" of HAPs, and to subdivide those sources into categories and subcategories. 42 U.S.C. § 7412(c)(1), (c)(2). To Industry Petitioners, the authority to subdivide sources means the EPA may only regulate the narrowest applicable categorization—in this instance, commercial and industrial boilers. But the statute does not require so rigid a reading. While the EPA is permitted to subdivide sources, each subdivision remains a component of either a major or area "source." Dividing sources into categories and subcategories does not make them any less of a "source" subject to the EPA's regulation.

For that reason, the EPA explained that the Rules reach, respectively, "[a]ny area source *facility* using a boiler," 2011 Area Boilers Rule, 76 Fed. Reg. at 15,555 (emphasis added), and "major source *facilities* having affected boilers or process heaters," 2011 Major Boilers Rule, 76 Fed. Reg. at 15,613 (emphasis added). Likewise, the regulations implementing the energy assessment requirement apply to those who "own or operate an existing affected boiler," not merely to the boiler itself. 40 C.F.R. § 63.11214(c); *see id.* § 63.7485. Going further, the relevant part of the CFR applies, by its own terms, to the "owner or operator of any stationary source." *Id.* § 63.1(b)(1).

The Congress's definition of the terms major and area source supports this reading. At bottom, both terms refer to a "stationary source." *See* 42 U.S.C. § 7412(a)(1), (a)(2). Stationary source, in turn, means "any building, structure, facility, or installation which emits or may emit any air pollutant." *Id.* § 7411(a)(3). Against that backdrop, the Rules apply to any "building, structure, facility, or installation" that contains a boiler emitting the specified HAPs. The EPA's

regulatory authority reaches the relevant stationary source, of which the boiler is part.

That the EPA may regulate stationary sources does not mean it may regulate every nook and cranny of those sources. The CAA directs its authority to the establishment of emission standards; it does not provide some general power to superintend the business processes of plants and manufacturing facilities. In this case, however, we have no occasion to parse the precise parameters of the EPA's authority to regulate aspects of area sources. It is enough to conclude that the challenged energy assessment—which applies only to systems that "us[e] energy clearly produced by affected boilers"—falls within the EPA's authority under the CAA. 2013 Area Boilers Rule, 78 Fed. Reg. at 7,493; 2013 Major Boilers Rule, 78 Fed. Reg. at 7,188.

In the remaining two challenges, the Industry Petitioners take issue with the EPA's justification of the energy assessment as a beyond-the-floor MACT standard and a GACT management-practice standard. We reject both challenges.

The assessment represents a valid beyond-the-floor MACT standard.[13] As discussed, after the Agency sets the MACT floor, it must determine "whether stricter standards are 'achievable,'" *Nat'l Lime Ass'n*, 233 F.3d at 629 (quoting 42 U.S.C. § 7412(d)(2)), considering costs, "any non-air

[13] In addition to challenging the assessment as a beyond-the-floor measure, the Industry Petitioners claim the assessment represents an invalid work-practice standard. But "[t]he energy assessment is not . . . a work practice standard, and EPA makes no claim that it is." No. 11-1141 EPA Br. 47 n.9. Therefore, we decline to address that contention.

quality health and environmental impacts and energy requirements," 42 US.C. § 7412(d)(2). These "measures, processes, methods, systems or techniques includ[e], but [are] not limited to, measures which—

> (A) reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications, . . .
>
> (D) are design, equipment, work practice, or operational standards . . . or
>
> (E) are a combination of the above.

Id. The EPA primarily justified the energy assessment as a beyond-the-floor measure designed to identify "process changes or other modifications to the facility" that would reduce fuel use and thereby reduce hazardous emissions. 2011 Area Boilers Rule, 76 Fed. Reg. at 15,573; 2011 Major Boilers Rule, 76 Fed. Reg. at 15,632.

The Industry Petitioners argue that the EPA skipped a step, imposing the energy assessment as a beyond-the-floor measure without first setting a relevant MACT floor. That is incorrect. The EPA first set a numeric MACT emissions limit for the categories and subcategories of sources subject to the energy assessment. *See* 40 C.F.R. pt. 63, subpt. JJJJJ tbl.1; *id.* pt. 63, subpt. DDDDD tbl.2. The energy assessment represents a step beyond that—a measure designed to discover energy efficiencies that, once implemented, could decrease emissions below the floor level.

Before setting a beyond-the-floor measure, the EPA must consider whether it is "achievable" based on a number of

factors, among them cost, "non-air quality health and environmental impacts and energy requirements." 42 US.C. § 7412(d)(2). The EPA did so here. To begin, the EPA adequately considered costs. In the EPA's estimation, "[t]he one-time cost of an energy assessment ranges from $2500 to $55,000 depending on the size of the facility." 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,907; National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (2010 Proposed Major Boilers Rule), 75 Fed. Reg. 32,006, 32,026 (June 4, 2010). Because saving fuel saves money, common sense suggested that sources would often find the energy assessment "cost-effective" to implement. 2011 Area Boilers Rule, 76 Fed. Reg. at 15,568 ("By definition, any emission reduction [achieved as a result of the energy assessment] would be cost effective or else it would not be implemented."); *see also* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,633.

In addition to costs, the EPA considered non-air quality health and environmental impacts in general terms, concluding that "improving energy efficiency reduces negative impacts on the environment." 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,907; 2010 Proposed Major Boilers Rule, 75 Fed. Reg. at 32,026. Given the nature of the assessment, the EPA's somewhat terse analysis of health and environmental impacts suffices. Performing the assessment involves rudimentary tasks—examining the boiler and associated energy systems and drafting a report—that do not impose meaningful health or environmental impacts. The same holds for the EPA's consideration of energy use requirements. Facilities would expend very little energy in conducting the one-time assessment, and could conserve

energy by implementing the results. The assessment therefore represents a lawful beyond-the-floor measure.

We also find that the assessment is a valid GACT management practice. With respect to area sources, the EPA has discretion to require the use of "generally available control technologies or management practices . . . to reduce emissions of hazardous air pollutants." 42 U.S.C. § 7412(d)(5). The EPA justified the energy assessment as a GACT management practice for oil- and biomass-fired boilers. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,567.

The Industry Petitioners challenge that justification, claiming the energy assessment—which does not require implementation—cannot "reduce emissions of hazardous air pollutants." 42 U.S.C. § 7412(d)(5). We disagree. The EPA did not need to make implementation mandatory to make the assessment lawful. Under the CAA, the EPA may sometimes act with a soft touch, rather than a firm hand. Here, the EPA selected a soft touch, requiring an assessment but not implementation. It was not unreasonable for the EPA to conclude, "after considering the structure of the requirement, the incentives it presents, and the likely behavior of sources, . . . that sources will find it cost-effective to implement the conservation measures identified in the energy assessment." 2011 Area Boilers Rule, 76 Fed. Reg. at 15,573. If the results were implemented, HAP emissions would be reduced. For present purposes, that is enough.

For those reasons, we reject the Industry Petitioners' challenges to the energy-assessment requirement.

D. RECORDKEEPING REQUIREMENT FOR CISWI UNITS

Section 7429 regulates combustion units that burn solid waste; units that do not burn solid waste will generally be regulated under section 7412. RCRA defines the term "solid waste" to mean (in part) "discarded material . . . resulting from industrial [or] commercial . . . operations." 42 U.S.C. § 6903(27); *see id.* § 7429(g)(6) (directing that "solid waste" carry "the meanings established by the Administrator pursuant to" RCRA). On the same day the EPA issued a rule setting emission standards for CISWI, it issued a separate rule fleshing out the meaning of solid waste in the context of combustion units. *See* NHSM Rule, 76 Fed. Reg. at 15,456.

The NHSM Rule generally provides that "non-hazardous secondary materials that are combusted are solid wastes,"[14] subject to several exceptions and exemptions. 40 C.F.R. § 241.3(a). Among the exceptions, non-hazardous secondary materials that meet certain "legitimacy" criteria do not qualify as solid waste. *See id.* § 241.3(b), (d). Source owners and operators may also seek a finding from the EPA that particular materials do not constitute solid waste when combusted by a third party. *Id.* § 241.3(c). And the rule exempts altogether a variety of materials from the definition of solid waste, including "traditional fuels." *Id.* § 241.2.

The NHSM Rule is self-implementing: each source owner or operator must determine whether combusted materials meet the definition of solid waste. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,740. To ensure that owners and

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[14] The NHSM Rule defines non-hazardous secondary material to "mean[] a secondary material that, when discarded, would not be identified as a hazardous waste." 40 C.F.R. § 241.2.

operators "review and apply" the NHSM Rule and its exceptions, the EPA issued strict recordkeeping requirements. *Id.* Owners and operators who determine the secondary materials they combust are *not* solid waste must "keep a record" justifying that decision. 40 C.F.R. § 60.2175(v). Failing to file records carries consequences. For units combusting discarded material other than traditional fuels, the failure to "keep and produce records" results in the determination that "the operating unit is a CISWI unit." *Id.* §§ 60.2265, 60.2875 (containing an identical provision).

Industry Petitioners challenge this last provision of the CISWI Rule.[15] They argue that the EPA cannot automatically treat units that fail to keep certain paperwork as CISWI units. Section 7429 permits regulation of "solid waste incineration units"—not units whose owners fail to file paperwork. As a result, the Industry Petitioners ask this court to invalidate the regulatory provision as exceeding the EPA's statutory authority.[16]

We decline the invitation. At *Chevron*'s first step, we find that "Congress did not speak directly, let alone clearly, to

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[15] In their reply brief, the Industry Petitioners clarify that they do not challenge the EPA's authority to require sources to keep records.

[16] The Industry Petitioners also argue the EPA arbitrarily failed to provide sufficient notice of the recordkeeping presumption. We disagree. The Industry Petitioners had sufficient notice of the CISWI Rule, which was promulgated after notice and comment and "give[s] fair warning of the conduct it prohibits." *Gen. Elec. Co. v. EPA*, 53 F.3d 1324, 1328 (D.C. Cir. 1995) (quoting *Gates & Fox Co. v. OSHRC*, 790 F.2d 154, 156 (D.C. Cir. 1986)).

this issue." *Am. Chem. Council v. EPA*, 337 F.3d 1060, 1064 (D.C. Cir. 2003). Section 7429 regulates "solid waste incineration units," a phrase that Congress defined "plainly and broadly to include 'a distinct operating unit of any facility which combusts any solid waste material from commercial or industrial establishments or the general public.'" *NRDC I*, 489 F.3d at 1257 (emphasis omitted) (quoting 42 U.S.C. § 7429(g)(1)). In *NRDC I*, we vacated an earlier iteration of the CISWI Rule that narrowed the scope of that definition beyond what its language would bear. *See id.* at 1257-58. When the Congress commanded the EPA to regulate units that burn "any" solid waste, the Congress meant what it said. *See id.*

In this case, the EPA included within the revised CISWI Rule a presumption designed to enforce the Congress's command. Section 7429 nowhere addresses whether the EPA may establish presumptions to ensure its regulations reach all sources burning solid waste. At the same time, the Congress plainly intended the EPA to regulate sources burning "any" solid waste, a goal presumably advanced by the recordkeeping presumption. *See id.* Against that backdrop, we cannot conclude that the presumption offends the text or purpose of section 7429.

Moving to *Chevron*'s second step, we conclude the recordkeeping presumption is reasonable. In *American Chemistry Council*, we upheld a regulation issued under RCRA defining hazardous waste to include any mixture or derivative of hazardous substances. *See* 337 F.3d at 1064-65. "[B]ecause many mixtures of and derivatives from hazardous wastes are themselves hazardous, it [was] reasonable for the EPA to assume that all such mixtures and derivatives are hazardous until shown otherwise." *Id.* at 1065. In that

context, it made good sense for the EPA to "[p]lac[e] the burden upon the regulated entity" to show that a given substance lacked "hazardous characteristic[s]." *Id.*

Similar reasoning applies here. The EPA crafted the presumption to reach sources likely to be burning solid waste, namely, those burning discarded materials other than traditional fuels. *See* 42 U.S.C. § 6903(27) (defining "solid waste" to include, among other things, "discarded material"); 40 C.F.R. § 241.2 (exempting traditional fuels, defined as "materials that are produced as fuels . . . that have not been discarded," from the definition of solid waste). Such sources are subject to strict recordkeeping requirements. *See* 40 C.F.R. § 60.2175(v). Within those confines, placing the burden on unit operators who have the mandatory obligation and the information to establish their non-regulable status is reasonable. *Cf. Am. Chem. Council*, 337 F.3d at 1065.

There is, however, a difference between the presumption in this case and the one we upheld in *American Chemistry Council*. The CISWI recordkeeping presumption appears to turn on the failure to file paperwork, rather than the presence of a regulated substance. However broadly the Congress defined "solid waste incineration unit" in section 7429, the Congress did not allow for the regulation of *non*-waste burning sources—even when those sources fail to file paperwork. Indeed, had the EPA attempted to regulate sources based *purely* on a failure to file paperwork, we may well have reached a different conclusion.

But the CISWI presumption does not stretch so far. As explained, the presumption depends on factors beyond the mere failure to keep records. Sources subject to the presumption burn materials likely to qualify as solid waste,

and must satisfy demanding recordkeeping requirements. The EPA acted reasonably when it presumed such sources were burning solid waste.

Despite the provision's narrow reach, the Industry Petitioners fear it will sweep up sources not burning solid waste. To the extent that possibility exists, sources wrongfully regulated as CISWI have multiple forms of recourse. Most obviously, sources can prepare and file the records they were already required to make under 40 C.F.R. § 60.2175(v). They can also avail themselves of procedures designed to identify non-waste materials in 40 C.F.R. § 241.3. The existence of these safety valves calms concerns that the presumption will regulate non-waste burning sources.

We therefore reject the Industry Petitioners' challenges to the recordkeeping presumption.[17]

E. WASTE-STREAM VARIANCE FOR SRI UNITS

The EPA regulated SRIs as a subcategory in the CISWI Rule. *See* Memorandum from Eastern Research Group, Inc., to Toni Jones, U.S. Environmental Protection Agency, CISWI Emission Limit Calculations for Existing and New Sources for the Reconsideration Final Rule (Jones Mem.) (Nov. 16, 2012) (No. 11-1125 J.A. 1159, 1162). There are 28 SRI units,

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[17] The Industry Petitioners also contend that the CISWI Rule functions as a form of injunctive relief in violation of 42 U.S.C. § 7413(a). That is incorrect. The provision is neither styled nor operated as a form of injunctive relief. *Cf.* 42 U.S.C. § 7413(a) (permitting the Administrator to issue, among other forms of relief, "an administrative penalty order" or "an order requiring [a person in violation of EPA regulations] to comply with such requirement or prohibition").

all of which are located in Alaska, and the EPA had emissions data for nine of them. *Id.* As explained *supra* § I.B.3, the EPA used the pollutant-by-pollutant approach to establish MACT emission standards for these units. For new-unit standards, the EPA determined which of the nine units had the lowest emissions for a particular pollutant and set the MACT floor for that pollutant at the level achieved by the identified unit. *See* 42 U.S.C. § 7429(a)(2) (explaining that MACT floors for new units must be set at "the emissions control that is achieved in practice by the best controlled similar unit"). When setting MACT floors for existing units, the EPA had to calculate the average level of emissions achieved by the best performing 12 per cent of units. *See id.* It therefore determined which four sources had the lowest emissions for a given pollutant and set the emissions standard for that pollutant at the average level achieved by those four units.

The Industry Petitioners argue that the EPA's approach was unlawful because it failed to account for the unique role that waste inputs play in emissions from SRIs. Unlike larger incinerators, SRIs burn small batches of waste at a time. Some batches include cleaner waste, such as wood and cardboard, while others include waste, such as sewage, that generates large quantities of SO_2 and other pollutants. Moreover, existing SRIs cannot use certain "end-of-stack" control technologies like wet scrubbers due to the Alaskan climate. The Industry Petitioners thus contend that emissions from SRIs are more closely tied to waste input than are emissions from other types of incinerators. This difference, they assert, required the EPA to take into account, when determining which SRI units were best performing for MACT floor purposes, the kind of waste an SRI unit was burning at the time of testing. Because the Agency did not do so, the

Industry Petitioners contend the MACT standards for SRIs are arbitrary and capricious. We disagree.

To support their challenge, the Industry Petitioners advance two arguments, neither of which has merit. Petitioners first point to section 7429(a)(3), which directs the EPA to base emission standards on "methods and technologies for removal or destruction of pollutants before, during, or after combustion." 42 U.S.C. § 7429(a)(3). According to the Industry Petitioners, this language requires the EPA to identify best performing units for MACT purposes by considering which units are best at removing or destroying pollutants. The Industry Petitioners assert that the Agency did not do this. Instead, they contend, the EPA set standards without regard to whether that unit happened to be burning cleaner waste. And, according to the Industry Petitioners, remote incinerators in Alaska cannot control their waste inputs because the core purpose of SRIs is to burn waste that is impracticably far from municipal landfills. The fact that emissions levels varied dramatically during test runs for the SRI units, they claim, is thus the result of random variance in the type of waste the unit was combusting, rather than any "method" or "technology" aimed at "removing" or "destroying" pollutants.

The EPA responds that the approach it adopted for SRIs complies with section 7429(a)(3) because "waste segregation"—that is, diverting dirtier waste to landfills and burning only cleaner waste—*is* a "method . . . for removal . . . of pollutants before . . . combustion." *See* 42 U.S.C. § 7429(a)(3). In fact, during notice and comment, the EPA estimated that many SRIs would choose to comply with the MACT standards by segregating their waste instead of by installing expensive control technologies. *See* Jones Mem.

The Agency also determined that waste segregation was possible for SRIs because their waste often contained materials that could be recycled. *Id.* Finally, the Agency factored in any additional variance in emissions from these units by calculating the MACT floors according to the UPL formula described at *supra* §§ I.B.1.a, IV.C. For these reasons, the Agency contends, it did not need to consider further any variation in emissions that might be caused by differences in waste inputs for SRIs.

The EPA has the better argument, based on both text and precedent. Textually, waste segregation plainly can be a "method[]" for "removal" of pollutants "before" combustion. *See* 42 U.S.C. § 7429(a)(3). Accordingly, the EPA, when setting MACT floors, could not have looked solely to technologies used to reduce emissions during combustion. *Accord Sierra Club v. EPA (Sierra Club II)*, 479 F.3d 875, 883 (D.C. Cir. 2007) (per curiam). Instead, the plain language of section 7429(a)(3) requires the Agency to consider whether emission reductions can be achieved by non-combustion-related controls such as using cleaner fuels or waste inputs. *Accord id*. The statute supports the approach that the Agency took here.

Our holding in *Sierra Club II* confirms that our conclusion is correct. In that case, the EPA had acknowledged that kilns emitted lower levels of pollutants when burning cleaner clay but nevertheless based MACT standards only on the emission reductions achieved by control technology *during* the combustion process. *Id.* at 882. The Agency explained that clean clay existed only in certain areas and that transportation of the clay over long distances was impractical. *Id.* The EPA therefore considered only those emission reductions that were attributable to "deliberate steps

kiln operators [took] to reduce emissions rather than to the 'happenstance' of being located near cleaner clay." *Id.* at 883. But we rejected that approach, finding that "the Clean Air Act requires neither an intentional action nor a deliberate strategy to reduce emissions." *Id.* Instead, where "non-technology factors" affect emission levels, we held the EPA must consider those effects when setting MACT floors. *Id.*

Applying that same reasoning, the EPA acted reasonably when it decided to consider the emissions reduction that could be achieved by waste segregation in SRI units before combustion. This is true even if an element of "happenstance" plays into an SRI unit's ability to segregate its waste. And, had the EPA instead determined that the best performers were those SRI units that most effectively reduced pollutants only *during combustion*, as the Industry Petitioners suggest, the resulting MACT standards may have run afoul of our holding in *Sierra Club II*. We cannot, as a result, find the Agency's choice to avoid that outcome unreasonable.

The Industry Petitioners' second argument also comes up short. According to Petitioners, the EPA selected the best performers for SRIs merely because those units happened to be burning batches of cleaner waste at the time of the emissions test. They claim this happenstance resulted in test data that did not reasonably estimate the *typical* performance of the units, and thus misidentified the best performers. *See Cement Kiln*, 255 F.3d at 862 (finding that although the EPA has authority to estimate which units perform best, its methodology must "provide[] an accurate picture of the relevant sources' actual performance"). Petitioners further argue that the Agency's use of the UPL method to account for variability did not fix this problem because the EPA applies that method only *after* identifying the best performers.

If the record supported this argument, it might well be persuasive; in *NACWA*, we accepted a similar contention that the EPA's dataset for determining MACT floors must fairly represent a unit's typical performance. *See* 734 F.3d at 1146. But the record here does not support the Industry Petitioners' position. None of the evidence on which Petitioners rely can bear the weight they would have us place on it.

First, Petitioners cite evidence indicating that XTO Energy, which operates the incinerator that the EPA deemed the best performer for SO_2, was burning low-sulfur "waste wood, cardboard, and oily waste" during the relevant test runs. *See* ConocoPhillips Co., Comment on EPA's Proposed National Emission Standards for Hazardous Air Pollutants, EPA-HQ-OAR-2003-0119 (Feb. 12, 2012) (No. 11-1125 J.A. 1036). But the record does not show that the resulting test data were unrepresentative of XTO's typical performance because the record says nothing about what XTO typically burns. *Id.*

Second, Petitioners note that Drift River, the unit the EPA deemed the worst performer for SO_2, had emissions results similar to XTO Energy's when burning low-sulfur waste, but results over 1,000 times higher when burning high-sulfur waste. *See id.* (No. 11-1125 J.A. 1032-33). But again, the record does not say anything about the type of waste Drift River typically burns or its sulfur content; it merely demonstrates that the unit's test results varied greatly from one run to the next. *See id.*

Third, Petitioners point to additional test data they provided for the Kuparuk unit, a source that met the EPA's MACT standards for NO_x. *See id.* (No. 11-1125 J.A. 1017, 1027-28). They claim this data shows that the Kuparuk unit

"consistently" emits NO_x levels exceeding that standard when burning sewage sludge. *Id.* This claim is both factually untrue—as the data reveals exceedances on only one day—and says nothing about whether the test data that the EPA used was representative of Kuparuk's typical performance. *Id.*

Instead, the record supports the EPA's assertion that it gave Petitioners "multiple opportunities" to present data on the variability of waste streams for SRIs, but Petitioners never provided a reasonable empirical basis upon which the Agency could adjust the MACT standards due to this variability. The Industry Petitioners have thus not met their burden to show that the EPA's test data was unrepresentative of SRI units' actual or typical performance.

In sum, no record evidence suggests that the current SRI emission standards are not achievable. The Industry Petitioners instead offer only general statements about the "small batch" nature of SRIs and the difficulty of using waste segregation or other controls in remote locations. These factors alone do not call into question the EPA's assertion that controls such as waste segregation and technology upgrades are a feasible means of achieving compliance with the MACT floors that it established. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,730 (explaining that the MACT floors will require SRIs to employ "the best demonstrated technologies that are technologically feasible at these facilities," such as afterburners and waste segregation, and noting that such controls "are sufficient to meet the MACT floor limits"). As a result, the EPA's action here was reasonable; the Agency did not need to account further for waste stream variance in setting MACT floor standards for these SRI units.

F. CARBON MONOXIDE AS A SURROGATE

In setting MACT standards for major boilers, the EPA used carbon monoxide (CO) as a surrogate for several of the HAPs that the Agency was required to regulate. A surrogate is another chemical that stands in as a proxy for the regulated HAP when the EPA sets numeric emission standards. The EPA regulates the surrogate in order to regulate the HAP, sometimes because the HAP itself is too difficult to measure.

We have previously approved the use of surrogates where the EPA's choice of a surrogate for the HAP is "reasonable." *See, e.g.*, *Nat'l Lime Ass'n*, 233 F.3d at 637. Here, the Industry Petitioners claim the EPA's use of CO as a surrogate was not reasonable for a particular type of emissions—organic HAP emissions from coal-fired boilers—for two reasons. First, the EPA based the MACT standards on datasets that contained numerous "non-detects" for these organic HAPs. Second, the Agency failed to explain why it used CO as a surrogate for major boilers, but used work-practice standards to regulate similar emissions from other types of boilers in another rule. We find no merit in either argument and, accordingly, deny this challenge.

The Industry Petitioners base their first argument on a deficiency in the EPA's dataset for coal-fired boilers' emissions—*i.e.*, the dataset contained numerous "non-detects" for organic HAP emissions. A test result is considered a "non-detect" when emissions testing returns a value below that which the test methods are capable of detecting. According to the Industry Petitioners, multiple non-detects in a dataset demonstrate that it is "not feasible" to set a numeric emission standard for the affected HAP. As a result, they argue, the EPA should have set work-practice standards for

these HAPs under section 7412(h)(2), which permits the EPA to set such standards when it is "not feasible" to set a numeric emission standard. *See* 42 U.S.C. § 7412(h)(2).

This argument fails because Petitioners have not explained how the non-detects here made setting numeric emissions "not feasible," as that term is defined in the CAA. The CAA expresses a clear preference for MACT emission standards and limits the EPA's ability to fashion more flexible work-practice standards. *Compare id.* § 7412(d)(3) (providing that emission standards "shall not be less stringent" than the MACT floor), *with id*. § 7412(h)(1) (permitting work-practice standards only if MACT standards are "not feasible"). To set a work-practice standard for these emissions, in fact, the EPA would need to find that it is *infeasible* to set a numeric standard for a particular HAP. *Id.* § 7412(h)(1). And, as relevant here, the statute defines setting a numeric standard as "not feasible" where "the application of measurement methodology to a particular class of sources is not practicable due to technological and economic limitations." *Id.* § 7412(h)(2)(B).

This is a high bar and Petitioners have not demonstrated that the non-detects they have identified meet it. During notice and comment, the Agency reasonably explained that non-detects are present in many of its datasets because they are inherent to the imprecision associated with measuring boiler emissions. *See, e.g.*, 2011 Major Boilers Rule, 76 Fed. Reg. at 15,623. The EPA's scientific conclusion that its data was nevertheless sufficient to set numeric standards receives an "extreme degree of deference." *Kennecott Greens Creek Mining Co. v. Mine Safety & Health Admin.*, 476 F.3d 946, 954-55 (D.C. Cir. 2007) (quotations omitted). And the Industry Petitioners never explain here why the particular

level of non-detects found in *this* dataset nevertheless made a numeric standard infeasible. Although the Industry Petitioners point to several comments asserting that no coal-fired boiler could meet the current numeric standards in all HAP categories, these general comments say nothing about the relevant question under the statute: whether it was feasible to establish numeric standards for organic HAP emissions in light of the non-detects in the coal-fired boiler datasets.

We also reject the Industry Petitioners' second argument that the EPA needed to explain why it established work-practice standards for other types of boilers in the unrelated "Utility MATS" rule. We take an "every tub on its own bottom" approach to the EPA's setting of emission standards pursuant to the CAA. *Sierra Club I*, 353 F.3d at 986. The adequacy of the underlying justification offered by the Agency is what matters in an arbitrary-and-capricious review—not what the Agency did on a different record concerning a different industry. *Id.* As a result, we cannot find that it was unreasonable for the EPA to use CO as a surrogate in setting numeric standards for coal-fired boilers on this basis. Nor can we find that the EPA was required on reconsideration to explain the discrepancy between its approach to organic HAP emissions in these two rules, as Petitioners assert. *See id.* at 987 ("EPA could have noted where the bases for its decision in this case differed from those with respect to other decisions in other cases, as was done in the EPA's brief to this court . . . but such explanations are not required given the different contexts of the various rulemakings.").

G. HEALTH-BASED EMISSIONS LIMITATION FOR HCL

In the Major Boiler Rule, the EPA chose not to exercise its discretion to create more lenient emission standards for hydrogen chloride (HCl) based on health. The Industry Petitioners challenge this decision as arbitrary and capricious because, they claim, the Agency considered impermissible factors in reaching the decision and departed from its previous position without adequate justification. We disagree and hold the EPA reasonably chose not to establish a health-based emissions limitation for HCl.

The EPA generally must establish emission standards for all listed pollutants emitted from a source category based on what the best performing similar sources have achieved, *i.e.*, the MACT floor. The Agency, however, may consider adopting alternative health-based emission standards—which are more lenient—for pollutants with an established health threshold. *See* 42 U.S.C. § 7412(d)(4). The statutory language permitting these alternative standards is discretionary, providing that "[w]ith respect to pollutants for which a health threshold has been established, the Administrator *may* consider such threshold level, with an ample margin of safety, when establishing emission standards under this subsection." *Id.* (emphasis added). But, even if the EPA considers, in its discretion, a health-based emission standard, the statutory text nowhere requires that the EPA adopt a more lenient standard than the MACT floor. This provision thus allows, but does not require, the EPA to adopt a standard more lenient than the MACT floor, subject to two critical restrictions: the Agency must determine (1) that there is an established health threshold, and (2) that the established threshold would provide "an ample margin of safety."

Using this authority, the EPA considered and adopted health-based emission standards for HCl in an earlier rulemaking for major boilers. *See* 2004 Boilers Rule, 69 Fed. Reg. at 55,240-41. At the time, the Agency based its decision on three key findings: a health threshold was established for HCl, adverse health effects were unlikely at emissions below that level, and low HCl emissions from major source boilers made HCl a "particularly well-suited" candidate for more lenient standards. *Id*. at 55,241. The EPA also said, however, that it was not embracing a general policy for HCl, but would instead "undertake in each individual rule to determine whether it is appropriate to exercise [the Agency's] discretion" to adopt such standards. *Id.* We later vacated that rule without considering the merits of the EPA's HCl decision. *See NRDC I*, 489 F.3d 1250.

The EPA again chose to consider a health-based standard for HCl in the current rulemaking, but this time declined to set such a standard. 2010 Major Boilers Rule, 75 Fed. Reg. at 32,030. The EPA explained that it continued to interpret its authority under section 7412(d)(4) to require that it find a health threshold exists, with an ample margin of safety, before using its discretion to depart from an established MACT floor. *Id.* The Agency reasoned further that, even if it made a finding that a health threshold exists, the discretionary nature of the authority allowed it to weigh additional factors when choosing whether to adopt the more lenient health-based standard. *Id.* Those factors included: the potential for *cumulative* adverse health effects due to concurrent exposure to other HAPs or emissions from other nearby sources; potential impacts of increased emissions on ecosystems; and reductions in emissions of other pollutants, also known as "co-benefits," achieved through enforcement of the HCl MACT floor. *Id.* at 32,030-31.

Applying this interpretation, the EPA suggested in its proposed rule that a health-based standard for HCl might not be appropriate because these additional health and environmental considerations cautioned against a more lenient emission standard. *Id.* at 32,031. The Agency acknowledged, in particular, that its decision in the 2004 rule was based on data that considered *only* the chronic respiratory effects of HCl exposure. *Id.* While affirming the validity of those findings, the EPA explained that those chronic impact studies did not consider the additional variables it had now identified, nor did it consider the potential acute or carcinogenic effects that might be caused by HCl exposure. *Id.* And, because of these potential (though unproven) risks, the Agency resolved that it currently lacked sufficient information to establish an HCl emission standard that would protect health with an ample margin of safety. *Id.* It thus requested additional data from stakeholders and the regulated community to help address its concerns, including information regarding the potential cumulative effects of HCl emissions from boilers and other nearby sources. *Id.*

After receiving numerous comments on the issue, the EPA declined to set a health-based standard in the final rule for two primary reasons: (1) the comments had not provided sufficient data on potential *cumulative* health and environmental effects caused by HCl emissions from boilers and other nearby sources; and (2) the comments affirmed the potential *co-benefits* that limiting HCl emissions might have in lowering emissions of other HAP and non-HAP pollutants. 2011 Major Boilers Rule, 76 Fed. Reg. at 15,643-44. According to the EPA, its consideration of these co-benefits was not a regulation of other pollutants; rather, it was simply choosing not to ignore the purpose of the CAA—to reduce the negative health and environmental effects of HAP

emissions—when exercising its discretionary authority under the Act. *Id.* at 15,644.

The Industry Petitioners contend that the EPA's consideration of the broad potential health and environmental impacts of HCl rendered the Agency's decision arbitrary and capricious. In particular, they argue that the Agency based its decision on two impermissible factors that were not supported by the record: (1) the potential cumulative effects of emissions from boilers and other nearby sources, and (2) the co-benefits of setting a more stringent MACT floor standard for HCl. We disagree on both counts.

The statutory text and purpose of section 7412(d)(4) amply support the Agency's decision to consider potential cumulative risks associated with emissions from boilers and other nearby sources. Although other CAA provisions require the EPA to set emission standards based on the emissions from a particular source, section 7412(d)(4)'s plain language is not focused on emissions from any particular source. *Compare* 42 U.S.C. § 7412(d)(3) (instructing the EPA to set emission standards for *sources* at the level achieved in practice by the best controlled similar *source*), *with id.* § 7412(d)(4) (containing no mention of emissions from a particular source). The EPA's consideration of the cumulative impacts from these emissions is also relevant to the Agency's statutory mandate to ensure that a health threshold would protect health with an "ample margin of safety." As such, the Agency had discretion to consider the potential risks associated with the cumulative emissions of boilers and other nearby sources under this provision.

The EPA was likewise free to consider potential co-benefits that might be achieved from enforcing the HCl

MACT floor. Section 7412(d)(4)'s text does not foreclose the Agency from considering co-benefits and doing so is consistent with the CAA's purpose—to reduce the health and environmental impacts of hazardous air pollutants. The Agency was under no obligation to ignore the CAA's purpose in making a final decision on whether to exercise a discretionary authority.

The Industry Petitioners attempt to refute this straightforward conclusion by pointing to "restrictions" in another provision, section 7412(d)(2). No. 11-1108 Indus. Pet'rs' Br. 55-56. This provision requires the EPA to consider costs, non-air quality health and environmental impacts, and energy requirements in setting *maximum* achievable emission standards. Petitioners contend that these same "restrictions" must be read into section 7412(d)(4). But, even if we assume Petitioners are correct that these factors restrict the Agency's ability to consider other factors under section 7412(d)(2), that provision furthers the statute's command to set the strictest possible emission standards above what has already been achieved (*i.e.*, the MACT floors). Section 7412(d)(4), by contrast, is a permissive authority for the EPA to *abandon* already achieved emission standards. We do not read limits on the EPA's authority to *set more stringent* standards into a provision laying out the EPA's authority to *set more lenient* standards. If anything, the difference between the provisions cuts the other way. Section 7412(d)(4) does not specify the factors that Petitioners argue for, while section 7412(d)(2) does. This difference shows that Congress knew how to provide such limits where it found them necessary. We thus find no basis to conclude that the EPA could not consider potential cumulative effects or co-benefits in rejecting a more lenient health-based HCl standard.

Finally, the Industry Petitioners claim that the EPA's decision was arbitrary because the Agency failed to support its reversal from the 2004 rule, in which it set health-based emission standards for HCl. Because the EPA changed its position, the Petitioners contend that the Agency had to present *factual* support for its decision to disregard the facts and circumstances that underlay its prior adoption of a health-based HCl standard. *See FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 516 (2009). The Agency failed to do this, Petitioners say, because it relied on a data *gap* regarding the potential cumulative effects of HCl exposure. But this argument fares no better than Petitioners' first.

At the outset, Petitioners misstate the EPA's burden to justify its change in policy. Although an agency does not generally need to provide a more substantial explanation or reason for a policy change than for any other action, it must do so where "its new policy rests upon factual findings that contradict those which underlay its prior policy." *Id.* at 515. In that circumstance, "it is not that further justification is demanded by the mere fact of policy change; but that a reasoned explanation is needed for disregarding facts and circumstances that underlay or were engendered by the prior policy." *Id.* at 515-16. The EPA, therefore, was not required to refute the factual underpinnings of its prior policy with new factual data. The Agency only needed to provide a reasoned explanation for discounting the importance of the facts that it had previously relied upon. *Id.*

The EPA did so here by explaining that its prior decision focused too narrowly on the chronic respiratory effects of HCl emissions without considering the broader implications of such emissions on health and environmental conditions. *See* 2010 Proposed Major Boilers Rule, 75 Fed. Reg. at 32,030-

31. In so doing, the EPA neither contradicted nor abandoned the factual findings it made in its earlier rulemaking. It instead acknowledged that those findings were more limited than what it now considered necessary to justify the exercise of its discretion to set a health-based standard. *Id.* For example, the Agency noted that: (1) little research had been done on HCl's carcinogenicity or on the toxicity of mixtures of HCl and other respiratory irritants emitted from boilers; and (2) the Agency had no data about peak short-term emissions of HCl from major boilers that might create risks of acute exposure. *Id.*

These enumerated concerns were sufficient to support the Agency's decision not to adopt a health-based standard. Section 7412(d)(4) does not require that the EPA present affirmative factual data to reject a health-based standard. The provision requires just the opposite: in order to *impose* a health-based standard, the Agency must find that a health threshold can be set that provides an ample margin of safety. The EPA here determined that it could not do so, in part because it lacked relevant data like that discussed above. 2011 Major Boilers Rule, 76 Fed. Reg. at 15,643-44. In other words, the EPA could not determine that any health threshold would provide an ample margin of safety to protect health. Without such a finding, the EPA could not invoke its discretionary authority under the statute. *Id.* There was thus nothing impermissible in the EPA's reliance on a lack of data in rejecting a more lenient health-based standard. The EPA's decision not to adopt health-based emission standards for HCl was not arbitrary and capricious.

H. EMISSIONS AVERAGING OF MULTIPLE CISWI UNITS IN ONE FACILITY

Certain industry entities urged the EPA to allow facilities with more than one CISWI unit to demonstrate MACT compliance by showing that the average HAP emissions across all units at that location fell under the relevant cap. They pointed to the EPA's allowance of emissions averaging in the Major Boilers Rule but the Agency defended its disparate treatment because, in its view, "[t]he applicability of CISWI is such that each unit is an affected facility." *See* 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,463. It subsequently elaborated that it did "not believe [it has] the legal authority to allow emissions averaging in CISWI or under section [7429] generally because each individual unit is an affected facility." CISWI Rule—Responses to Comments, at 195-96. The Industry Petitioners challenge the disallowance of facility-wide averaging for CISWIs, arguing that "unit" cannot mean "facility" because section 7429(g)(1) defines "solid waste incineration unit" as "a distinct operating unit of any facility" and therefore the EPA's rule fails *Chevron* step 1. They also argue the EPA's conflation of "unit" and "facility" is unreasonable, and thus violates *Chevron* step 2, because the EPA has allowed emissions averaging in a different section 7429 rule and in a number of section 7412 rules.

Although the Industry Petitioners' point is well taken—the plain terms of the CAA foreclose the EPA's conflation of a CISWI "unit" and "affected facility," *see* 42 U.S.C. § 7429(g)(1) ("facility" is comprised of "units")—we agree that the EPA has no statutory authority to allow emissions

averaging under section 7429.[18] Section 7429 requires the EPA to regulate emissions from all "solid waste incineration units," 42 U.S.C. § 7429(a)(2); *see also id.* § 7429(a)(4), and the CAA defines a "solid waste incinerator unit" as "a *distinct operating unit*" of a "facility," *id.* § 7429(g)(1) (emphasis added). In other words, because the CAA mandates that the EPA regulate each "distinct" CISWI unit in a "facility," the EPA cannot allow emissions averaging of *all* CISWI units in a facility. *See id.*

For this reason, the Industry Petitioners' *Chevron* challenge fails, notwithstanding the EPA's minimal explanation set forth in its proposed CISWI Rule. It is axiomatic that an agency must "articulate[] an *adequate* explanation for its action," *Int'l Fabricare Inst. v. EPA*, 972 F.2d 384, 389 (D.C. Cir. 1992) (emphasis added); *see also State Farm*, 463 U.S. at 48, but the EPA's failure to do so here cannot create statutory authority that does not exist. And because the EPA has no authority under section 7429 to allow emissions averaging of multiple CISWI units in one facility, the Petitioners' *Chevron* argument does not carry the day.[19]

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[18] The EPA *does* have statutory authority under section 7412 to allow facility-wide emissions averaging in the Major Boilers Rule. *See* 42 U.S.C. § 7412(a)(1) ("major source[s]" defined as "any stationary source or *group of stationary sources* located within a contiguous area and under common control" (emphasis added)); *see also id*. § 7411(a)(3) ("stationary source" defined as "any building, structure, facility, or installation which emits or may emit any air pollutant").

[19] The EPA concedes that it once allowed, in a different rule, emissions averaging for units subject to section 7429 but has since concluded that it does not have the statutory authority to do so. Although the Industry Petitioners argue that the Agency arbitrarily

IV. ENVIRONMENTAL PETITIONERS' CHALLENGES

A. CARBON MONOXIDE AS A SURROGATE

As explained at *supra* §§ I.B.1 and III.F, the EPA used carbon monoxide (CO) as a surrogate for several non-dioxin/furan organic HAPs when the Agency set the MACT floors for major boilers. In support of this approach, the EPA found that both CO and these HAPs were the products of "incomplete combustion." 2010 Proposed Major Boilers Rule, 75 Fed. Reg. at 32,018. The Agency concluded as a result that CO was a reasonable surrogate because: (1) minimizing CO emissions would minimize these HAPs; (2) methods used for the control of these HAP emissions would be the same methods used to control CO emissions (*i.e.*, good combustion or using an oxidation catalyst); (3) standards limiting CO emissions would result in decreases in these HAP emissions; and (4) establishing emission limits for individual organic HAPs would be impractical and costly. *Id.* Although several commenters challenged aspects of this reasoning, the EPA ultimately stuck with its decision to use CO as a surrogate for non-dioxin/furan organic HAP emissions, without further explanation, in the final Major Boilers Rule. *See* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,145 (explaining the EPA was denying Sierra Club's petition to reconsider the suitability of CO as a surrogate for non-organic HAPs based on the reasoning provided by the Agency in the 2010 proposed rule).

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changed its position, the fact that the EPA may have acted outside its authority in a rule is not at issue here. "[P]revious statutory violations," of course, "cannot excuse" new ones. *New Jersey v. EPA*, 517 F.3d 574, 583 (D.C. Cir. 2008).

The Environmental Petitioners challenge this decision, arguing that the EPA has not adequately explained how setting emission standards for CO will accomplish what the statute plainly requires: that the EPA set emission standards for organic HAPs at the average level achieved by the best performers *with regard to those HAPs*. We agree and remand to the EPA to adequately explain how CO acts as a reasonable surrogate for non-dioxin/furan organic HAPs. We do not, however, vacate the current emission standards because we conclude that the Agency will likely be able to adequately explain its decision on remand and that vacatur would prove substantially disruptive.

The EPA may use a surrogate to regulate HAPs under section 7412 where "reasonable." *See, e.g.*, *Nat'l Lime Ass'n*, 233 F.3d at 637. To be reasonable, the emission standard set for the surrogate must reflect what the best source or best 12 per cent of sources in the relevant subcategory achieved with regard to the HAP. *See Sierra Club I*, 353 F.3d at 984. This requires the surrogate's emissions to share a close relationship with the emissions of the HAP. *Id.* One crucial factor we have identified for determining whether that close relationship exists is the availability of alternative control technologies. *See id.* at 985. These technologies regulate the HAP without impacting a surrogate's emissions, or regulate the surrogate without impacting the HAP. *Id.* As we have explained, the importance of this factor to our reasonableness analysis "is clear: if EPA looks only to [the surrogate], but HAPs are reduced [in another] way that does not reduce [the surrogate], the best achieving sources, and what they can achieve with respect to HAPs, might not be properly identified." *Id.*

In the Major Boilers Rule, the EPA proposed using CO as a surrogate because, as relevant here: (1) the lowest possible

CO emissions resulted in the lowest possible HAP emissions, and (2) the same combustion and oxidation control methods reduce both types of emissions. *See* 2010 Proposed Major Boilers Rule, 75 Fed. Reg. at 32,018. But, during notice and comment, the EPA failed to directly consider and respond to several comments that introduced evidence suggesting that other control technologies and methods could be effectively used to reduce HAP emissions without also impacting CO emissions, or vice versa. *See, e.g.*, Inst. of Clean Air Cos., Comments on National Emission Standards for Hazardous Air Pollutants for Major Sources, EPA-HQ-OAR-2002-0058 (Aug. 23, 2010), at 20-21 (No. 11-1108 J.A. 822-23); Responses to Public Comments on EPA's National Emission Standards for Hazardous Air Pollutants for Major Sources, vol. 2, EPA-HQ-OAR-2002-0058 (Feb. 2011) (No. 11-1108 J.A. 1033, 1035-36, 1049-52). The EPA ultimately decided to use CO as a surrogate for all non-dioxin/furan organic HAPs in its final rule without ever addressing whether such alternative control technologies and methods might be used to lower organic HAP emissions further. *See* 2011 Major Boilers Rule, 76 Fed. Reg. at 15,654; 2013 Major Boilers Rule, 78 Fed. Reg. at 7,138. Instead, the Agency responded by doubling down on its assertion that both CO and organic HAP emissions were the product of poor combustion and, as a result, optimal combustion would minimize the emissions of both CO and non-dioxin/furan organic HAPs. 2013 Major Boilers Rule, 78 Fed. Reg. at 7,145. But this response was no response at all to the substantial concerns raised in the comments that other variables might also affect emissions.

Although we afford an agency's scientific decision "an extreme degree of deference," *see Kennecott Greens*, 476 F.3d at 954-55 (quoting *Hüls Am., Inc. v. Browner*, 83 F.3d 445, 452 (D.C. Cir. 1996)), we cannot uphold an agency

decision that does not consider all relevant factors or fails to establish a reasonable connection to the facts in the record. *Cf. Ethyl Corp. v. EPA*, 51 F.3d 1053, 1064 (D.C. Cir. 1995). The EPA could not conclude that CO acts as a reasonable surrogate in this statutory context without at least *considering* a key factor: whether the best performing boilers might be using alternative control technologies and methods that reduce organic HAP emissions beyond what they achieve by regulating CO alone. *See Sierra Club I*, 353 F.3d at 985. We therefore reject the EPA's contention that its reason for using CO as a surrogate—that good combustion would minimize both CO and non-dioxin/furan organic HAP emissions—was alone sufficient to support its decision.

We recognize that there might be a context where a surrogate's use is reasonable despite the presence of alternative control methods or technologies, but the Agency does not explain why it did not need to even *consider* whether such methods might further reduce HAPs here. For example, if the EPA used a surrogate that was closely correlated to the HAP and set surrogacy emission standards at a level that would eliminate HAP emissions altogether, the Agency might not need to account for alternative control technologies in its final rule. In that case, the use of the surrogate would not call into question whether the Agency had regulated the HAP as required by the statute because, after all, nothing is better than eliminating HAP emissions entirely. But the Agency offers us no analogous explanation or supportive data here. Although it is possible that all of the challenged CO emission standards are in fact set at such a level, the Agency has not defended the rule on such reasoning. Indeed, the Agency failed to consider or even comment directly on this issue, including whether certain post-combustion processes might increase organic HAP emissions without a corresponding

increase in CO emissions. We cannot ignore such an oversight in this context.

We reject, however, the Environmental Petitioners' other argument that combustion-related issues preclude the EPA from using CO as a surrogate for non-dioxin/furan organic HAPs. The Petitioners contend that the EPA's decision to use CO was arbitrary because record evidence demonstrated a breakdown in the correlation between CO and organic HAP emissions at CO emission levels below 130 parts per million (ppm). But the EPA explained that this apparent breakdown was most likely caused by the difficulty of measuring the regulated HAP at such extremely low emission levels, rather than by a flaw in the correlation between CO and organic HAPs. 2013 Major Boilers Rule, 78 Fed. Reg. at 7,144-45; Memorandum from Eastern Research Group, Inc. to Jim Eddinger, EPA, Revised MACT Floor Analysis for the Industrial, Commerical, and Institutional Boilers and Process Heaters National Emission Standards for Hazardous Air Pollutants—Major Source (2012 MACT Floor Memorandum) (Aug. 2012), at 11-12 (No. 11-1108 J.A. 1462-63). This is precisely the sort of scientific judgment to which we must defer and accordingly, we do so on this point. *See Kennecott Greens*, 476 F.3d at 954-55. The Environmental Petitioners fail to provide any reason to believe that organic HAP emissions can, in fact, be accurately measured at such low levels. And the Agency's explanation also addresses why the EPA discounted record evidence regarding extremely high burn temperatures that demonstrated a potential breakdown in the CO and organic HAP relationship as HAP emissions approached zero.

Still, the EPA's failure to address substantial record evidence on the potential availability of alternative control

technologies or methods rendered the Agency's use of CO as a surrogate for certain organic HAPs arbitrary and capricious. We thus remand the portion of the Major Boilers Rule providing for CO's use as a surrogate for non-dioxin/furan organic HAPs to the Agency for further consideration. We do not, however, vacate the current emission standards based on CO's use as a surrogate. We may remand without vacatur where there is a likelihood of (1) cure on remand, and (2) a substantial disruptive effect that would result from vacatur. *See Heartland Reg'l Med. Ctr. v. Sebelius*, 566 F.3d 193, 197-98 (D.C. Cir. 2009). Here, vacatur would cause substantial disruptive effects by removing emission limits for the regulated HAPs. And it is likely that the EPA will be able to adequately explain its use of CO on remand after properly considering the matter. As a result, we decline to vacate the current standards in the interim.

B. EXCLUSION OF CERTAIN UNITS FROM MACT ANALYSIS

In the Major Boilers Rule, the EPA created subcategories based primarily on the fuel combusted. *See* 2013 Major Boilers Rule, 78 Fed. Reg. at 7,142. To qualify for certain subcategories, the EPA required that a source burn a fuel mixture comprised of only 10 per cent of the subcategory-defining fuel. *See, e.g.*, *id.* at 7,193 ("Unit designed to burn solid fuel subcategory means any boiler . . . that burns . . . *at least 10 percent solid fuel* . . . in combination with liquid fuels or gaseous fuels." (emphasis added)). Notwithstanding the low bar for inclusion, we conclude, and discuss at greater length below, *see infra* § IV.J, that the EPA reasonably exercised its discretion when it subcategorized boilers this way.

We cannot say the same about the EPA's exclusion of certain high-performing units from its MACT-floor calculation. Although the EPA allowed sources that combust only *10 per cent* of a subcategory-defining fuel to join that subcategory, it declined to consider emissions from any source that burned *less than 90 per cent* of the subcategory-defining fuel when determining the average emissions level of the best performing sources in setting MACT floors for existing sources. And when it set a subcategory's MACT floors for new sources, the Agency declined to consider the emissions levels from any source that did not burn *100 per cent* of the fuel. This disparate treatment makes a difference; several sources excluded from the MACT-floor determination were among the best performing sources (or, in some cases, the single best performing source) in that fuel-based subcategory.

The CAA, however, demands that source subcategories take the bitter with the sweet. Section 7412 mandates, without ambiguity, that the EPA set the MACT floor at the level achieved by the best performing source, or the average of the best performing sources, in a subcategory. *See* 42 U.S.C. § 7412(d)(3)(A), (B). It thus follows that if the EPA includes a source in a subcategory, it must take into account that source's emissions levels in setting the MACT floor.

The Agency, however, claims discretion to omit from MACT-floor computation sources it considers dissimilar. In support, it cites section 7412(d)(3), which provides that MACT standards must be no less stringent than "the best controlled *similar* source, *as determined by the [EPA]*." *Id.* § 7412(d)(3) (emphases added). Our decision in *Sierra Club II*, 479 F.3d 875, however, forecloses this argument. In *Sierra Club II*, the EPA set MACT standards for brick and

ceramic kilns. *Id.* at 879. For some subcategories, the EPA based its MACT-floor determination on "the pollution control devices used by the *second-best performers*," not the best performers. *Id.* (emphasis added). Although the EPA argued that it "reasonably construe[d] the term 'best performing' . . . to allow it to consider whether retrofitting kilns with a particular pollution control technology is technically feasible," *id*. at 880 (alterations in original), we held that the EPA could not circumvent the requirement that it base the MACT floor "on the emission level actually *achieved* by the best performers (those with the lowest emission levels)." *Id.* at 880-81 (citing *Cement Kiln*, 255 F.3d at 861) (emphasis in original). We reach the same conclusion here.

The EPA tries to distinguish *Sierra Club II*, arguing that the issue in that case "was whether [the] EPA could exclude all units using the most-effective emission control technique because it might not be applicable to all existing units"; however, "[h]ere, [the] EPA is excluding a test result that is unrepresentative of typical operations of units in the subcategory, and thus is inappropriate to use in establishing the MACT floor." No. 11-1108 EPA Br. 81. But it makes no difference whether the EPA exempts from consideration units with certain highly effective technology or units with impressive test results driven by the fuel combination it combusts. Either approach contravenes our holding in *Sierra Club II* that the EPA cannot ignore "the emission level actually achieved by the best performers (those with the lowest emission levels)" in the subcategory. 479 F.3d at 880 (emphasis omitted). In any event, the EPA has not simply excluded aberrant test results; it has excluded an entire class of units—those burning less than 90 per cent of the subcategory's fuel—even though every one of those units fits

the subcategory's parameters. This is no different from what we rejected in *Sierra Club II*.

The EPA insists that if a source is "unrepresentative of typical operations of units in the subcategory," it is "inappropriate to use [it] in establishing the MACT floor." No. 11-1108 EPA Br. 81. Not so. "The idea is to set limits that, as an initial matter, require all sources in a category to at least clean up their emissions to the level that their best performing peers have shown can be achieved." *Sierra Club I*, 353 F.3d at 980 (citing 42 U.S.C. § 7412(d)(3)). For this reason, an unusually high-performing source should be considered; indeed its performance suggests that a more stringent MACT standard is appropriate. Accordingly, we vacate the MACT standards for all major boiler subcategories that would have been affected had the EPA considered all sources included in the subcategories.[20]

C. UPPER PREDICTION LIMIT

Sections 7412 and 7429 create MACT-floor criteria that, for our purpose, are materially the same. *Compare* 42 U.S.C.

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[20] In its brief, the EPA argued that the Environmental Petitioners' challenge was moot either because the challenged MACT standards had been remanded for other reasons or because inclusion of the allegedly dissimilar sources would not have affected the MACT standard. During oral argument, however, it conceded that it misunderstood the scope of the Petitioners' argument, which argument challenges unremanded MACT standards that have in fact been affected by the EPA's decision to omit certain high-performing sources from its MACT-floor analysis. *See* Oral Arg. Recording pt. B at 48:28-49:22. We believe that the Environmental Petitioners' challenge is not moot and has not been waived.

§ 7412(d), *with id.* § 7429(a)(2). In both provisions, the CAA mandates that MACT floors have maximum stringency but also be continuously achievable. *See id.* § 7412(d)(2), (k); *id.* § 7429(a)(2); *id.* § 7602(k). Satisfying the statutory criteria is no easy task, especially because no source emits any HAPs at a constant level. *See* Page Mem. 6. Rather, emissions levels fluctuate over time and for many reasons. *See id.* at 3.[21] We have held, *see Mossville Envtl. Action Now v. EPA*, 370 F.3d 1232, 1242 (D.C. Cir. 2004), and recently reaffirmed, *see NACWA*, 734 F.3d at 1133-34, that the EPA can consider this variability when setting MACT floors.

Further complicating the task is the way in which sources typically measure emissions. Virtually all of the data the EPA collects to set MACT floors come from the three-run stack test. Page Mem. 6. The three-run stack test, as the name suggests, involves three measurements of the source's emissions taken over a short time period (*i.e.*, no more than a few days) with each of the three test "runs" lasting from one hour to four hours. *Id.* at 3. Because the tests provide three "snapshots" of a source's emissions performance, they cannot accurately represent the source's full range of emissions over *all* times and under *all* conditions. *Id.* at 3-4. Because stack testing typically involves "three separate runs," however, it "will in most cases show *some* of a particular source's

[21] *See also* Page Mem. 2-3 ("This variability occurs due to a number of factors, including measurement variability (both sampling and analysis) and short term fluctuations in the emission levels that result from short-term changes in fuels, processes, combustion conditions, and controls.").

variability over the short period of time during which testing was conducted." *Id.* at 6 (emphasis added).[22]

1. *NACWA*, 734 F.3d 1115 (D.C. Cir. 2013)

Based on the limitations inherent in stack testing, the EPA concluded that it could not set MACT floors based on that testing alone. It began using the UPL to account for the HAPs-emissions variety that stack-testing data do not reflect. *See NACWA*, 734 F.3d at 1122. The Agency did so in several rules promulgated in 2011, including not only the Major Boilers Rule and the CISWI Rule but also the Sewage Sludge Incinerator Rule addressed in *NACWA*. *See id.* In that case, the petitioners challenged the EPA's UPL use, arguing that the Agency failed to establish that the UPL fairly represented the "average emissions limitation achieved" by the best performing sources to set the Sewage Sludge Incinerator MACT floors and, accordingly, was "unlawful and arbitrary." *Id.* at 1130. We agreed in part. *See id.* at 1119.

Specifically, we struggled to pin down the EPA's precise interpretation of the phrase "average emissions limitation achieved by the best performing 12 percent of units." *Id.* at 1142-43 (quoting 42 U.S.C. § 7429(a)(2)).[23] As best we could tell, the EPA defended its use of the UPL as follows: "[b]ecause the [UPL] represents the value which [the EPA]

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[22] *See also* Page Mem. 5 ("[E]ven single three run tests, which are performed over a short period of time, typically show different emissions levels during each individual test run.").

[23] *See also NACWA*, 734 F.3d at 1142 ("[I]t *seems* EPA has adopted yet another interpretation of the phrase 'average emissions limitation achieved by the best performing 12 percent of units.'" (emphasis added)).

can expect the mean (*i.e.*, average) of *three future observations* (3-run average) to fall below, based upon the results of the independent sample size from the same population, the [UPL] reflects average emissions." *Id.* at 1142 (quoting Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Sewage Sludge Incineration Units, 76 Fed. Reg. 15,372, 15,389 (Mar. 21, 2011)) (emphasis added) (some alteration in original). In our view, however, "the word 'average' . . . seems to mean the average emissions limitation that the *existing* population of the best-performing 12 percent of incinerators *has achieved*." *Id.* (emphases added).

Despite these doubts, we reasoned that the EPA could have "plausibl[y]" concluded that the UPL represents the "average emissions limitation achieved" by the best performing sources. *Id.* at 1143. That said, we were not willing to assume the EPA's responsibility of "supply[ing] a reasoned basis" for its UPL use. *Id.* (quoting *Bowman Transp., Inc. v. Ark.-Best Freight Sys., Inc.*, 419 U.S. 281 (1974)). For that reason, we remanded—but did not vacate, *see id.* at 1161—the UPL portion of the Sewage Sludge Incinerator Rule and ordered the EPA to "clarify how the [UPL] represents the average emissions limitation achieved by the best performing 12 percent." *Id.* at 1143 (internal quotation marks omitted).[24]

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[24] *See also NACWA*, 734 F.3d at 1151 ("[W]hile we determine that [the] EPA's use of the [UPL] may be lawful, we are remanding this portion of its rulemaking for further explanation on the issue[] of how the upper prediction limit represents the average emissions limitation achieved . . . ." (internal quotation marks omitted)).

Because the EPA also used the UPL in the Major Boilers Rule and the CISWI Rule, the Agency moved for a limited remand of the current petitions so that it could include its revised UPL explanation in the administrative records of these two regulations.[25] *See* Page Mem. 2. On July 14, 2014, the EPA published a fifteen-page memorandum authored by Stephen D. Page, the EPA Director of Air Quality Planning and Standards (Page Memorandum), in response to *NACWA*. *See id.* at 1. The EPA's current explication of the UPL is now before us.[26]

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[25] In *NACWA*, we had other problems with the EPA's use of the UPL. Specifically, the EPA had explained that "a smaller dataset may have greater variability, and thus a higher [UPL]." *NACWA*, 734 F.3d at 1144. We instructed the EPA not only to explain its use of the UPL in general but also to "explain why the [UPL] could still be considered accurate *given a small dataset*" in particular. *Id.* at 1144-45 (emphasis added). In its remand motion, the EPA represented that it could "adequately explain why [its] use of the UPL in general is consistent with Clean Air Act requirements through a remand of the record for a limited time" but that "the question of whether the UPL is an appropriate statistical method for small data sets requires more analysis . . . [along with] additional notice and comment rulemaking." No. 11-1108 Mot. for Remand 9, 13 (Feb. 28, 2014). We agreed and, for this reason, the only issue we decide today is whether the EPA carried its burden of establishing, as a general matter, that the UPL reasonably estimates the average emissions level achieved by the best performing source or sources to set MACT floors.

[26] The Environmental Petitioners urge us to ignore the Page Memorandum, insisting that it "provide[s] a series of new interpretations and assertions that, rather than 'explaining' the prior record, instead contradict and revise the agency's earlier position," in contravention of *NACWA* and the scope of the remand the Agency requested regarding the Major Boilers Rule and the CISWI

2. The Page Memorandum

The Page Memorandum recognized our "concern about the interpretation [we] believed [the] EPA was taking" of the word "average." Page Mem. 3. It clarified that the Agency "does *not* interpret the term 'average'" to mean "the average of a future 3-run compliance test." *Id.* (emphasis added) (quoting *NACWA*, 734 F.3d at 1143). Rather, it explained that the "EPA interprets the average to mean the average emissions over time," based not only on the "average of all emissions test data from the best performing source or sources" but also on "information regarding the *variability* of emissions." *Id.* (emphasis added).

In the EPA's judgment, "variability is a key factor in establishing" MACT standards because "[e]ach MACT standard is based on limited data from sources whose emissions are expected to vary over their long term

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Rule. No. 11-1108 Envtl. Pet'rs' Br. 41. But our *NACWA* decision did not, as the Petitioners would have it, require the EPA to adopt our belief that the Agency construed "average" to mean "the average of a future 3-run compliance test." *See NACWA*, 734 F.3d at 1143. Rather, we asked the EPA to clarify how, in its view, the UPL "represents the 'average emissions limitation achieved by the best performing 12 percent.'" *Id.* (emphasis added). Nor do we think that the EPA altered its initial basis for using the UPL, which the EPA has consistently held out as "a statistical formula designed to estimate a MACT floor level that is equivalent to the average of the best performing sources based on future compliance tests." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,630 (emphasis added). What the EPA failed to do before *NACWA* was to explain how the UPL functions and why it is a reasonable way to calculate "average" emissions levels. The Page Memorandum does precisely that.

performance." *Id*. Specifically, "[t]he available emissions data are generally in the form of short term, three-run stack tests, with each test run lasting for between 1 and 4 hours." *Id*. For this reason, the EPA concluded that it did not have information "encompass[ing] the emissions performance of a source *over time*." *Id.* (emphasis added). And because the "EPA interprets 'emissions performance' . . . to mean the emissions of a source over the *long term*, rather than just during a short-term stack test," the EPA found it necessary to "appl[y] a methodology that *predicts* the actual emissions levels the source is achieving at times *other than* when stack testing was conducted." *Id.* at 3-4 (emphases added).

The UPL is the methodology the EPA selected to account for these limitations. *Id.* at 4. "[A] value derived from widely accepted and commonly used statistical principles," the UPL "represents the upper end of a prediction interval." *Id*. In layman's terms, the UPL uses an equation that considers (1) the average of the best performing source or sources' stack-test results (*i.e.*, the mean); (2) the pattern the stack-test results create (*i.e.*, the distribution); (3) the variability in the best performing source or sources' stack-test results (*i.e.*, the variance); and (4) the total number of stack tests conducted for the best performing source or sources (*i.e.*, the sample size). *Id.* at 4-5.

The UPL, however, cannot demonstrate with absolute certainty the average emissions levels achieved by the best performing sources at all times (indeed, certainty is impossible without continuous monitoring). *See id.* Instead, the UPL equation produces a range of values that is *expected*, given the variance in the relevant stack-test data, to encompass the average emissions levels achieved by the best performing sources a specified percentage of the time. *Id.* at

4. To establish the MACT floor, the EPA calibrated the UPL equation to produce a range in which the average emissions levels of the best performing source or sources would be expected to fall 99 per cent of the time, which is referred to as a 99 per cent confidence interval. *Id.* Once the EPA had this range, it set the MACT floor at the top level of that range—hence, the "upper" in "upper prediction limit"—to arrive at a figure that, 99 out of 100 times, it expected the average emissions levels of the best performing sources to "achieve." *Id.* Or, in the EPA's words, "the 99 percent UPL is the level of emissions that" the EPA is "99 percent confident is achieved by the average source represented in a dataset over a long-term period based on its previous, measured performance history as reflected in short term stack-test data." *Id*.

One of the equations the EPA used to calculate the UPL is as follows:[27]

[27] The EPA used "one of several equations" to calculate the UPL depending on "certain characteristics of [the] dataset," including the distribution of data within the dataset. Page Mem. 4. Here, we set out the equation the EPA used for a dataset with a "normal distribution." *Id.* at 10. For our review, we need not recount the other, somewhat more complicated equations the EPA used in determining the UPL for datasets with, *e.g.*, a "lognormal distribution." *See id.* ("Even though they differ due to separate mathematical properties associated with each distribution, the UPL equations share a common format . . . ."); *see generally id.* at 11 (describing lognormal distribution equation).

$$= \bar{x} + t(0.99, n-1) \times \sqrt{s^2 \times \left(\frac{1}{n} + \frac{1}{m}\right)}$$

NACWA, 734 F.3d at 1139. In this equation:

- "$\bar{x}$" is the mean;
- "*t*(0.99, n-1)" is a value called the "t-statistic," the statistical tool used to set the confidence interval (here, 99 per cent);
- "*n*" is the sample size;
- "*m*" is the number of stack tests that were run to calculate the mean ("$\bar{x}$"); because most stack tests involve 3 "runs," *m* usually equals 3;
- "*s*" represents the "standard deviation."

See id.; *see also* Page Mem. 10-11.

3. Instant Challenges to UPL

After the EPA issued the Page Memorandum, the Environmental Petitioners renewed their argument that the UPL represents neither (1) the "average" emissions limit of the best performing source or sources in a subcategory, nor (2) the emissions levels "achieved" by the best performing sources in a subcategory. We believe that the EPA has carried its burden of demonstrating that the UPL "reflect[s] a reasonable estimate of the emissions achieved in practice by

the best performing sources." *Cement Kiln*, 255 F.3d at 871-72 (internal quotation marks omitted); *see also NACWA*, 734 F.3d at 1148 ("[H]aving decided to account for variability, and having decided to estimate that variability, EPA bears the burden of demonstrating with substantial evidence that its estimate is reasonable.").

Our conclusion is driven, in large part, by the deference we owe the EPA when it determines how best to meet the technical challenges in its area of expertise. Indeed, the EPA "typically has wide latitude in determining the extent of data-gathering necessary to solve a problem" and, for that reason, we have "accorded *Chevron* deference to [its] interpretation of [the CAA] as allowing it to estimate MACT floors." *NACWA*, 734 F.3d at 1131. Moreover, "the requirement that the existing unit floors not be less stringent than the average emissions limitation achieved by the best performing 12 percent of units does not, on its own, dictate how the performance of the best units is to be calculated," *id.* (internal quotation marks omitted)—"[f]loors need not be perfect mirrors of the best-performers' emissions," *Cement Kiln*, 255 F.3d at 871. So long as the EPA "demonstrate[s] with substantial evidence—not mere assertions"—that the UPL "allows a *reasonable inference* as to the performance of the top 12 percent of units," *NACWA*, 734 F.3d at 1131 (quotations omitted) (emphasis added), the EPA has conducted reasoned decision making.

The Agency has done so here. The Page Memorandum explains the limitations of stack-test data—*i.e.*, the "snapshots" cannot reflect the best performing source's or sources' average emissions levels at all times and under all operating conditions. Page Mem. 6. The Page Memorandum also explains that the Agency chose the UPL as a tool

"derived from widely accepted and commonly used statistical principles," *id.* at 4, that "reasonably account[s] for variability in the emissions of . . . sources," *id.* at 2. Finally, the Page Memorandum plugs the analytical gap we identified in *NACWA*—it thoroughly explains *how* and *why* the UPL accounts for the variance and therefore how and why it reasonably represents the emissions level "achieved by the average source" or sources. *Id.* at 3-5. In so doing, the EPA has "clarif[ied]," to our satisfaction, "how the upper prediction limit represents the average emissions limitation achieved." *NACWA*, 734 F.3d at 1143 (internal quotation marks omitted).

The Environmental Petitioners' arguments to the contrary are unavailing. Their primary objection is that the UPL cannot reasonably estimate the "average" emissions level achieved by the best performing source or sources because the UPL represents "a level [the] EPA expects *any* future compliance test by *any* [source] in the top 12 percent to fall below." No. 11-1108 Envtl. Pet'rs' Br. 35 (emphases added) (internal quotation marks omitted).[28] But the Page Memorandum counters the Environmental Petitioners' mistaken understanding of what the UPL represents.[29] According to the EPA, "the UPL does not represent the *worst* emissions performance of the best performing units at any

[28] *See also* No. 11-1108 Envtl. Pet'rs' Reply Br. 15 ("It is, as its name indicates, an upper limit—the emissions limitation that *every* member of the best-performing 12 percent will fall below . . . ." (emphasis in original) (quotation marks omitted)).

[29] The Environmental Petitioners' argument rests, at least in part, on their contention that we should not consider the Page Memorandum at all. We decline their invitation to ignore the explanation we ordered the EPA to provide.

time." Page Mem. 4 (emphasis in original).[30] It is instead "the *average* level expected to have been achieved over time" by the best performing source or sources. *Id.* (emphasis in original). "In other words, the 99 percent UPL is the level of emissions that [the EPA is] 99 percent confident is achieved by the *average source* . . . over a long-term period based on its previous, measured performance history as reflected in short term stack test data." *Id.* (emphasis added).

Next, the Environmental Petitioners criticize the Page Memorandum's explanation that the UPL represents the long-term average emissions levels achieved because "the first element of the UPL equation is the average of the short-term emissions test data from the best-performing sources." *Id.* In their view, the UPL is no different from "saying that, over time, the average of 1, 2, and 3 = 2 + 500 because the first element in the equation (2) is the average of 1, 2, and 3." No. 11-1108 Envtl. Pet'rs' Br. 48. But the UPL does not simply tack an arbitrary increase on top of the stack-test average of the best performing sources. Rather, the UPL "allows [the] EPA to use emissions test data *and the data characteristics*," which include "the distribution and sample size, along with the intrinsic variability *associated with those data*," to estimate "an emissions limit based on a specified level of confidence such that an average best performing existing

[30] *See also* Page Mem. 5 (It is "generally . . . reasonable to establish a [MACT floor] standard that all the best performing 12 percent of existing sources can meet without any modification because the statute requires the Agency to establish the standard at the *average* level of performance of the best 12 percent of sources." (emphasis in original)); *id.* at 14 ("[T]he MACT floor represents the *average* emission level achieved by the best performing sources, not the *worst* emission level achieved by those sources." (emphases in original)).

source would not be expected to exceed the limit a specified number of times." Page Mem. 6 (emphases added). In other words, the UPL does not simply add an arbitrarily chosen value but instead turns entirely on the features inherent in the stack-test data and how those features reflect the natural variance in emissions experienced by the best performing sources over time. *See id.* at 4 ("[T]he MACT floor calculation takes into account the *inherent variability* in emissions performance to more accurately reflect the range of the best performing sources' emissions over time." (emphasis added)).[31] Thus, as the Page Memorandum amply demonstrates, *see id.*, the EPA's use of the UPL is not arbitrary.

The Environmental Petitioners also attack the results produced by the UPL. They provide a series of charts that, in their view, demonstrate that the UPL sets MACT floors far too high to comport with the CAA's mandate that floors represent "the maximum degree of reduction in emissions." *See* 42 U.S.C. § 7412(d)(2). True, some of the charts show that the EPA has set a MACT floor above the highest emissions level recorded by the best performing sources' stack testing. *See* No. 11-1108 Envtl. Pet'rs' Br. 14-15; No. 11-1108 Envtl. Pet'rs' Reply Br. 23. But this does not mean that the UPL is an arbitrary "average" proxy—for at least two reasons.

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[31] *See also* Page Mem. 6-7 ("[T]he UPL equation that is used to account for variability and [to] calculate the MACT floor standard depends on the distribution of the data."); *id.* at 11 ("The UPL . . . is directly related to the confidence level and to the variance, meaning that as either of these values go up or down, so does the UPL value.").

First, the charts selectively included are generated from data sets with considerable variance between the highest recorded stack test and the lowest. Unsurprisingly, if a handful of "snapshots" in a data set demonstrate that emissions levels experience high spikes and low plummets at discrete times, it is more likely that the average emissions level achieved by the best performing sources at *all* times might be high. This is because a data set with high variability will produce a higher UPL than a data set with low variability, even if the two sets share the same average. In other words, the UPL takes large variance into account and therefore naturally goes higher to arrive at the 99 per cent certainty the EPA thinks is appropriate.[32] Second, where the UPL suggested a MACT floor higher than the results of the stack tests, it often did so by insubstantial amounts. Indeed, for at least one chart, "the limit is a mere 4 *millionths* of a pound per million Btu above the emissions test results of best performers, an unalarming amount given that the methodology is supposed to account for *variable* results." No. 11-1108 Indus. Intervenors' Br. 10 (emphases in original). For these reasons, the Environmental Petitioners have not convinced us that the EPA failed to satisfy the

[32] The EPA "selected the 99 percent level in order to provide reasonable assurance that the limit can be met at all times by a source with emissions at the average level achieved by the best performing source or sources." Page Mem. 10. The Environmental Petitioners have not challenged the EPA's choice of a 99 per cent confidence level, as opposed to a lower level of certainty, and we express no opinion on that choice. And we reiterate that the more specific concerns we had with the UPL when we decided *NACWA*—in particular, the UPL's accuracy "given a small dataset"—are not before us. 734 F.3d at 1144-45.

"minimal standard[] of rationality" that we require. *Ethyl Corp. v. EPA*, 541 F.2d 1, 36 (D.C. Cir. 1976) (en banc).

Finally, the Environmental Petitioners insist that "[t]he UPL predicts a level that hypothetical future tests will fall below, rather than estimating what boilers actually achieved," in contravention of the requirement that MACT floors "reflect what the best-performing sources achieved." No. 11-1108 Envtl. Pet'rs' Reply Br. 24 (internal quotation marks omitted). But the Environmental Petitioners ignore the Page Memorandum's explanation that, because the UPL is not time-dependent, it "not only is a prediction of the emissions performance of those sources in tests conducted in the future, but is also an indication of the range of current average emissions performance of those units." Page Mem. 3;[33] *see also* No. 11-1108 Indus. Intervenors' Br. 9 ("Because this statistical method is not time-dependent, it is equally valid for predicting past performance (*i.e.*, the range of emissions levels expected to have been experienced in the past by the best performers during periods when actual emissions testing was not underway) and future performance.").

We believe that the UPL "reflect[s] a reasonable estimate of the emissions achieved in practice by the best-performing sources," *Cement Kiln*, 255 F.3d at 871-72 (internal quotation marks omitted), and, accordingly, we reject the Environmental Petitioners' challenge to it.

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[33] *See also* Page Mem. 4 ("[T]he 99 percent UPL is the emissions level that the source would be predicted to be below 99 out of 100 performance tests, including emissions tests conducted in the past, present, and future."); *id.* at 10 ("The confidence level, in this case 99 percent, is the percentage of measurements (past, present, and future) that are predicted to fall at or below the UPL value.").

D. BEYOND-THE-FLOOR STANDARDS FOR CISWI UNITS

The EPA declined to set beyond-the-floor standards for CISWI units. The Environmental Petitioners challenge that determination in three primary respects, each of which we reject.[34]

Section 7429 of the CAA directs the EPA to set MACT standards in two steps. It first sets a floor level based on the best performing sources. *See* 42 U.S.C. § 7429(a)(2). Next, it determines "whether a more restrictive standard is 'achievable,'" *NRDC III*, 749 F.3d at 1057, "taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and

[34] Although the EPA does not argue that the court lacks jurisdiction to consider this argument, Environmental Petitioners raise the issue defensively, contending that they satisfied the CAA's administrative exhaustion provision. We agree. During the rulemaking process, the Petitioners comprehensively critiqued the EPA's proposed rationale for rejecting beyond-the-floor standards. *See, e.g.*, Natural Resources Defense Council, Comments on Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources, EPA-HQ-OAR-2003-0119 (Aug. 23, 2010), at 11-16 (No. 11-1125 J.A. 668-73). Many of those comments challenged the EPA's consideration of costs and other factors—the same types of issues Petitioners now ask the Panel to resolve. Because the Environmental Petitioners raised the relevant issues "with reasonable specificity" during the period for public comment, our jurisdiction is not in question. 42 U.S.C. § 7607(d)(7)(B); *see Portland Cement Ass'n v. EPA*, 665 F.3d 177, 186 (D.C. Cir. 2011) ("While we certainly require some degree of foresight on the part of commenters, we do not require telepathy. We should be especially reluctant to require advocates for affected industries and groups to anticipate every contingency.").

energy requirements,"[35] 42 U.S.C. § 7429(a)(2). The "EPA calls these stricter requirements 'beyond-the-floor' standards." *NRDC III*, 749 F.3d at 1057.

In section 7429, the "Congress gave EPA broad discretion in considering whether to go beyond-the-floor." *NACWA*, 734 F.3d at 1157. The Congress required the EPA to *consider* a variety of factors without telling the EPA how to weigh them. That calculus belongs to the EPA's discretion. *See* 42 U.S.C. § 7429(a)(2) (delegating to the EPA Administrator the responsibility to "tak[e] into consideration" the statutory factors). Against that backdrop, challenges to the EPA's beyond-the-floor determinations "must clear a high bar, as we are at our most deferential when an agency is 'making predictions, within its area of special expertise, at the frontiers of science.'" *NACWA*, 734 F.3d at 1156 (quoting *Husqvarna*, 254 F.3d at 199).

When establishing MACT standards for CISWI, the EPA declined to establish beyond-the-floor standards in the proposed rule, *see* 2010 Proposed CISWI Rule, 75 Fed. Reg. at 31,956-59, and the final rule, *see* 2011 CISWI Rule, 76 Fed. Reg. at 15,729-32. The EPA also declined requests to reconsider that decision. *See* Memorandum from Eastern Research Group, Inc., to Amy Hambrick, U.S. Environmental Protection Agency, Revised Draft CISWI Reconsideration Issues (Dec. 20, 2012), at 22-23 (No. 11-1125 J.A. 1219-20).

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[35] EPA interprets the statutory factor of "cost" to permit consideration of cost-effectiveness, *NRDC III*, 749 F.3d at 1060-61, which is often calculated "on [a] per ton of emissions removed basis," *Husqvarna AB v. EPA*, 254 F.3d 195, 200 (D.C. Cir. 2001). We have previously upheld that interpretation. *See, e.g.*, *NRDC III*, 749 F.3d at 1060-61.

The first challenge targets several instances in which the EPA refused to require sources to adopt, as a beyond-the-floor measure, controls that most sources would employ to meet the MACT floor standard. In each instance, the EPA determined that the relative costs outweighed the expected emissions gains. In the first such case, the EPA decided not to require liquid-fired energy recovery units to install dry sorbent injection and fabric filters as a beyond-the-floor measure, despite the fact that "four of the six" units would need to install those systems to meet the floor standard. 2011 CISWI Rule, 76 Fed. Reg. at 15,731. That decision satisfied the statute. Had the EPA mandated the control measures, the remaining two units would have needed to expend "$1.1 million per year" to achieve only a small emissions reduction, "which translates into an incremental cost-effectiveness of about $230,000 per ton" of emission. *Id.* Nothing in section 7429(a)(2) requires the Agency to impose a cost so disproportionate to the expected emissions gains.

The Environmental Petitioners take issue with two other decisions along these lines. In the first, the EPA declined to set beyond-the-floor mercury control measures for kilns, citing a cost-effectiveness of roughly $351 million per ton. *See* Memorandum from Eastern Research Group, Inc., to Toni Jones, U.S. Environmental Protection Agency, Final Reconsideration Beyond-the-Floor Analysis for CISWI Units (Reconsideration Mem.) (Dec. 20, 2012), at ¶ 3.4.2 (No. 11-1125 J.A. 1232). In the second, a $26,000 per-ton implementation cost led the Agency not to establish stricter carbon monoxide control measures for calciner kilns. *See id.* ¶ 3.4.3. Energy use—a factor mandated in section 7429(a)(2)—also entered the equation. With respect to calciner kilns, the technology used to reduce carbon

monoxide would also increase energy requirements, and therefore increase energy costs. *See id.* In each of these decisions, the EPA reasonably applied the statutory factors. That Petitioners would have weighed the costs differently provides no grounds to displace the EPA's otherwise reasonable determination.

In the second challenge to the decision not to set beyond-the-floor standards, the Environmental Petitioners contend the Agency arbitrarily failed to set emission levels *lower* than the MACT floor for categories likely to adopt technology capable of meeting those lower levels. Specifically, according to the Environmental Petitioners, the EPA knew waste-burning kilns and energy recovery units would adopt fabric filters that "achieve particulate matter emissions levels dramatically lower than the floor, but refused to set the standard at that lower level." *See* No. 11-1125 Envtl. Pet'rs' Br. 50.

That is incorrect. The Environmental Petitioners spin this yarn based on a line in the proposed rulemaking. There, the Agency speculated that kilns and energy recovery units would adopt fabric filters to comply with the MACT floor limit, and would "likely achieve a level of performance" below the floor. 2010 Proposed CISWI Rule, 75 Fed. Reg. at 31,958. That statement represented a *preliminary* prediction, which was subject to change during the notice-and-comment process. And change it did. In the final rulemaking, the EPA further subcategorized the energy recovery unit subcategory and revised the MACT floor for waste-burning kilns. *See* 2013 CISWI Rule, 78 Fed. Reg. at 9,122 (explaining the changes). New information received during the rulemaking inspired those changes, which the EPA made after considering the statutory factors. *See id.*; Reconsideration Mem., ¶ 2.3-3.4.5. The evidence does not suggest that the

EPA refused to set beyond-the-floor emission levels it knew were reasonably achievable.[36]

In the third challenge, the Environmental Petitioners take issue with three determinations that rested on factors other than cost. First, the EPA declined to require coal-fired energy recovery units to adopt linkageless boiler management systems as a beyond-the-floor measure for carbon monoxide. *See* Reconsideration Mem., ¶ 2.3.1.1. While acknowledging that linkageless systems were available at "fairly low-cost," the EPA concluded it had insufficient data to determine the "actual reductions this control option would achieve" relative to an alternative control system. *Id.*

The EPA acted reasonably. The record suggests the EPA had scant evidence on the efficacy of linkageless control measures applied to coal-fired energy recovery units. *See id.* Had the Agency imposed a stricter standard based on controls for which it had precious little (if any) evidence, a reviewing court may well have concluded the decision lacked "a rational connection between the facts found and the choice made." *State Farm*, 463 U.S. at 43 (internal quotation marks omitted).

Second, the EPA rejected regenerative thermal oxidizers as a beyond-the-floor control for carbon monoxide in solid waste energy recovery units. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,732. Thermal oxidizers could do the job "but likely at a far greater energy requirement (specifically natural

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[36] This argument suffers from an additional flaw: the Environmental Petitioners appear to treat as interchangeable proposed emissions rules for new units with the final rules applicable to existing ones. That apples-and-oranges comparison underscores the weakness of the argument.

gas) [and] with comparable control efficiency" as carbon monoxide catalysts, which "some units will need to install to meet the MACT floor . . . limits." *Id.* In other words, even though oxidizers work as well as carbon catalysts, oxidizers would be unsuitable because they use more energy. *See id.* (concluding that beyond-the-floor controls "would be unreasonable for this subcategory due to additional cost and energy impacts").

The Environmental Petitioners contend that the EPA failed to "suggest that these natural gas requirements are high in an absolute sense or relevant to achievability." No. 11-1125 Envtl. Pet'rs' Br. 51. We agree that the EPA's analysis is less than fully satisfying. Among other reasons, nowhere did the Agency estimate the per-ton cost of mandating thermal oxidizers, or compare the energy costs relative to other control measures.

Despite these imperfections, we reject the challenge. *See Dist. Hosp. Partners, L.P. v. Burwell*, 786 F.3d 46, 61 (D.C. Cir. 2015) ("[I]mperfection alone does not amount to arbitrary decision-making."). The EPA's somewhat sparse analysis on this issue reflects a somewhat sparse record. At bottom, the Agency rejected thermal oxidizers because it lacked sufficient evidence to support their utility, at least compared with control measures whose efficacy and costs were better known.

The Agency's determination should be read in context. Elsewhere in the final rule, the EPA expanded on the energy and environmental impacts of thermal oxidizers, concluding that "[t]he combustion of fuel needed to generate additional electricity and to operate [thermal oxidizer] controls would yield slight increases in emissions, including NO_X, CO, PM, and SO_2 and an increase in CO_2 emissions." 2011 CISWI

Rule, 76 Fed. Reg. at 15,744. The EPA addressed another statutory factor—cost—by reasonable implication. Energy—natural gas, in this case—is not free. A technology that demands "far greater energy requirement[s]" naturally comes at a cost. *See id.* at 15,732.

Though courts are powerless to "supply a reasoned basis for the agency's action that the agency itself has not given," "[w]e will . . . uphold a decision of less than ideal clarity if the agency's path may reasonably be discerned." *State Farm*, 463 U.S. at 43 (internal quotation marks omitted). Here, the Agency's path may reasonably be discerned: mandating thermal oxidizers was not achievable due to increased energy demands and a corollary increase in cost, *see* 2011 CISWI Rule, 76 Fed. Reg. at 15,732 (declining to set a beyond-the-floor limit "due to additional cost and energy impacts"). For those reasons, EPA did not act unreasonably.

Third, and finally, the Environmental Petitioners challenge the rejection of dry sorbent injection and wet scrubbers as beyond-the-floor measures for waste-burning kilns. The EPA determined those measures would be cost-effective (at only $5,000 per ton) but declined to require them due to "uncertainty" surrounding "the appropriate control system that some existing kilns would need to employ to meet" a stricter standard, "especially kilns that use ingredients with a high sulfur content." *See* Reconsideration Mem., ¶ 3.4.5. Adding to that uncertainty, the EPA could not "account for potential costs at existing sources for additional scrubber water and spent sorbent." *Id.* As before, the EPA reached a reasonable conclusion in the face of imperfect information. Had the EPA set a beyond-the-floor standard based on sorbent injection and wet scrubbers, the Agency

would have been flying blind. In avoiding that course, we conclude the EPA acted reasonably.

E. REGULATION OF CERTAIN CISWI UNITS

The final CISWI Rule did not contain emission standards for burn-off ovens, cyclonic burn barrels, foundry sand reclamation units, soil treatment units, and space heaters. The Environmental Petitioners claim that the EPA unlawfully exempted these units from regulation by creating subcategories that capture only a subset of the units that the Agency is required to regulate as CISWI. The EPA, however, protests that it did not exempt these five types of units from regulation. Rather, the Agency determined that it lacked sufficient data to regulate the units at this time, and, with respect to some, it received comments suggesting the units were not CISWI.[37]

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[37] The EPA asserts that it has not made a final decision with regard to the regulation of the five units at issue here—a claim that calls into question our jurisdiction, which under the CAA is limited to "final" actions. *See Portland Cement*, 665 F.3d at 193 (citing 42 U.S.C. § 7607(b)). We disagree with the Agency. Because the statutory deadline for the EPA to establish emission standards for all CISWI has passed, *see* 42 U.S.C. § 7429(a)(1)(D), "the promulgated regulations must be deemed the [A]gency's complete response in compliance with the statutory requirement[]." *Hercules Inc. v. EPA*, 938 F.2d 276, 282 (D.C. Cir. 1991) (internal quotation marks omitted). Accordingly, "even if [the Agency] promulgates additional . . . rules sometime in the future, petitioners' claim that the *existing* final regulations are unlawful remains reviewable by this court." *Id.* (internal quotation marks omitted). Moreover, the EPA did not signal in the administrative record that it was "continu[ing] the rulemaking process" as to these five units. *Portland Cement*, 665 F.3d at 194 (holding that the EPA's action

We agree with the Environmental Petitioners that the Agency has violated its nondiscretionary statutory duty (1) to promulgate standards with respect to cyclonic burn barrels, and (2) to determine whether the remaining four types of units fall within the statutory definition of CISWI. The CAA requires the EPA to "establish performance standards . . . for each category of solid waste incineration units" no later than November 15, 1994. *See* 42 U.S.C. § 7429(a)(1)(A), (D). The statute then defines "solid waste incineration unit" as a "distinct operating unit of *any* facility which combusts *any* solid waste material from commercial or industrial establishments or the general public." *Id.* § 7429(g)(1) (emphasis added). That provision unambiguously requires the EPA to set emission standards for "any facility that combusts any commercial or industrial solid waste material at all," subject only to the listed statutory exceptions. *NRDC I*, 489 F.3d at 1257-58. Because the statutory deadline to regulate these units has long passed, the EPA has "breached a non-discretionary duty" if it has failed to promulgate standards for *any* facilities combusting solid waste from commercial or industrial establishments that do not fit into the listed exceptions. *Sierra Club v. EPA*, 992 F.2d 337, 346 (D.C. Cir. 1993); *cf. id.* (explaining that the "plain language" of a similar provision in RCRA "obligates the Agency to issue, by the deadline, revisions for *all* facilities" covered by the statute and therefore "does not contemplate partial compliance").

The Agency makes no effort to claim that cyclonic burn barrels fall outside the statutory definition for CISWI units.

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was not "final" under 42 U.S.C. § 7607(b) because the Agency expressly stated in its final rule that the rulemaking process remained underway). We therefore need not consider whether our conclusion regarding finality would change had it done so.

Nor could it—both the administrative record and the EPA's brief make clear that cyclonic burn barrels "combust" solid waste. *See* 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,460 (describing a cyclonic burn barrel as "a combustion device for waste materials"); No. 11-1125 EPA Br. 68 (same); *see also* 42 U.S.C. § 7429(g)(1) (defining "solid waste incineration unit" as a "distinct operating unit of any facility which combusts any solid waste material from commercial or industrial establishments or the general public"). Because they combust solid waste, cyclonic burn barrels clearly fall within the statutory definition of "solid waste incineration unit" and, as established above, the EPA had a nondiscretionary statutory duty to establish emission standards for *all* these units by 1994. We therefore conclude that the Agency violated that duty by failing to promulgate emission standards for cyclonic burn barrels.

The EPA protests that it reasonably chose not to regulate cyclonic burn barrels at this time, given how little information it had on them. According to the EPA, comments revealed there were many more cyclonic burn barrels in use than originally thought, the Agency lacked data on these units, and it was "difficult, if not impossible, to test such units for the section 7429 pollutants." No. 11-1125 EPA Br. 69. But this argument misses the point: in light of the unambiguous statutory command to promulgate numeric standards for *all* solid waste incineration units, the EPA had no discretion to avoid regulating any such units—even if its choice to avoid regulating these units would have been otherwise reasonable. The Agency was obligated to collect the data it needed, and Congress gave it the authority to do so. *See* 42 U.S.C. § 7414(a) (explaining that for the purpose of regulating solid waste combustion under section 7429, the EPA may, for example, require owners and operators of those units to

sample emissions, keep records, and offer other information that the Agency needs). Moreover, the Agency provides no evidence that it would be infeasible to set emission standards for these units. Instead, the EPA merely states that it "received information" that measuring emissions is difficult, "if not impossible," but points to no comments or evidence supporting this assertion. 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,460.

The EPA also had a duty to determine whether the other challenged sources—burn-off ovens (including foundry sand reclamation units), soil treatment units, and space heaters—were units that "combust" solid waste. Several commenters told the Agency that these units fell within the statutory definition of CISWI, and the EPA itself initially viewed some of these units as combusting waste. *See, e.g.*, CISWI Rule—Responses to Comments, at 74-76; 2010 Proposed CISWI Rule, 75 Fed. Reg. at 31,941. Under these circumstances, the Agency was obligated to determine whether the units in fact combust solid waste. Yet the EPA concedes it never made that determination. As we have explained, the EPA had a nondiscretionary duty to promulgate standards for *all* solid waste combustion units. This obligation includes the subsidiary duty to determine whether the units identified by the commenters in fact combust solid waste. Any other conclusion would allow the Agency to ignore its statutory mandate altogether by not taking the initial step of identifying such units.

The CAA unambiguously requires that the Agency establish standards for all CISWI units. As a result, we grant the Environmental Petitioners' petition for review on this issue and remand to the Agency to set emission standards for cyclonic burn barrels. The EPA must also determine whether

the remaining four types of units are CISWI units and, if it finds that they are, it must set standards for them as well.

F. DELISTING UNDER 42 U.S.C. § 7412(C)

In contrast to major source subcategories (all of which the EPA must control), the CAA does not require the EPA to control emissions in every area source subcategory. *See* 42 U.S.C. § 7412(c)(1), (3). The Act does, however, mandate that the EPA control area source emissions if the area source subcategory meets certain criteria. Section 7412(c)(1), for instance, requires the EPA to control any area source subcategory upon the Agency's finding that emissions from the sources in the subcategory jeopardize either the environment or human health. *See id.* § 7412(c)(3). If so, the EPA can establish either a MACT or a GACT standard. *See id*. § 7412(d)(5). Similarly, if the EPA finds that capping emissions from an area source subcategory is necessary to achieve a 90 per cent reduction in the aggregate emissions of one of seven CAA-enumerated HAPs, section 7412(c)(6) requires the Agency to impose caps in that subcategory as well. *See id.* § 7412(c)(6). Upon that finding, however, the EPA *must* impose a MACT standard. *Id.*

In addition to prescribing requirements for inclusion of area source subcategories, the CAA provides a mechanism for removal of area source subcategories that, in the EPA's view, no longer need to be controlled. Specifically, the EPA can "delete" any subcategory if it finds that no source or group of sources in it (1) emits *cancer-causing* HAPs at a volume sufficient to increase the lifetime risk of cancer in the population by more than one in one million and (2) emits *non-cancer-causing* HAPs at a level in excess of that which is adequate "to protect public health with an ample margin of

safety" and to prevent against environmental harm. *Id.* § 7412(c)(9)(B). The section 7412(c)(9) process is known as "delisting."

In 1998, the EPA identified several area source boiler subcategories—including oil-fired, industrial wood, commercial oil-fired and commercial wood-combustion boilers—as contributors to the "90 per centum of the aggregate emissions" of Hg and POM under section 7412(c)(6). *See* Source Category Listing for Section 112(d)(2) Rulemaking Pursuant to Section 112(c)(6) Requirements, 63 Fed. Reg. 17,838, 17,839 (Apr. 10, 1998). When it decided to "list" these sources, however, the EPA included a caveat. It explained that it used the best emissions information it had at the time to conclude that these boiler subcategories produced enough Hg and POM emissions to justify section 7412(c)(6) control but it also admitted that it could not "assure that this calculation of the 90 percent will remain constant." *Id.* at 17,840.

The caveat proved prescient. When the EPA issued the 2010 Proposed Area Boilers Rule, it decided it needed to regulate only coal-fired boilers at the MACT level to control 90 per cent of Hg emissions. *See* 75 Fed. Reg. at 31,898. And when it finalized the 2011 Area Boilers Rule, the Agency similarly decided that it needed to regulate only coal-fired boilers at the MACT level to control 90 per cent of POM emissions. *See* 76 Fed. Reg. at 15,566.

For this reason, the EPA established GACT, rather than MACT, standards for the oil-fired and biomass-fired area source subcategories regarding these two pollutants. *See id.* It did not, however, make any of the "delisting" findings required by section 7412(c)(9) when it removed these area

source subcategories from section 7412(c)(6)'s purview. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,566 ("[W]e have not removed or 'delisted' oil-fired and biomass-fired area source boilers by this action. We are not promulgating MACT-based regulations at this time because they are unnecessary to meet the requirements of CAA section 112(c)(6)."). The Environmental Petitioners challenge the EPA's imposition of GACT standards, arguing that, because once the EPA "listed" these sources under section 7412(c)(6)'s MACT requirement, the CAA mandates that the EPA "delist" them under section 7412(c)(9) before putting them under the more lenient GACT standards. In their view, the EPA's contrary approach fails at *Chevron* step 1. The EPA responds that section 7412(c)(9) applies only if it decides to "delist" a subcategory entirely from section 7412 regulation, resulting in neither MACT nor GACT restrictions.

Because section 7412(c)(9) does not unambiguously apply to section 7412(c)(6) and because the EPA's interpretation of section 7412(c)(9)'s delisting requirement is reasonable, we uphold the EPA's decision as permissible under *Chevron* step 2. Section 7412(c)(9) provides that the EPA "may delete any source category from the list under this subsection" on its finding that the source category is not a threat to human health or the environment. 42 U.S.C. § 7412(c)(9)(B). The inclusion of a singular "list" to govern "this subsection" seems, most naturally, to refer to the list contemplated by section 7412(c)(1), which states that the EPA "shall publish, and shall from time to time . . . revise . . . *a list* of all categories and subcategories of . . . area sources (listed under paragraph (3))." *Id.* § 7412(c)(1) (emphasis added). In other words, it appears that section 7412(c)(1) directs the EPA to create one "list" of source categories and subcategories to subject to emission controls and section

7412(c)(9) instructs how to remove source categories from that list. This conclusion finds support in section 7412(c)(1)'s cross reference to "paragraph (3)" of section 7412(c), which lays out the circumstances under which the EPA "shall list" area source categories for emissions control. *Id.* § 7412(c)(3).

In the Environmental Petitioners' view, section 7412(c)(9) also applies to a second, subsidiary list—that contemplated by section 7412(c)(6), requiring imposition of the MACT standard. Granted, section 7412(c)(6) mandates that the EPA "shall . . . list" source categories and subcategories if doing so is necessary to control 90 per cent of the aggregate emissions from seven enumerated pollutants. *Id.* § 7412(c)(6) (emphasis added). But the use of the verb "list" in section 7412(c)(6) does not unambiguously establish that 7412(c)(9), titled "[d]eletions from the list," applies. Because section 7412(c)(9) is ambiguous, we defer to the EPA so long as its interpretation is "based on a permissible construction." *Chevron*, 467 U.S. at 842-43. And the EPA's reading of section 7412(c)(9)—that it applies only if the EPA wants to remove a category from *all* section 7412 regulation—is reasonable.

First, the EPA's approach harmonizes sections 7412(c)(1), 7412(c)(3), and 7412(c)(9). Because the EPA must find that an area source "presents a threat of adverse effects to human health or the environment" before it regulates the source category at all, *id.* § 7412(c)(3), it makes sense to require the EPA to find that "no source in the category or subcategory . . . exceed[s] a level which is adequate to protect public health . . . and no adverse environmental effect will result from emissions from any source" before it completely deregulates that category, *id.* § 7412(c)(9). It makes less sense to require the EPA to make

the same findings before it opts for GACT instead of MACT standards, which occurs when the EPA removes a source from section 7412(c)(6)'s purview but continues to regulate it under section 7412(c)(1).

Second, the EPA's approach is consistent with our decision in *New Jersey*, 517 F.3d 574. There, we held that "the only way EPA could remove [a source category] from the section [7412(c)(1)] list was by satisfying section [7412(c)(9)'s] requirements." *Id.* at 582. In other words, *New Jersey* held that the EPA cannot remove a source category from all section 7412 regulation without delisting it; it said nothing about the process by which the EPA moves source categories from section 7412(c)(6).

Finally, the Petitioners' argument would freeze the EPA's decision as to which sources need to be controlled to reach the requisite 90 per cent emissions reduction for the section 7412(c)(6) pollutants until it determines that "no source in the category or subcategory . . . exceed[s] a level which is adequate to protect public health . . . and no adverse environmental effect will result from emissions from any source." 42 U.S.C. § 7412(c)(9). This, in turn, would hamper the EPA's ability to respond to updated data, thereby substantially complicating its attempts to control the pollutants. Nothing in the CAA suggests that the Congress intended to so hamstring the Agency.

G. TITLE V PERMIT EXEMPTION FOR SYNTHETIC BOILERS

The EPA has discretion to exempt one or more area source categories from Title V permitting requirements upon a finding "that compliance with such requirements is impracticable, infeasible, or unnecessarily burdensome on such categories." 42 U.S.C. § 7661a(a). The EPA originally

proposed exempting some area source categories because existing "testing, monitoring, notification, and recordkeeping requirements" rendered Title V permitting cumulative. 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,910. At the time, however, the EPA elected not to exempt synthetic area sources as one of those categories. *Id.* at 31,913. Synthetic area sources are boilers that "naturally" emit pollutants at a major source level but which qualify as area sources due to the voluntary adoption of air pollution control technologies. *Id.* Despite its initial stance, the EPA ultimately decided to exempt *all* area sources—including synthetic area sources—from Title V's permitting requirements. *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,578.

Environmental Petitioners argue the EPA's decision to exclude synthetic boilers from Title V licensing requirements is arbitrary and capricious for two reasons. First, they say, the EPA arbitrarily concluded synthetic area sources would bear the same level of burden as other area sources in complying with Title V permitting requirements, rather than a lesser one. *See* No. 11-1141 Envtl. Pet'rs' Br. 39-43. And second, they contend the EPA arbitrarily dismissed the additional compliance benefits of Title V licensing for these synthetic sources. *See id.* at 43-47. Under *State Farm*, "an agency rule [is] arbitrary and capricious if the agency . . . offered an explanation of its decision that runs counter to the evidence before the agency." 463 U.S. at 43. A court may not accept an agency's "*post hoc* rationalizations" for its decisionmaking. *Id.* at 49.

The EPA has authority under the CAA to exempt sources from Title V permitting requirements if those requirements would be "impracticable, infeasible, or unnecessarily burdensome" on the area source. 42 U.S.C. § 7661a(a). The

EPA previously developed a four-factor balancing test to determine whether Title V's requirements are "unnecessarily burdensome." *See* Exemption of Certain Area Sources from Title V Operating Permit Programs, 70 Fed. Reg. 75,320, 75,323 (Dec. 19, 2005). Under this test, the EPA considers whether: (1) Title V permitting would result in significant improvements in compliance with emission standards; (2) whether Title V permitting would impose significant burdens on the area source category; (3) whether the costs are justified, taking into account potential gains; and (4) whether there are existing enforcement programs in place sufficient to ensure compliance. *See id.* at 75,323-26. The EPA also must consider, consistent with the legislative history of the CAA, whether exemption would "adversely affect public health, welfare, or the environment." *Id.* at 75,333-34. These factors are considered in combination and not every factor must point in favor of exemption for the EPA to choose that course. *See id.* at 75,323.

In its 2010 Proposed Area Boilers Rule, the EPA applied this balancing test and excluded almost all area source boilers *except* synthetic boilers that achieved "area" status via installation of a control technology (although it exempted those that achieved "area" status through operational changes). The EPA provided an extensive rationale for its decision to exclude these "natural" area sources from Title V's permitting requirements. *See* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,910-13. With respect to factor one, the EPA found its proposed rule already required "direct monitoring of emissions," both continuously and periodically, recordkeeping that would allow for additional monitoring, and "semi-annual reporting to assure compliance." *Id.* at 31,911. Moreover, under the proposed rule, "records are required to be maintained in a form suitable

and readily available for expeditious review" for up to five years. *Id.* The EPA acknowledged Title V permitting could provide some additional compliance benefits; specifically, that Title V has an every-six-month monitoring and reporting requirement. *See id.* But the EPA ultimately concluded the monitoring, recordkeeping, and reporting requirements of its proposed rule were sufficient to assure compliance: "Given the nature of the operations at most area sources and the types of requirements in this rule, Title V would not significantly improve those compliance requirements." *Id.*

As to the second factor, the EPA noted that subjecting most area sources to Title V would "impose[] certain burdens and costs that do not exist outside of the [t]itle V program." *Id.* at 31,912. One of the EPA's major concerns was that "requiring permits for the large number of area sources could, at least in the first few years of implementation, potentially adversely affect public health, welfare, or the environment by shifting [s]tate agencies[']] resources away from assuring compliance for major sources with existing permits to issuing new permits for these area sources, potentially reducing overall air program effectiveness." *Id.* at 31,913. For the third factor, the EPA concluded the costs of compliance would "impose a significant burden on many of the approximately 137,000 facilities affected by this proposed rule" with only "low" potential gains in compliance. *Id.* at 31,912. Finally, for the fourth factor, the EPA determined that "[s]tate delegated programs are sufficient to assure compliance with this [rule]," and noted that the Agency retains authority to enforce this rule "anytime." *Id.* The EPA therefore proposed exempting these area sources from the permitting requirements. *See id.* Environmental Petitioners are not currently challenging the exemption for non-synthetic area boilers.

However, in this 2010 rulemaking, the EPA also explained precisely why it declined to exempt synthetic area sources that installed air pollution controls from Title V requirements. First, the EPA noted these synthetic area sources "represent less than one percent of the total number of sources that will be subject to the final rule." *Id.* at 31,913. The EPA also characterized these sources as "much more like the major sources" that are not exempt from Title V permitting requirements. *Id.* Further distinctions included that "many of these sources are located in cities, and often in close proximity to residential and commercial centers where large numbers of people live and work," that they "have significantly higher emissions potential when uncontrolled" (even compared to synthetic boilers that adopted operational limits to attain area source status), and that many of these sources "are large facilities with comprehensive compliance programs in place" as opposed to small facilities, like schools or hospitals. *Id.* Given these distinctions, the EPA concluded additional public involvement and compliance oversight through Title V was "important to ensure that these sources are maintaining their emissions at the area source level." *Id.*

But the EPA shifted its position in the 2011 Area Boilers Rule by deciding to exempt *all* area sources, including synthetic sources. *See* 76 Fed. Reg. at 15,578. The EPA provided only a cursory explanation for this shift, noting how a further review of the record led it to conclude "observations and data we have relied upon in other rulemakings for distinguishing between sources that became synthetic area sources due to controls and other synthetic and natural area sources *[do] not necessarily* apply to this source category." *Id.* (emphasis added). Because the EPA asserted it no longer had "sufficient information" to identify control-technology-dependent synthetic sources, it decided to apply the same

rationale used to exempt "natural" sources to these synthetic sources. *Id.* ("[T]he rationale for exempting most area sources subject to this rule . . . is also now relevant for sources which we proposed to permit [under Title V]."). But—even if the EPA truly cannot distinguish between synthetic sources relying on control technologies and other sources—it does not invariably follow that the justifications the Agency relied on for exempting "natural" sources under the four-factor balancing test can be transposed onto these synthetic sources. *Cf. Sierra Club II*, 479 F.3d at 884 ("We agree with the Sierra Club that EPA's use of work practice standards instead of emission floors violates section 7412(h). That provision allows EPA to substitute work practice standards for emission floors only if measuring emissions levels is technologically or economically impracticable. Here, EPA never determined that measuring emissions from ceramic kilns was impracticable; it determined only that it lacked emissions data from ceramics kilns. EPA thus had no basis under section 7412(h) for using work practice standards.").

In its next iteration of the rule, the EPA endeavored to further explain its exemption of synthetic sources. The EPA again stated it "lacked sufficient information" to distinguish these synthetic sources from other area sources. *See* 2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,538. The Sierra Club challenged this exemption in a comment, and the EPA responded with "additional analysis" of the synthetic exemption. *Id.* In this analysis, the EPA first reiterated the difference in number between the two types: estimating there to be at least 48 control-technology-dependent synthetic sources versus 137,000 other area sources, most of which are located at small facilities like schools, hospitals, and churches. *See id.* The EPA then provided a new rationale for the exemption: that these

synthetic facilities "may already have a Title V permit for other reasons." *Id.* The EPA also found that "synthetic area sources would *likely* be subject to more stringent permit and monitoring requirements than natural area sources" because they have a "legal duty to use the control equipment" to keep them at an "area" level. *Id.* (emphasis added). Finally, the EPA made several assertions about the similarities between synthetic and natural sources. Specifically, that synthetic sources are "similar in size and sophistication to those that are natural area sources," that their "uncontrolled emissions are generally on the same order of magnitude as the emissions of natural sources," and that "the facilities and owners are comparable in size." *Id.* The EPA provided no data or examples in support of these assertions, which appear to directly contradict the distinctions the EPA listed in its earlier version of the rule. *Compare id.*, *with* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,913. In its final rule, the EPA declined to make any changes to its Title V exemptions—exempting all area sources including synthetic sources using a control technology. *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,497.

Based on this record, the EPA's reasoning has several fatal flaws that render its exemption decision arbitrary. The EPA put forward two primary justifications for exempting synthetic sources: (1) that it could not necessarily rely on existing data for distinguishing the different type of sources, and (2) that these facilities are "similar in size and sophistication" to natural area sources. *See* 2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,538. The second justification flatly contradicts the EPA's earlier, extensive discussion about how these synthetic sources have higher emissions potential and are often located on large sites with existing compliance programs, in addition

to being uniquely few in number and generally found near cities. 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,912-13. These factors all undercut the EPA's assertion that synthetic sources are "similar"—in size, sophistication, or otherwise—to natural sources. With respect to the lack of data for distinguishing, the EPA was able to estimate in its proposed rule that 48 synthetic sources would have been affected by this rule—which suggests the EPA possesses some mechanism for distinguishing the types. *See* 2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,538. Moreover, the EPA does not explain *why* the data it used in prior rulemakings to distinguish these source types is not accurate in this context. Environmental Petitioners also point out that, "to qualify for area-source status, synthetic area sources must notify the EPA or the state permitting authority of the limits on their emissions," such that the EPA "need only ask these authorities to identify the sources operating in their states." No. 11-1141, Envtl. Pet'rs' Br. 39-40. The EPA never endeavors to explain why that mechanism (or any other existing mechanism) is insufficient for identifying synthetic area sources.

Because its justifications for the final rule contradict earlier findings, the EPA must provide some reasoning to explain why its final decision "runs counter to the evidence before the agency." *State Farm*, 463 U.S. at 43. The EPA's proffered explanation fails. This court has "often declined to affirm an agency decision if there are unexplained inconsistencies in the final rule." *See Dist. Hosp. Partners*, 786 F.3d at 59; *see also Gulf Power Co. v. FERC*, 983 F.2d 1095, 1101 (D.C. Cir. 1993) ("[W]hen an agency takes inconsistent positions . . . it must explain its reasoning."); *Gen. Chem. Corp. v. United States*, 817 F.2d 844, 846 (D.C. Cir. 1987) (holding agency action to be arbitrary because its

analysis was "internally inconsistent and inadequately explained"). The EPA had a duty here to examine and justify the "key assumptions" underlying its decision, and it failed to do so. *See Appalachian Power Co. v. EPA*, 135 F.3d 791, 818 (D.C. Cir. 1998) ("EPA retains a duty to examine key assumptions as part of its affirmative burden of promulgating and explaining a nonarbitrary, non-capricious rule." (internal quotation marks omitted)).

The EPA's major oversight was its failure to explain why the rationale it used to exempt natural area sources from Title V could be identically applied to synthetic area sources. One of the Agency's main justifications for exempting natural area sources was that their prolific numbers might overwhelm state and local regulatory agencies, diverting resources from other important environmental programs, thereby harming public health and welfare. The EPA never explained why requiring 48 synthetic area sources to comply with Title V would strain government resources to a comparable degree as would requiring the 137,000 natural area sources to comply. As discussed above, the EPA also did not explain how it suddenly determined these synthetic area sources were "similar in size and sophistication" to natural sources, when it had previously articulated several key differences. It is particularly unclear how these synthetic sources could have "uncontrolled emissions . . . generally on the same order of magnitude as the emissions of natural area sources." 2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,538. Given that synthetic sources are defined as "major" sources that have artificially reduced their emissions to an "area" level, it is difficult to understand how the *uncontrolled* emissions of these sources would be similar to natural area sources. Additionally, the EPA asserted that synthetic source "facilities and owners are comparable in

size" to natural sources. *Id.* This contradicts earlier findings that synthetic sources tend to be large, located on sites with existing compliance plans, and near population-dense areas. The EPA provides no data or explanation to support this shift.

The EPA relies on another problematic premise when it claims the potential benefits of subjecting synthetic area sources to Title V requirements are low. Both the EPA and Industry Intervenors argue that the added benefits of Title V would be minimal for these synthetic sources, relying solely on the rationale given for natural sources. But the EPA originally asserted "additional public involvement and compliance assurance requirements through title V [are] *important* to ensure that these sources are maintaining their emissions at the area source level." 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,913 (emphasis added). The EPA never explains why these additional benefits were considered "important" before but are now "not important" simply because it allegedly determined that synthetic sources may be hard to distinguish from natural sources. The difficulty in identifying synthetic sources says nothing about the benefits that may be gained by requiring Title V permits, assuming the sources can be identified. Synthetic sources retain the attributes which first motivated the EPA to subject them to Title V permitting: they tend to be near cities, specifically near large residential populations, and they have greater emission potential if their control technology is removed, turned off, or not kept up to standards. The EPA arguably finds Title V's additional compliance benefits unnecessary because synthetic sources have "a legal duty to use the control equipment" and that use is "not optional." 2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,538. But that observation does not speak to the need for public oversight; just because facilities are obligated

to use the control technology does not mean they will always do so. Title V's process requires facilities to submit compliance documentation every six months—far more frequently than under the EPA's current rule—which expands the opportunity for public oversight and compliance. Perhaps this "legal duty" provides a stronger incentive for compliance than public oversight but, if so, the EPA still fails to explain how.

Similarly, for factor three's balancing of costs and benefits, the EPA never justifies applying to natural sources—which tend to be small sites like schools, hospitals, and churches—the same rationale it applies to these larger synthetic sources, which tend to be located at refineries, chemical plants, and factories. Given these distinctions, it is at least possible this balancing would lead to a different outcome for synthetic sources. Taken as a whole, the EPA's analysis fails to explain why several of the facts and characteristics it relied on for its initial assessment are no longer relevant—creating several glaring inconsistencies in the rulemaking record. The EPA offers no plausible reason for applying the results of the four-factor test for natural sources wholesale to these control-technology-dependent synthetic sources. We do not hold, however, that the EPA can never remove synthetic area sources from the ambit of Title V compliance. The outcome the EPA ultimately reached may be reasonable; however, "[n]ot only must an agency's decreed result be within the scope of its lawful authority, but the process by which it reaches that result must be logical and rational." *Allentown Mack Sales & Serv., Inc. v. NLRB*, 522 U.S. 359, 374 (1998). The EPA should have applied its four-factor balancing test directly to synthetic sources or, at a minimum, provided an explanation for adopting the natural

source balancing test that is not premised on inconsistencies in the record.

With respect to remedy, there is a strong possibility that the Agency can properly explain its decision to exclude synthetic boilers from the Title V permitting requirement; moreover, vacating the decision would be unnecessarily disruptive for synthetic boiler operators who, in the interim, would not know whether they needed to begin the expensive, time-consuming process of obtaining a Title V permit. *See Allied-Signal, Inc. v. U.S. Nuclear Regulatory Comm'n*, 988 F.2d 146, 150-51 (D.C. Cir. 1993). We therefore remand this issue (without vacating) for further explanation by the EPA.

H. GACT STANDARD DETERMINATIONS

With few exceptions, the EPA has broad discretion to choose how to control area source emissions. For instance, the EPA has discretion to choose between GACT and MACT standards in the majority of cases. *See* 42 U.S.C. § 7412(d)(5). Even if the EPA chooses a MACT standard, it has discretion—although somewhat circumscribed—to set a work-practice standard instead of a numeric standard. *Id.* § 7412(h)(1). And the EPA has discretion when choosing among different GACT-standard options. *See id.* § 7412(d)(5).

Accordingly, we must uphold the EPA's GACT-standard determinations so long as it "has considered the relevant factors and articulated a rational connection between the facts found and the choice made, and has not relied on [improper] factors." *Nat'l Ass'n of Clean Air Agencies*, 489 F.3d at 1228 (citations and internal quotation marks omitted). But for all of the discretion the EPA enjoys, it must nonetheless demonstrate that it exercised its judgment in a reasoned way.

The cases establishing this principle are legion. *See, e.g.*, *Transactive Corp. v. United States*, 91 F.3d 232, 236 (D.C. Cir. 1996) (agency must "identif[y] and explain[] the reasoned basis for its decision"); *Int'l Fabricare Inst.*, 972 F.2d at 389 (agency must "examine[] the relevant data and . . . articulate[] an adequate explanation for its action"). The EPA need not go to great lengths to meet its burden; indeed, we "uphold a decision of less than ideal clarity" so long as "the agency's path may reasonably be discerned." *State Farm*, 463 U.S. at 43 (quoting *Ark.-Best Freight Sys., Inc.*, 419 U.S. at 286).

With these principles in mind, we address the Environmental Petitioners' two challenges to the EPA's discretionary decisions regarding the Area Boilers Rule.

1. EPA's Selection of GACT Standards for Non-Hg Metals

The Environmental Petitioners argue that the EPA failed to support its decision-making when it established MACT standards for Hg and POM emissions from some coal-fired boilers but declined to regulate *non*-Hg emissions under the MACT standard from the same boilers. We agree. Although the EPA thoroughly explained why it chose to impose one GACT standard instead of another, nothing in the record explains why the EPA decided to impose GACT standards instead of MACT standards in the first place. Despite the Agency's broad discretion, we cannot sustain its action in the absence of some explanation for why GACT standards are more appropriate than MACT standards for these sources and types of pollutants. *See Transactive Corp.*, 91 F.3d at 236. For this reason, we remand (but do not vacate) the EPA's choice of GACT standards for non-Hg emissions from coal-

fired boilers. *See Sierra Club*, 167 F.3d at 664; *Nat'l Lime Ass'n*, 233 F.3d at 634-35.

2. EPA's Selection of Certain GACT Standards

The Environmental Petitioners also challenge several of the EPA's choices among different GACT standards. As noted, *see supra* § I.A.1.c, the CAA provides virtually no instruction regarding GACT standards but the standards generally take the form of "methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems." S. REP. NO. 101-228, at 171 (1989). Because the EPA has ample discretion to choose the appropriate GACT standard, we will affirm its choices so long as we can discern reasoned decision-making from the record. *State Farm*, 463 U.S. at 43. For the reasons set forth below, we can do so here and, accordingly, we reject the Environmental Petitioners' GACT-focused challenges.

First, the Environmental Petitioners challenge the data set the EPA used to arrive at the numeric GACT standards for non-Hg-metal emissions from coal-fired boilers. Specifically, they contend that the EPA set the GACT limit based on boilers with no control technology, which resulted in a numeric standard of 0.42 lb/mmBtu. They insist that the EPA should instead have examined boilers outfitted with fabric filters, which would have resulted in a numeric standard of 0.03 lb/mmBtu. The EPA, however, thoroughly explained why it considered the uncontrolled boiler data set. Specifically, the controlled data set derives from the EPA's "New Source Performance Standards" (NSPS) data, which, in

the Agency's view, could be used to set the non-Hg-metal GACT standard for boilers with a heat input capacity of 30 mmBtu/hr or greater but did not suffice for boilers with a lower heat input capacity. For this reason, the EPA examined its original data set, found that none of the coal-fired boilers in that set used control technology and, accordingly, set the GACT numeric standard at the emissions level achieved by the best performing uncontrolled source in that data set (*i.e.*, 0.42 lb/mmBtu). We are satisfied that the EPA exercised its discretion in a reasoned manner and, accordingly, we do not disturb it. *See Transactive Corp.*, 91 F.3d at 236.

Next, the Environmental Petitioners challenge the EPA's decision to establish a tune-up requirement as a GACT management-practice standard for Hg and POM emissions from large biomass-fired and oil-fired boilers. In their view, other, more restrictive control technologies, including multiclones,[38] are "generally available" and their availability mandates that the EPA set numeric standards based on boilers that use those controls. But the EPA explained its approach:

> A boiler tune-up requirement would potentially result in the same non-mercury metallic HAP reduction as a PM emission limit based on performance of multiclones but would also reduce emissions of organic HAP. In addition the cost of a boiler tune-up appears minimal compared to the cost for testing and

[38] A multiclone is a PM "mechanical separator[]." *See* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,908. It diverts particles from the exhaust stream by creating a circular air flow. *See id.*

> monitoring to demonstrate compliance with an emission limit.

See 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,908. The EPA also explained that multiclones were "minimally effective" for controlling non-Hg metals, ineffective for POM and Hg, and expensive. *Id.* Because the EPA's decision to impose a tune-up requirement fits within its "technical expertise," we owe the Agency an "extreme degree of deference" so long as its explanation is rational. *Catawba Cty., N.C. v. EPA*, 571 F.3d 20, 41 (D.C. Cir. 2009) (quoting *City of Waukesha v. EPA*, 320 F.3d 228, 247 (D.C. Cir. 2003)). And because its explanation was rational, we reject the Petitioners' challenge thereto.

Finally, the Petitioners challenge the EPA's decision to set a tune-up requirement as a management-practice standard for small biomass-fired and oil-fired area boilers. The EPA adopted this approach because measuring PM emissions for smaller boilers is "not feasible." 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,906. When the EPA explained its decision regarding small *biomass*-fired and *oil*-fired area boilers, it provided the same reasons it gave for its use of a tune-up requirement for small *coal*-fired area boilers, which we address (and uphold), *infra*, § IV.M. For those reasons, we reject the challenge to the EPA's tune-up requirement for small biomass-fired and oil-fired area boilers.

I. 30-DAY ROLLING AVERAGE

As discussed, *see supra* § I.B.1.a, when the EPA sets a MACT floor, it begins by examining data generated by stack testing. Once the MACT standard is established, however, a source may (and in some cases, must) demonstrate compliance by implementing "continuous monitoring" instead

of conducting additional stack tests.[39] *See* 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,464-65. For a source using a continuous monitor, the EPA determines MACT-standard compliance based on the source's thirty-day "rolling average." *Id.* at 80,465.

The calculation of a thirty-day rolling average is straightforward: the average of a source's daily emissions for the immediately preceding thirty days. Each day produces a new rolling average and each "average is a separate compliance determination." No. 11-1125 EPA Br. 88 n.17. In the EPA's view, this "allow[s] operators sufficient flexibility for operational and control device adjustments should they be needed for short term fuel or waste characteristics variability." 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,465. The EPA also concluded that thirty-day rolling average violations will occur almost as frequently as violations of shorter rolling-average periods. *Id*.

The CAA vests the EPA with authority to "prescribe procedures and methods for determining compliance and for monitoring and analysis of pollutants." 42 U.S.C. § 7661c(b). We have emphasized that the EPA has "broad discretion in selecting a monitoring regime that ensures compliance, and as long as it reasonably articulate[s] the basis for its decision, [we] will defer to the informed discretion of the Agency,

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[39] As the name suggests, a continuous monitoring system measures the source's emissions at all times and generally takes one of two forms: (1) a continuous parameter monitor, which measures, *e.g.*, a source's temperature, pressure or oxygen content; or (2) a continuous emissions monitor, which measures the pollutant concentration in the source's emissions.

recognizing that analysis of this issue requires a high level of expertise." *White Stallion Energy Ctr., LLC v. EPA*, 748 F.3d 1222, 1255 (D.C. Cir. 2014) (per curiam) (citation and internal quotation marks omitted), *rev'd on other grounds by Michigan v. EPA*, 135 S. Ct. 2699 (2015). Notwithstanding this deference, the Environmental Petitioners argue that allowing a source to demonstrate compliance by way of a thirty-day rolling average not only fails *Chevron* review but is also arbitrary. We disagree.

First, they argue that the thirty-day rolling average fails at *Chevron* step 1 because it allows sources to emit HAPs continuously at the UPL-established MACT floor. Because they do not believe that the UPL represents the average emissions level achieved by the best performing sources, they argue that, *ipso facto*, allowing sources to continuously emit HAPs at the UPL level means that sources are permitted to emit at levels higher than the average levels achieved by the best performing sources. Because we have already concluded that the UPL is in fact a reasonable proxy for the average emissions level achieved by the best performing sources, *see supra* § IV.C, the Environmental Petitioners' premise is inaccurate. And because the "total emissions from a unit complying with a rolling average must still be below the total emissions from a unit emitting continuously at the level of the standard," No. 11-1125 EPA Br. 90, the Environmental Petitioners' *Chevron* step 1 argument fails.

The Environmental Petitioners' *Chevron* step 2 argument fares no better. The EPA explained that (1) it expects to catch violations using a thirty-day rolling average "almost as much as for a shorter term average" and (2) it believes the longer average to be more effective in addressing "[c]oncerns of variability outside the operators['] control such as fuel

content, seasonal factors, load cycling, and infrequent hours of needed operation." 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,465. Because the EPA "reasonably articulate[d] the basis for its decision," we uphold it. *White Stallion*, 748 F.3d at 1255 (internal quotation marks omitted).

Finally, we conclude that the EPA's allowance of thirty-day rolling averaging does not reflect an arbitrary change in position. Although the Petitioners cite other rules that, in their view, manifest that the EPA once believed that longer averaging periods resulted in less stringent enforcement, most of the rules they cite have nothing to do with MACT-setting or MACT compliance[40] and none evidences an unexplained or unjustified deviation. Similarly, the Petitioners point to the EPA's explanation in the 2011 CISWI Rule that "24-hour block averages . . . would be inconsistent with the sampling time for the stack test data" to indicate an arbitrary change in position. *See* 76 Fed. Reg. at 15,728. But the EPA made this statement while discussing why stack-test data and continuous-monitoring data could not be used in tandem to *set* a MACT level, which says nothing about allowing emissions

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[40] The only exception is the EPA's 1996 Medical-Waste Incinerators Rule, which provides that "[t]he period of time over which emissions are measured and then averaged to determine compliance with the regulation . . . must correspond to the period of time over which emission levels were measured and averaged in determining the emission limits included in the regulation." Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Medical Waste Incinerators, 61 Fed. Reg. 31,736, 31,748 (June 20, 1996). This twenty-year-old statement, however, does not detract from the EPA's well-reasoned defense of the thirty-day rolling average in the CISWI Rule.

averaging—long-term or otherwise—to gauge MACT-floor *compliance*. *See id.* And even if the Environmental Petitioners had directed us to a real about-face, the EPA's justification for allowing the thirty-day rolling average convinces us that any change was not arbitrary.

J. FUEL-COMBUSTION-BASED SUBCATEGORIES

Section 7412 provides that the EPA may distinguish among "classes, types, and sizes" of sources when establishing emission standards. 42 U.S.C. § 7412(c), (d)(1). Under this authority, the EPA created subcategories of major source boilers based on the fuel the boiler was designed to burn. 2013 Major Boilers Rule, 78 Fed. Reg. at 7,144. The Environmental Petitioners challenge this decision on three grounds: First, they claim that the text of the statute forecloses the EPA from creating such subcategories. Next, they argue that the EPA's subcategories are arbitrary because they permit a boiler to switch subcategories from year to year. Finally, they contend that the EPA's action was arbitrary because the Agency failed to demonstrate with substantial evidence that burning a different fuel alters the boiler's class, type, or size.

These arguments fail. Section 7412(d) gives the EPA discretion to create subcategories based on boiler type, and nothing in the statute forecloses the Agency from doing so based on the type of fuel a boiler was designed to burn. Nor was the EPA's decision to create such subcategories arbitrary and capricious. The Agency considered the relevant factors in coming to a reasoned decision that the type of fuel a boiler is designed to burn impacts the feasibility of emission standards. And, finally, the EPA based its technical judgment on sufficient record evidence. As a result, we deny the

Environmental Petitioners' challenge to the EPA's subcategorization of major source boilers based on the type of fuel the boiler is designed to burn.

The Environmental Petitioners first claim that the text of the CAA forecloses the EPA from creating subcategories of "types" of boilers based on the fuel a boiler burns because a single boiler may use different fuels over the course of its lifetime. This may be true, but the Petitioners never explain what it is about the word "type" that bars the EPA from regulating a boiler that burns "x" differently from a boiler that burns "y." According to its ordinary meaning, "type" is easily broad enough to accommodate changes in boiler characteristics from year to year. *See* OXFORD ENGLISH DICTIONARY (2013) (defining "type" as a "general form, structure, or character distinguishing a particular kind, group, or class of beings or objects"). There is no textual reason then to assume that a boiler's type must be written in stone.

Nor does our understanding of "type" write it out of the statute, as the Petitioners contend. The EPA has done what the term plainly encompasses: it has distinguished among boilers based on the kind of fuel the boiler burned over the last year. It is thus not surprising that we have interpreted a similar provision to permit distinctions based on fuel inputs. *See Sierra Club v. Costle*, 657 F.2d 298, 318-19 (D.C. Cir. 1981) (holding that the text of 42 U.S.C. § 7411, which allows the EPA to "distinguish among classes, types and sizes," permits distinctions based on variations in the sulfur content of coal used by utility plants). Likewise, we conclude that section 7412's undefined and unrestricted use of class, type, or size does not foreclose the EPA's interpretation.

This court will, as a result, defer to the EPA's interpretation so long as it is reasonable. *See, e.g.*, *Sierra Club I*, 353 F.3d at 990. And here, it is. The Agency explained that boilers vary in their designs depending on the type of fuel they burn. 2010 Proposed Major Boilers Rule, 75 Fed. Reg. at 32,016-17. These differences, according to the Agency, affect boiler emissions and the feasibility of emission controls. *Id*. And, because design constraints also restrict a boiler's ability to switch fuels, the Agency concluded that it could determine a boiler's type by looking at the fuel it had burned over the previous 12-month period. *Id.* at 32,014. The Environmental Petitioners point to nothing in the record that calls into question either of these technical judgments, which receive great deference. *See NRDC I*, 489 F.3d at 1375. Nor do the Petitioners offer any additional reasons in support of their argument that the Agency has ventured beyond its authority under the statute. In fact, the EPA's reasoning from the emissions data is consistent with the very existence of a subcategorization authority because the grant of this authority implicitly acknowledges that the EPA may need to set different emission standards within a category of major sources based on what is achievable for a subset of those sources. Because the statutory text readily encompasses the EPA's interpretation for the reasons explained above, and because the Environmental Petitioners offer no additional argument as to why the EPA's interpretation was unreasonable, we reject the Petitioners' *Chevron* challenge to the EPA's interpretation of its subcategorization authority.

The Environmental Petitioners nevertheless claim that the EPA's subcategories are arbitrary because a boiler is not of a different type when it can be a boiler "designed to burn coal" one year, and a boiler "designed to burn biomass" the next. But this argument fails for the same reasons as the *Chevron*

argument we just rejected. The fact that boilers may switch from one type to another over time does not, alone, render a subcategorization arbitrary. With no discernable basis to find the EPA's choice here questionable, much less arbitrary, we reject this argument too.

Finally, the Environmental Petitioners contend that the Agency failed to demonstrate with sufficient evidence, rather than mere assertions, that burning a different fuel makes the boiler a different class, type, or size. The Petitioners largely fail to develop this argument and, regardless, the EPA easily met its burden. The EPA based its decision on documented emissions data, several reports provided by the National Energy Technology Laboratory on boiler operations, and operating manuals provided by boiler manufacturers. *See, e.g.*, Summary of Public Comments and Responses for National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, EPA-HQ-OAR-2002-0058-3511-A1 (Dec. 2012), at 558-63. These sources support the EPA's decision to distinguish boilers based on the type of fuel they are designed to burn and the Agency's conclusion that boilers designed for one fuel type are unlikely to use another fuel type. *Id.* The Petitioners present no contrary evidence, nor do they attack the validity or accuracy of the data that the EPA relied upon. We thus find no merit in the Petitioners' various challenges to the EPA's decision to subcategorize major boilers based on the fuel the boiler is designed to burn.

K. "UNITS THAT BEGIN COMBUSTING SOLID WASTE" AS "EXISTING" SOURCES

Section 7429(a)(2) distinguishes between "existing" and "new" CISWI units. The former must comply with floors set

at the "average emissions limitation achieved by the best performing 12 percent of units" and the latter must comply with stricter floors set at the level achieved by "the best controlled similar unit." 42 U.S.C. § 7429(a)(2). "Modified" units, defined as units "at which modifications have occurred" that either experience changes that cost more than 50 per cent of the original construction price or result in increased emissions, *see id.* § 7429(g)(3), must be treated as "new," *see id.* § 7429(g)(2).

The preamble to the 2011 CISWI Rule states, "[u]nits that begin combusting solid waste are considered *existing* sources." 76 Fed. Reg. at 15,714 (emphasis added). Commentators objected that this blanket statement contravened the Act's plain terms, which mandate that the EPA treat such sources as "new," not "existing," if they meet the section 7429(g)(3) requirements. In its subsequent 2011 Proposed CISWI Rule on Reconsideration, the EPA refined its position: "An existing source will not be considered a new source solely due to a combustion material switch. Assuming new source applicability is not triggered, existing sources that change fuels or materials are considered existing sources . . . ." 76 Fed. Reg. at 80,459.

The Environmental Petitioners argue that the EPA's broad statement in the 2011 CISWI Rule indicates that it impermissibly changed its treatment of "modified sources" in contravention of the CAA. The EPA, however, agrees that any CISWI unit fitting the statutory criteria for a modified source must comply with new-unit MACT levels, not existing-unit MACT levels. *See* 42 U.S.C § 7429(g)(2). It also recognizes that its categorical statement in the 2011 CISWI Rule "may have been imprecise" and, in any event, it

argues that the Environmental Petitioners have taken its statement out of context. *See* No. 11-1125 EPA Br. 73.

We agree with the Agency. The EPA's later statement made clear that it intended to treat "sources that change fuels or materials" as "existing sources" unless "new source applicability," as mandated by the Act, is "triggered." *See* 2011 Proposed CISWI Rule on Reconsideration, 76 Fed. Reg. at 80,459. Moreover, the Agency provided its more precise statement while discussing specifically what constitutes a "modification" for the CISWI Rule. *See id.* ("An existing source will not be considered a new source solely due to a combustion material switch."). It made its earlier, "imprecise" comment, in contrast, while describing when a fuel change could mean the difference between regulation under section 7412 or section 7429. *See* 2011 CISWI Rule, 76 Fed. Reg. at 15,714. Convinced that the EPA has not impermissibly changed the statutory definition of "modified" CISWI, we reject the Petitioners' challenge.

L. EXCLUSION OF "TEMPORARY" BOILERS FROM AREA BOILERS RULE

In the final 2013 Area Boilers Rule, the EPA excluded "temporary boilers" from regulation under section 7412. *See* 78 Fed. Reg. at 7,491. The Rule defined "temporary boilers" as "any gaseous or liquid fuel boiler that is designed to, and is capable of, being carried or moved from one location to another by means of, for example, wheels, skids, carrying handles, dollies, trailers, or platforms." *Id.* Moreover, a boiler is *not* a temporary boiler if any of the following apply:

(1) The equipment is attached to a foundation.

(2) The boiler or a replacement remains at a location within the facility and performs the same or similar function for more than 12 consecutive months, unless the regulatory agency approves an extension. An extension may be granted by the regulatory agency upon petition by the owner or operator of a unit specifying the basis for such a request. Any temporary boiler that replaces a temporary boiler at a location within the facility and performs the same or similar function will be included in calculating the consecutive time period unless there is a gap in operation of 12 months or more.

(3) The equipment is located at a seasonal facility and operates during the full annual operating period of the seasonal facility, remains at the facility for at least 2 years, and operates at that facility for at least 3 months of each year.

(4) The equipment is moved from one location to another within the facility but continues to perform the same or similar function and serve the same electricity, steam, and/or hot water system in an attempt to circumvent the residence time requirements of this definition.

2013 Area Boilers Rule, 78 Fed. Reg. at 7,491-92.

Environmental Petitioners challenge this exclusion as a violation of the EPA's obligations under the CAA to regulate all boilers listed under section 7412. By its own terms, the 2011 Area Boilers Rule "applies to all existing and new industrial boilers, institutional boilers, and commercial boilers located at area sources. Boiler means an enclosed combustion device having the primary purpose of recovering thermal energy in the form of steam or hot water." 76 Fed. Reg. at 15,557; *see also* 76 Fed. Reg. at 15,554 ("EPA is promulgating national emission standards for control of hazardous air pollutants from two area source categories: Industrial boilers and commercial and institutional boilers."). Environmental Petitioners claim the general term "boiler" necessarily encompasses temporary boilers: "[T]he category of 'boilers' plainly includes temporary boilers, just as the category of 'courts' includes federal courts, or the category of 'dogs' includes brown dogs." No. 11-1141, Envtl. Pet'rs' Reply Br. 7. According to Petitioners, then, sections 7412(c) and 7412(d) of the CAA require the EPA to issue emission standards for temporary boilers as well as "permanent" boilers. *See* 42 U.S.C. § 7412(c)(2) ("For the categories and subcategories the Administrator lists, the Administrator shall establish emission standards . . . ."); *id.* § 7412(d)(1) ("The Administrator shall promulgate regulations establishing emission standards for each category or subcategory of major sources and area sources of hazardous air pollutants listed for regulation . . . .").

To the extent Environmental Petitioners challenge as unreasonable the EPA's justifications for declining to set emission standards for temporary boilers, they cannot prevail. "Under arbitrary-and-capricious review, EPA's determinations are presumptively valid provided [they] meet[] a minimum rationality standard." *Nat'l Ass'n for Surface*

Finishing, 795 F.3d at 7 (internal quotation marks omitted). So the question is whether the EPA offered a sufficiently rational explanation for its exclusion of temporary boilers. The EPA has done so here. First, contrary to Petitioners' claims, temporary boilers were never considered an inexorable part of the "industrial boiler" category section 7412 requires the EPA to regulate. While the EPA only listed generic area source categories—"industrial boilers" and "institutional/commercial boilers"—in its 1999 rulemaking, it has since refined these broad categories pursuant to its statutory authority. *See* National Air Toxics Program: The Integrated Urban Strategy, 64 Fed. Reg. 38,706, 38,721 tbl.2 (July 19, 1999). In doing so, the EPA excluded several other subgroups of boilers that might otherwise be read as falling under one of the general boiler categories. *See, e.g.*, 2013 Area Boilers Rule, 78 Fed. Reg. at 7,492 (excluding boilers already regulated by other MACT standards); 2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,539 (excluding electric and residential boilers as not part of either source category). The EPA's clarification that temporary boilers were never considered part of the "industrial boilers" category was simply another refinement, as contemplated by the statute. *See* 42 U.S.C § 7412(e)(4) (precluding judicial review until the EPA has issued its final emission standards for a category or subcategory).

Second, as both the EPA and Industry Intervenors note, the parallel rule for major source boilers has always explicitly excluded temporary boilers from its "industrial boiler" categorization. *See* 40 C.F.R. § 63.7491(j). The EPA thus considered commenters' requests to add a similar clarification to the 2013 Area Boilers Rule and reasonably decided to do so. *See, e.g.*, American Forest & Paper Association, Comments on Proposed Area Source Rule (AF&PA

Comments), EPA-HQ-OAR-2006-0790-1939 (Aug. 23, 2010), at 58 (No. 11-1141 J.A. 389). EPA explained this choice in its proposed rule:

> Owners and operators of regulated sources have pointed out that temporary boilers are small (less than 10 MMBtu/hr heat input) and are generally owned and operated by contractors, rather than the facility. As a result, they are not included in the facility's operating permits because state and federal CAA operating permit programs have historically classified such units as insignificant sources. The owners and operators also noted that compliance with the work practice requirements applicable to these small boilers would be complicated because they are typically located on site for less than a year, but would be subject to biennial management practice requirements. We agree that the source category identified in subpart JJJJJJ should specifically exclude these temporary boilers because they have been considered insignificant sources, and were not included in the EPA's analysis of the source category.

2011 Proposed Area Boilers Rule on Reconsideration, 76 Fed. Reg. at 80,535.

The unique nature of temporary boilers favors their exclusion. These boilers tend to be rented for use on a temporary basis and come in "shop-fabricated package designs." AF&PA Comments, at 58 (No. 11-1141 J.A. 389).

Temporary boilers also "typically only fire gas or liquid fossil fuels (natural gas or distillate oil) which may be cleaner than the boiler(s) they are temporarily replacing. In addition, these units often do not have exhaust stacks that meet EPA Method 1 requirements for application of test methods." *Id.* Regardless, during the rulemaking, Environmental Petitioners argued the EPA had "not explained why this is a distinction that justifies differential treatment, let alone an exemption." *See* Area Boilers Rule—Responses to Comments, at 65. The EPA responded by explaining that rather than having "created a category or subcategory of 'temporary boilers' and then exempted them from the standards," the Agency never "intend[ed] to regulate temporary boilers under the area source standards" in the first place. *See id.* The EPA further noted that, "[b]y their nature of being temporary, these boilers operate in place of another non-temporary boiler while that boiler is being constructed, replaced or repaired, in which case we counted the non-temporary boiler as the one being regulated." *Id.* Finally, the Agency concluded regulation of temporary boilers was not necessary to meet its statutory emission requirements under sections 7412(c)(6) and 7412(c)(3) of the CAA. *Id.* In its final rule, the EPA reiterated this explanation: "Similar to residential boilers, we did not intend to regulate temporary boilers under the area source standards because they are not part of either the industrial boiler source category or the commercial/institutional boiler source category." 2013 Area Boilers Rule, 78 Fed. Reg. at 7,491. The final regulation also included a detailed explanation of how EPA decided on its limited definition of "temporary boilers." *See id.* at 7,499.

The evidence before the Agency supported its decision to exclude temporary boilers. Indeed, the EPA "cogently explain[ed]" why it exercised its discretion in this manner,

such that this court concludes the Agency's choice "was the product of reasoned decision making." *U.S. Telecom Ass'n v. FCC*, 227 F.3d 450, 460 (D.C. Cir. 2000). We therefore uphold the EPA's exclusion of temporary boilers from regulation of area source boilers.

M. WORK-PRACTICE STANDARDS FOR COAL-FIRED BOILERS

When setting emission limits for area sources, the EPA enjoys greater discretion than when setting limits for major sources. With respect to major sources, the EPA has to promulgate MACT standards, *see* 42 U.S.C. § 7412(d)(2), whereas for area sources the EPA can generally promulgate more lenient GACT standards, *see id.* § 7412(d)(5). The CAA, however, singles out seven particularly hazardous pollutants that require stricter regulatory standards, even for area sources.[41] Under section 7412(c)(6), the EPA must "list categories and subcategories of sources assuring that sources accounting for not less than 90 per centum of the aggregate emissions of each such pollutant" are regulated. The EPA listed a variety of area sources under section 7412(c)(6) in its 1998 rulemaking based on their Hg and POM emissions. *See* Proposed 2010 Area Boilers Rule, 75 Fed. Reg. at 31,898; Source Category Listing for Section 112(d)(2) Rulemaking Pursuant to Section 112(c)(6) Requirements, 63 Fed. Reg. 17,838, 17,849-50 (Apr. 10, 1998). But the Agency subsequently refined that list and ultimately concluded only

[41] These seven pollutants are: (i) alkylated lead compounds, (ii) polycyclic organic matter (POM), (iii) hexachlorobenzene, (iv) mercury (Hg), (v) polychlorinated biphenyls, (vi) 2,3,7,8-tetrachlorodibenzofurans, and (vii) 2,3,7,8-tetrachlorodibenzo-p-dioxin. *See* 42 U.S.C. § 7412(c)(6).

coal-fired area boilers needed to be listed to meet the statute's 90 per cent emissions threshold. *See* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,898; *see also* No. 11-1141 EPA Br. 14 ("[T]he coal-fired subcategory is responsible for over 82 percent of the mercury emissions from the [area source] category in the inventory, even though it represents only 2 percent of the boilers in the category.").

Under section 7412(c)(6), the EPA was therefore required to set either a MACT limit under section 7412(d)(2), a health threshold under section 7412(d)(4), or a work-practice standard under section 7412(h) for all coal-fired boilers. The Agency chose to set MACT numerical emission limits for Hg and CO[42] at new and existing large coal-fired boilers. 2013 Area Boilers Rule, 78 Fed. Reg. at 7,488. However, the EPA found it "technologically and economically impracticable to apply [its] measurement methodology to . . . small sources," and so it chose to institute a work-practice standard[43] for all new and existing small coal-fired boilers. *Id.* at 7,488-89. This work-practice standard requires small coal-fired units to be periodically tuned up but does not impose any numeric emission limit. *See id.* The EPA similarly decided that, for large coal-fired boilers undergoing a startup or a shutdown, a work-practice standard—rather than a numeric emission standard—was

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[42] Because the EPA chose to regulate POM emissions indirectly—by using CO emissions as a surrogate—the standards it set under section 7412(c)(6) are for CO rather than POM. *See* 2013 Area Boilers Rule, 78 Fed. Reg. at 7,488, 7,503.

[43] In their brief, Environmental Petitioners alternate between the terms "operational standards" and "work-practice standards," both of which fall under section 7412(d)(2)(D). This opinion will use "work-practice standards" for simplicity.

most practicable. *See id.* at 7,518 tbl.2 (requiring owners of large "[e]xisting or new coal-fired" boilers to "[m]inimize the boiler's startup and shutdown periods and conduct startups and shutdowns according to the manufacturer's recommended procedures").

Environmental Petitioners challenge the EPA's decision to employ work-practice standards as a violation of 7412(d)(2)'s mandate to achieve the "maximum degree of reduction in emissions." We examine Petitioner's statutory argument step-by-step, as it hinges on the interplay between several statutory provisions. First, section 7412(c)(6)—which governs regulation of Hg and POM emissions—requires the Administrator to regulate sources of these pollutants under either section 7412(d)(2) or (d)(4). Section 7412(d)(4) allows the Administrator to establish health-based emission standards; it is not implicated here. Instead, the EPA decided to regulate coal-fired boilers under section 7412(d)(2). Section 7412(d)(2) instructs the Administrator to achieve "the maximum degree of reduction in emissions of the hazardous air pollutants . . . that the Administrator, taking into consideration the cost of achieving such emissions reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing sources." The Administrator is authorized to use several means to achieve this reduction including implementing "design, equipment, work practice, or operational standards . . . as provided in [section 7412(h)]." 42 U.S.C. § 7412(d)(2)(D). Section 7412(h)(1) states: "[I]f it is not feasible in the judgment of the Administrator to prescribe or enforce an emission standard for control of a [pollutant], the Administrator may, in lieu thereof, promulgate a . . . work-practice standard . . . , which in the Administrator's judgment is consistent with the provisions of

subsection (d) or (f) of this section." Petitioners do not dispute the EPA's ability to set work-practice standards here; they instead focus on section 7412(h)'s requirement that any such standards be "consistent with" subsection (d)—which requires the "maximum degree of reduction in emissions." According to Petitioners, the EPA's decision to set these particular work-practice standards fails at both *Chevron* steps.

With respect to *Chevron* step 1, Petitioners argue the "EPA does not claim the operational standards [for coal-fired boilers] are 'consistent with the provisions of subsection (d) or (f)' of § 7412." No. 11-1141 Envtl. Pet'rs' Br. 33. In other words, because these work-practice standards "do not even purport" to be consistent with section 7412(d)'s mandate to maximize reduction of emissions, "they are unlawful under *Chevron* step one." *Id*. Petitioners point to the EPA's specific findings to support this claim: for large coal-fired boilers, the EPA found that mercury emissions could be reduced by 75 to 82 per cent through the use of a fabric filter. *Id.* But, according to Petitioners, the "EPA admits the tune-up program [for small coal-fired boilers] will reduce emissions by only one percent." *Id.* And, with respect to large coal-fired boilers undergoing startup or shutdown, Petitioners argue the "EPA does not claim that 'following the manufacturer's recommended procedures' during startup and shutdown will reduce emissions at all." *Id.*

At the familiar *Chevron* step 1, the court must "first examine the statute *de novo*, employing traditional tools of statutory construction." *Nat'l Ass'n of Clean Air Agencies*, 489 F.3d at 1228 (internal quotation marks omitted). If the Congress's intent is clear, then the Agency's interpretation is afforded no deference, and the court "must give effect to the unambiguously expressed intent of Congress." *Id.*

In this case, Environmental Petitioners place too much emphasis on certain snippets of the statute without examining the larger context. For one, Petitioners seem to argue that the EPA *must* adopt work-practice standards that result in the maximum possible reduction of emissions, without taking into account any other considerations. But section 7412(d)(2) itself belies this claim: it says the EPA must promulgate standards that require "the maximum degree of reduction in emissions . . . *that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable.*" 42 U.S.C. § 7412(d)(2) (emphasis added). This portion of the statute explicitly defers to the Administrator's judgment regarding a standard's "achievability," even though it directs him to consider particular factors in making that assessment. Section 7412(h) similarly requires the Administrator to adopt a work-practice standard that *in his judgment* is consistent with section 7412(d)(2)'s mandate. We therefore cannot accept Petitioners' suggestion that Congress unambiguously required the EPA to adopt standards that result in the maximum reduction of emissions that is technologically feasible.

Environmental Petitioners' challenge to these work-practice standards as unreasonable under *Chevron* step 2 and arbitrary under *State Farm* presents a closer call. With respect to *Chevron* step 2, the court must "uphold an agency's interpretation if it is reasonable." *Ariz. Pub. Serv. Co. v. EPA*, 211 F.3d 1280, 1287 (D.C. Cir. 2000). And, "even where EPA's construction satisfies *Chevron*, [the court] still must ensure that its action is not otherwise arbitrary and capricious. The arbitrary and capricious standard is '[h]ighly deferential,' and it 'presumes the validity of agency action.'" *Nat'l Ass'n*

of Clean Air Agencies, 489 F.3d at 1228 (citations omitted). As long as an agency has "considered the relevant factors and articulated 'a rational connection between the facts found and the choice made,'" then its decision must be upheld. *Allied Local & Reg'l Mfrs. Caucus*, 215 F.3d at 68.

Petitioners mount both a "facial" and a substantive challenge to the EPA's rationale for adopting work-practice standards. First, Petitioners claim the EPA's decision is arbitrary because it fails "to reconcile its approach with the statutory requirement [of section 7412(d)(2)]." No. 11-1141 Envtl. Pet'rs' Br. 34. Specifically, Petitioners insist the EPA must explicitly state somewhere that these particular work-practice standards are "consistent" with section 7412(d)(2). *See id.* at 33-34. Otherwise, Petitioners contend, the Court must simply "*assume* that the Agency heeded § 7412(h)'s 'consistent with' requirement, notwithstanding the EPA's failure to acknowledge and apply that requirement in the record." No. 11-1141 Envtl. Pet'rs' Reply Br. 10.

The Agency responds that, "by identifying the tune-up and startup/shutdown requirements as 'work practices,' [it] is stating that those standards are issued under section 7412(h) and are consistent with the requirements of section 7412(d) (*i.e.*, MACT)." No. 11-1141, EPA Br. 71. The EPA did acknowledge it has an obligation to maximize emission reductions under section 7412(d)(2) when promulgating work-practice standards. S*ee* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,568 ("CAA section 112(h) authorizes the Administrator to promulgate [a work-practice standard] consistent with the provisions of CAA sections 112(d) or (f) . . . ."). However, Petitioners are correct that the Agency did not make a finding on the record that these work-practice

standards would achieve the highest emissions reduction possible.

But the lack of an explicit statement does not automatically condemn this portion of the rule. *See Bowman*, 419 U.S. at 286 ("[W]e will uphold a decision of less than ideal clarity if the agency's path may reasonably be discerned."). The Petitioners offer no support for their contention that the EPA must make an express finding that its standards are "consistent" with section 7412(d)(2). Nor does our conclusion requires us to merely "assume" that the Agency's actions comport with section 7412(d)(2). Instead, as we usually do when presented with such arguments, we review the rulemaking record to determine whether the justifications the EPA offered for adopting these work practices standards were permissible.

1. Small Coal-Fired Boilers

First, with respect to small coal-fired boilers, the EPA determined that a biennial tune-up requirement would best comply with section 7412(h)'s requirements. As a starting point, the EPA surveyed a sample of state regulations mandating various work-practice standards for small coal-fired boilers; the Agency found that ten states required tune-ups, two required periodic inspections, one required operator training, and one required operation in accordance with manufacturer specifications. 2011 Area Boilers Rule, 76 Fed. Reg. at 15,573-74. The EPA thus concluded that tune-ups were the most typical work-practice standard employed for this type of boiler. *Id.* The Agency also found that regular tune-ups could lower HAP emissions by increasing the efficiency of small coal-fired boilers. *See id.* at 15,575 ("A tune-up performed to the manufacturer's specifications would

ensure the highest energy efficiency and reduce fuel usage, which will ultimately reduce HAP emissions."); *see also* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,908 ("A boiler tune-up provides potential savings from energy efficiency improvements and pollution prevention. . . . In addition, the cost of a boiler tune-up appears minimal compared to the cost for testing and monitoring to demonstrate compliance with an emission limit.").[44]

The EPA elected to implement a work-practice standard because the typical method used to measure emissions of Hg and CO could not be used to sample emissions from stacks with small diameters (less than 12 inches). *See* 2011 Area Boilers Rule, 76 Fed. Reg. at 15,568. Because many small coal-fired boilers have stacks with diameters below 12 inches—and because many of these boilers "do not currently have sampling ports or a platform for accessing the exhaust stack"—the Agency concluded the cost of testing and monitoring these small boilers would "present an excessive burden for smaller sources." *Id.* The Agency's consideration of cost effectiveness is particularly appropriate in this context because the "vast majority" of area source boilers are "generally owned and operated by small entities," which would be disproportionately burdened by a numeric emissions limit. See Fact Sheet: Final Adjustments to the Air Toxics Standards for Industrial, Commercial, and Institutional Boilers at Area Source Facilities, 1, 2 (No. 11-1141 J.A. 684-

[44] The EPA's discussion of boiler tune-up advantages occurs mainly in the context of its decision to select a GACT standard rather than any numeric emission standards for certain boilers. Environmental Petitioners challenge this decision on similar grounds, *see supra* § IV.H. But the benefits of periodic tune-ups also apply to the coal-fired boilers at issue here.

85); *see also* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,906 ("The results of the analysis indicate that total compliance costs exceed 3 percent (and can reach as high as 19 percent) of the average firm revenues for 79 percent of the facilities.").

Environmental Petitioners counter that while tune-ups may minimally reduce HAP emissions, they do not maximize this reduction per section 7412(d)(2)'s mandate.[45] But Petitioners view section 7412(d) too myopically; under that section, the Administrator is empowered to adopt standards that "tak[e] into consideration the cost of achieving such emission reduction." 42 U.S.C. § 7412(d)(2). The EPA here examined the costs of imposing a numeric emission standard on small coal-fired boilers and found that option "not feasible" due to high costs and monitoring difficulties, considerations equally permissible under section 7412(d)(2). Petitioners argue that requiring the use of a fabric filter would have resulted in greater reductions, but they are unable to point to any small coal-fired boiler that currently uses such a filter. *See* 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,906 ("For existing [small] area source boilers, the only work practice being used that potentially controls mercury

[45] Petitioners also point to a comment they made in the record arguing that a tune-up standard "would not achieve emission reductions that are consistent with the definition of MACT," and urge that the EPA never addressed these concerns. *See* National Association of Clean Air Agencies, Comments on EPA Proposals for Regulation of Hazardous Air Pollutants (HAPS), EPA-HQ-OAR-2006-0790, EPA-HQ-OAR-2002-0058, EPA-HQ-OAR-2003-0119 (Aug. 23, 2010), at 21-22 (No. 11-1141 J.A. 417-18). But this comment was specifically addressed to *gas-fired* boilers, and it is inapposite to the EPA's consideration of standards for coal-fired boilers.

and POM emissions is a boiler tune-up."). Evidence before the agency in fact indicated that the best performing small coal boilers for POM emission use no add-on controls. *See* Memorandum from Amanda Singleton & Brandon Long, Eastern Research Group, to Jim Eddinger, EPA (MACT/GACT Mem.), App. E-2a (No. 11-1141 J.A. 540). It was therefore reasonable for the EPA, when considering costs, to conclude that biennial tune-ups would allow for the maximum "achievable" reduction in emissions.

Petitioners' most compelling argument involves the EPA's lack of data on small coal-fired boilers. As they point out, the EPA's summary of its 2008 combustion survey makes no mention of any small coal-fired boilers. *See* MACT/GACT Mem., App. D-3, tbl.1 (No. 11-1141 J.A. 523). And the EPA never directly addressed whether control technologies, such as fabric filters, were useable by small boilers; "[t]he only claim EPA made in the record is that tune-ups are the most effective option that [small] coal-fired boilers . . . are *currently* using, not that tune-ups yield the maximum reduction 'achievable.'" No. 11-1141 Envtl. Pet'rs' Reply Br. 11. In *Sierra Club II*, this court agreed with Sierra Club's challenge to the EPA's use of a work-practice standard instead of an emission floor because the "EPA never determined that measuring emissions from ceramics kilns was impracticable; it determined only that it lacked emissions data from ceramics kilns. EPA thus had no basis under section 7412(h) for using work practice standards." 479 F.3d at 884. That context is somewhat distinguishable, given that the statute there explicitly required the EPA to make a "feasibility" finding (as discussed above), but it could be argued that the EPA here lacked the data to determine whether tune-ups were "consistent with" section 7412(d)(2).

Ultimately, though, the high level of deference afforded the EPA counsels in favor of upholding this work-practice standard. Although the EPA did not explicitly state that tune-ups were the best option to reduce emissions while still "considering costs," this finding can be inferred from the record as a whole. For instance, the EPA found that "[n]one of the States for which we have an inventory have an applicable emissions limit" for small coal-fired boilers, except New Jersey, which actually has tune-ups as its work-practice standard. 2010 Proposed Area Boilers Rule, 75 Fed. Reg. at 31,909. Based on these findings, it can reasonably be inferred that—given the prevalence of these small boilers—at least a *few* would be using a control technology if that were technologically or economically feasible. Because numeric emissions cannot easily be measured from these smaller sources and the costs of outfitting them with such technology would be cost prohibitive, the EPA's choice of tune-ups as the work-practice standard is sufficiently reasonable to uphold under both *Chevron* step 2 and *State Farm*. The Agency's choice is consistent with section 7412(h)'s "feasibility" requirement and with section 7412(d)(2)'s instruction to maximize emission reductions while also considering costs.

2. Large Coal-Fired Boilers Undergoing Startup or Shutdown

The record for large coal-fired boilers undergoing startup or shutdown is less extensive but again the EPA's determination is reasonable. While large coal-fired boilers are required to meet numeric emission standards during "normal" operations, the EPA adopted a work-practice standard for the temporary periods of startup and shutdown. *See* 40 C.F.R. § 63.11214 ("[M]inimize the boiler's startup and shutdown periods following the manufacturer's

recommended procedures, if available. If manufacturer's recommended procedures are not available, you must follow recommended procedures for a unit of similar design for which manufacturer's recommended procedures are available."). Environmental Petitioners contend that the EPA never stated this practice would reduce emissions at all, and therefore it has not met its burden under section 7412(d)(2). But we have already explained that no *express* finding of consistency with section 7412(d)(2) need be made. Here, the record suggests that the work-practice standard the Agency chose would reduce emissions, and we therefore can "reasonably [] discern[]" the Agency's path. *Bowman*, 419 U.S. at 286. Specifically, the EPA explained that requiring boilers to operate in startup and shutdown mode for "sufficient time to conduct the required test runs [to impose numeric standards] could result in higher emissions than would otherwise occur." 2011 Major Boilers Rule, 76 Fed. Reg. at 15,642. Industry stakeholders also pointed out that "it is very common . . . for certain control devices to be out of operation during periods of start-up due to the nature of the equipment." *See* American Chemistry Council, Comments on EPA's Proposed Rule for National Emission Standards for Hazardous Air Pollutants for Area Sources, EPA-HQ-OAR-2006-0790 (Aug. 23, 2010), at 31 (No. 11-1141 J.A. 386). Because the control technology is temporarily offline, "it is likely that emissions will exceed the standards proposed [during that time period]." *Id.* A work-practice standard that requires facilities to minimize the time their boilers spend in startup or shutdown thus seems calculated to maximally reduce emissions during those periods—and Petitioners fail to provide any viable alternative. We therefore conclude the EPA's decision to adopt these work-practice standards for large coal-fired boilers during startup and shutdown was reasonable.

V. CONCLUSION

For the foregoing reasons, we grant the petitions in part and deny them in part. Specifically, we vacate the MACT standards for all major boiler subcategories that would have been affected had the EPA considered all sources included in the subcategories, as explained at *supra* § IV.B. We also remand, without vacatur, to the EPA to: (1) adequately explain how CO acts as a reasonable surrogate for non-dioxin/furan organic HAPs; (2) set emission standards for cyclonic burn barrels; (3) determine whether burn-off ovens, soil treatment units, and space heaters are CISWI units and, if so, to set standards for those types of units; (4) adequately explain the exclusion of synthetic boilers from Title V's permitting requirements; and (5) adequately explain the choice of GACT standards over MACT standards for non-Hg metals.

So ordered.