United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued May 3, 2013 Decided August 20, 2013

No. 11-1131

NATIONAL ASSOCIATION OF CLEAN WATER AGENCIES,
PETITIONER

v.

ENVIRONMENTAL PROTECTION AGENCY AND GINA
MCCARTHY, ADMINISTRATOR, EPA,
RESPONDENTS

MAXWEST ENVIRONMENTAL SYSTEMS, INC., ET AL.,
INTERVENORS

Consolidated with 11-1167, 11-1185, 12-1236, 12-1237

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

Jeffrey A. Knight argued the cause for petitioners/respondents-intervenors National Association of Clean Water Agencies, et al. With him on the briefs were *Peter H. Wyckoff* and *Steven A. Hann*.

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

James S. Pew argued the cause for petitioner Sierra Club. With him on the briefs was *Jonathan A. Wiener*.

Lisa Sharp argued the cause for intervenor MaxWest Environmental Systems Inc. With her on the briefs was *D. Cameron Prell*.

Michele L. Walter and *Martha C. Mann*, Attorneys, U.S. Department of Justice, argued the causes and filed the brief for respondents.

Jonathan A. Wiener argued the cause for respondent-intervenor Sierra Club. With him on the brief was *James S. Pew*.

Steven A. Hann, *Jeffery A. Knight*, and *Peter H. Wyckoff* were on the brief for respondents-intervenors National Association of Clean Water Agencies, et al.

Before: GARLAND, *Chief Judge*, BROWN, *Circuit Judge*, and SENTELLE, *Senior Circuit Judge*.

Opinion for the Court filed by *Senior Circuit Judge* SENTELLE.

SENTELLE, *Senior Circuit Judge*: In March 2011, the Environmental Protection Agency ("EPA") issued a final rule establishing emission standards for sewage sludge incinerators under § 129 of the Clean Air Act, 42 U.S.C. § 7429. *See* Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Sewage Sludge Incineration Units, 76 Fed. Reg. 15,372 (Mar. 21, 2011). Determining that sewage sludge incinerators were "solid waste incineration unit[s]" as defined in § 129(g)(1),

the EPA promulgated "maximum achievable control technology" ("MACT") standards for two subcategories of sewage sludge incinerators.

The Clean Air Act cabins EPA's discretion in setting MACT standards, requiring EPA to base the standards on the emissions achieved by the best-performing existing incinerators. *See* 42 U.S.C. § 7429(a)(2). But acting under pressure of a court order to establish the MACT standards by a set deadline, EPA took a targeted approach to collecting emissions data and used several different methods to estimate the emissions levels achieved by existing incinerators. *See* 76 Fed. Reg. at 15,386.

The petitioners challenge several different aspects of the rulemaking. Petitioners National Association of Clean Water Agencies and Hatfield Township Municipal Authority (collectively, "NACWA") challenge EPA's authority to regulate sewage sludge incinerators under § 129, asserting that sewage sludge incinerators do not fall within the scope of § 129(g)(1)'s definition of "solid waste incineration unit." Petitioners NACWA and Sierra Club seek review of the sewage sludge incinerator emission standards, challenging several aspects of EPA's methodology for estimating the emission levels achieved by the best performing units. In addition to these petitioners, MaxWest Environmental Systems, developer of a proprietary biosolids management process, intervenes to challenge EPA's treatment of its technology in the sewage sludge incinerator rule.

For the reasons stated below, we deny NACWA's petition for review as to EPA's authority to regulate sewage sludge incinerators under § 129. As to the petitioners' challenges to EPA's methodology in setting emission standards, we agree that in some respects EPA has not

adequately established that its estimations are reasonable, and so remand parts of the sewage sludge incinerator rule to EPA for further proceedings without vacating the current standards. We otherwise deny the petitions for review, and will not consider intervenor MaxWest's arguments as they are not within the scope of issues raised by the petitioners.

I. BACKGROUND

A. Statutory Background

The Clean Air Act requires EPA to set emission standards for polluting sources "to protect and enhance the quality of the Nation's air resources." 42 U.S.C. § 7401(b)(1). Section 112 of the Clean Air Act, 42 U.S.C. § 7412, requires EPA to set emission standards for a list of hazardous air pollutants emitted by major sources and area sources. *Id.* § 7412(d). Section 129 is more specific, directing EPA to establish emission standards for a list of nine pollutants emitted by solid waste incineration units. *Id.* § 7429(a). Subject to certain exceptions not relevant to this case, § 129 defines a "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 (including single and multiple residences, hotels, and motels)." *Id.* § 7429(g)(1).

Under § 129, the standards established by EPA must reflect "the maximum degree of reduction" in the emissions of a list of pollutants[1] that EPA, "taking into consideration the

[1] Specifically, § 129 requires EPA to set numerical emission limitations for: "particulate matter (total and fine), opacity (as appropriate), sulfur dioxide, hydrogen chloride, oxides of nitrogen, carbon monoxide, lead, cadmium, mercury, and dioxins and dibenzofurans." § 129(a)(4).

cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing units" in each category of sources. *Id.* § 7429(a)(2). EPA refers to these standards as the "maximum achievable control technology" standards, abbreviated as the MACT standards. *Northeast Maryland Waste Disposal Authority v. EPA*, 358 F.3d 936, 939–40 (D.C. Cir. 2004).

Congress set parameters governing EPA's establishing of the MACT standards, which EPA has implemented through a two-step process. First, EPA sets a baseline level of stringency for emissions controls known as the MACT floor. For new units, the MACT floor is the level of emissions control "that is achieved in practice by the best controlled similar unit," as determined by EPA. 42 U.S.C. § 7429(a)(2). For existing units, the MACT floor is "the average emissions limitation achieved by the best performing 12 percent of units" in each category. *Id.* Second, EPA determines whether more stringent "beyond-the-floor" MACT standards are achievable, taking into consideration the factors listed in § 129(a)(2).

The Clean Air Act makes promulgating MACT standards under § 112 and § 129 mutually exclusive. *Id.* § 7429(h)(2). Although the statutory directive on setting MACT standards is virtually identical under § 112 and § 129, EPA's decision to regulate a source under one section rather than the other has practical consequences. For example, the list of pollutants for which EPA must set MACT standards differs between the two sections. *Compare id.* § 7412(b) (list of hazardous air pollutants), *with id.* § 7429(a)(4) (list of nine pollutants for which EPA must set MACT standards for solid waste incinerators). The stringency of regulation for sources covered under these sections can also differ, depending on the

type of source. Under § 129, *all* solid waste incinerators within § 129(g)(1)'s definition of "solid waste incineration unit" are subject to the MACT standards that EPA establishes for that category of incinerator. *See id.* § 7429(a). In contrast, the MACT standards established under § 112 are mandated only for "major sources," defined as sources that have the potential to emit ten tons per year or more of any hazardous air pollutants, or twenty-five tons per year or more of any combination of hazardous air pollutants. *See id.* § 7412(a)(1), (d)(5).

For sources that are not "major sources"—defined in § 112(a)(1) as "area sources"—EPA is given the discretion to establish standards providing "for the use of generally available control technologies or management practices . . . to reduce emissions of hazardous air pollutants." *Id.* § 7412(d)(5). The generally available control technology standard is not governed by the same statutory requirements as the MACT standard, giving EPA more flexibility in regulating area sources. Because EPA determined in 2002 that no sewage sludge incinerator emitted hazardous air pollutants at such a level as to qualify as a major source, the generally available control technology standard would apply to sewage sludge incinerators if EPA regulated them under § 112. *See* National Emission Standards for Hazardous Air Pollutants: Revision of Source Category List Under Section 112 of the Clean Air Act, 67 Fed. Reg. 6,521, 6,523. (Feb. 12, 2002). Sewage sludge incinerators also would not be subject to monitoring and siting review requirements, which are mandated by § 129 but not by § 112. *See* 42 U.S.C. § 7429(a)(3), (c).

B. Regulatory Background

Publicly-owned treatment works, owned by municipalities or regional authorities, are responsible for managing all sewage that enters into the sanitary sewer system. Publicly-owned treatment works first treat the wastewater, creating sewage sludge in the process, then use various methods to dispose of the sewage sludge. Many publicly-owned treatment works use sewage sludge incinerators to dispose of sewage sludge. EPA's inventory of sewage sludge incinerators stood at 204 at the time of the rulemaking. 76 Fed. Reg. at 15,387.

EPA proposed emission standards for sewage sludge incinerators in October 2010, asserting its authority under § 129 to regulate "other categories of solid waste incineration units." *See* 75 Fed Reg. at 63,263; 42 U.S.C. § 7429(a)(1)(E). EPA began to develop these standards after the District Court for the District of Columbia determined that EPA was failing to discharge its non-discretionary duty under provisions of § 112, and ordered EPA to do so. *See* 75 Fed. Reg. at 63,264. Although the specific § 112 obligations with which EPA had failed to comply are not relevant to this petition, the district court determined that § 112 required EPA to set emission standards for sewage sludge incinerators.[2] *See Sierra Club v. Jackson*, 1:01-CV-1537, EFC No. 84 at 23 (D.D.C. filed Aug. 2, 2006); *Sierra Club v. Jackson*, 1:01-CV-1537, ECF No. 150 at 6–8 (D.D.C. filed Jan. 20, 2011). After granting EPA multiple motions to extend the deadline for issuing sewage

[2] The § 112 obligations were to identify and regulate certain area sources that account for 90 percent or more of aggregate air emissions of 30 hazardous air pollutants identified by EPA under § 112(k)(3)(B)(i)–(ii). *See Sierra Club v. Jackson*, No. 1:01-CV-1537, ECF No. 80 (D.D.C. filed Mar. 31, 2006); *see also* 42 U.S.C. § 7412(c)(3), (k)(3)(B).

sludge regulations, the district court ultimately required EPA to promulgate the final rule by February 21, 2011. *Id.*, ECF No. 150, at 25.

1. Proposed Rule

On October 14, 2010, EPA issued a proposed rule proposing emission standards for sewage sludge incinerators. *See* Standards of Performance for New Stationary Sources & Emission Guidelines for Existing Sources: Sewage Sludge Incineration Units, 75 Fed. Reg. 63,260. In the preamble, EPA explained that although it had stated in other rules its intent to regulate sewage sludge incinerators under § 112, it was proposing to regulate sewage sludge incinerators under § 129 in light of our ruling in *Natural Resources Defense Council v. EPA*, 489 F.3d 1250 (D.C. Cir. 2007). *See id.* at 63,263 (citing Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Source: Other Solid Waste Incineration Units, 70 Fed. Reg. 74,870 (Dec. 16, 2005)).

In the proposed rule, EPA established two subcategories of sewage sludge incinerators: multiple hearth incinerators and fluidized bed incinerators. *Id.* at 63,268. EPA found that these were the only two types of incinerators used to combust sewage sludge, and determined subcategorization was warranted because the combustion design for these two types of incinerators varied significantly. *Id.*

In proposing the MACT standards for the subcategories of incinerators, EPA extensively discussed the methodology it used to derive the MACT floors. *See id.* at 63,269–75. To select which units to survey for emissions data, EPA identified units equipped with the control technology that it believed would achieve the lowest emissions possible for the

§ 129 pollutants. *Id.* at 63,270. EPA stated that using control technologies to select best-performing units was sufficient because municipalities were already required to limit the concentration of pollutants in sewage sludge under Clean Water Act regulations. *Id.* (citing 40 C.F.R. pt. 503). These preexisting regulations, EPA explained, caused incinerators to "burn a relatively homogeneous waste," thus rendering control technologies a suitable proxy for targeting the best-performing units from which to collect emissions data. *Id.*

For its dataset, EPA surveyed 9 municipalities, and supplemented the results of that study with data from State environmental agencies' public databases, yielding emissions information from 5 fluidized bed incinerators and 20 multiple hearth incinerators, although EPA acknowledged that not every test contained information on all nine § 129 pollutants. *Id.* Because 12 percent of the existing incinerator population based on EPA's then-current count of incinerators was 7 fluidized bed incinerators and 20 multiple hearth incinerators, EPA acknowledged that it did "not have actual emissions test data for the population of units that represent the best-performing 12 percent," for every pollutant. Because EPA interpreted § 129 to require a MACT floor dataset representative of the best-performing 12 percent of incinerators, EPA concluded it needed to determine whether its data from fewer than 12 percent of incinerators could represent the best-performing 12 percent. *Id.*

EPA addressed this issue by explaining that it could use "statistical techniques to determine the minimum number of observations needed to accurately characterize the distribution of the best performing 12 percent of units in each subcategory." *Id.*; *see* Memorandum from Eastern Research Group, Inc. to Amy Hambrick, U.S. EPA, at 7–9 (Jan. 2011) ("Revised MACT Floor Memo"). Based on this statistical

analysis, EPA concluded that it had collected enough observations to conclude that the dataset it used met "the minimum size needed to characterize the population of 12 percent of the best-performing units for all pollutants, when late-arriving data are included." 75 Fed. Reg. at 63,271. Nevertheless, EPA requested "that commenters provide additional emissions stack test data and supporting documentation, as that may enable us to establish a final MACT floor based on a more complete data set." *Id.* at 63,270.

The proposed rule also discussed EPA's methods for addressing variability in the emissions data it collected. EPA bases its MACT standards on short-term emissions test data, which are not always "representative of the range of operating conditions that the best-performing facilities face on a day-to-day basis." *Id.* at 63,269. Therefore, EPA believed it needed to account for variability in emissions performance. *Id.* EPA explained that for two or more tests at a single incinerator under what appear to be the same operating conditions, "[v]ariations in emissions may be caused by different settings for emissions testing equipment, different field teams conducting the testing, differences in sample handling or different laboratories analyzing the results." *Id.* And emissions may even vary within a single test, as each test comprises at least three separate test runs, and each test run captures only a snapshot of an incinerator's performance. *Id.*

To address this variability, EPA proposed using a statistical tool it terms the "upper prediction limit." For future observations of emissions from an incinerator, the upper prediction limit "is the upper end of a range of values that will, with a specified degree of confidence, contain the next (or some other pre-specified) randomly selected observation from a population." *Id.* Thus, a 99 percent confidence-level

upper prediction limit "represents the value which one can expect the mean of future 3-run performance tests from the best-performing 12 percent of sources to fall below, with 99 percent confidence, based upon the results of the independent sample of observations from the same best-performing sources." *Id.* at 63,271.

EPA's proposed MACT floor methodology also addressed "non-detect data," which are emission testing data too low for the testing equipment to accurately detect. *Id.* at 63,272. Rather than estimate that non-detect data was at the "method detection level," *i.e.*, "the minimum concentration of a pollutant that can be measured with confidence that the level is greater than zero," EPA Br. at 61 n.20, EPA used a different test to determine the MACT floor. *Id*. at 63,273. Under the test, EPA multiplied what it termed the "representative method detection level" by three, and compared that value to the MACT floor that EPA calculated using all data, including non-detect data. *Id.* If three times the representative method detection level was less than the calculated MACT floor, EPA would conclude that the MACT floor calculation adequately addressed measurement variability; if not, EPA would use the three-times value "to ensure that the MACT floor emission limit accounts for measurement variability and imprecision." *Id.*

For new source MACT floors, EPA explained that it would base the floors "on the best-performing single source for each regulated pollutant, with an appropriate accounting for emissions variability." *Id.* at 63,274. Thus, EPA identified the lowest emitting incinerator with at least three test runs, and applied the 99 percent upper prediction limit. *Id.* While EPA proposed a new source MACT floor for fluidized bed incinerators, it did not propose a new source MACT floor for multiple hearth incinerators. *Id.* at 63,272.

Instead, it proposed that all new incinerators—including multiple hearth incinerators—meet the emission limits for the best-performing fluidized bed incinerator, explaining that industry information suggested that future units constructed would likely be fluidized bed incinerators and that industry information demonstrated that new fluidized bed incinerators "have more efficient combustion characteristics resulting in lower emissions." *Id.* at 63,272, 63,274.

In discussing whether to set "beyond-the-floor" MACT standards for existing sources, EPA determined that for most of the § 129 pollutants, no additional control technologies were available that would cost-effectively reduce emissions. *Id.* at 63,275, 63,277. For mercury, EPA concluded that using activated carbon injection with some form of particulate matter control for multiple hearth incinerators would be a cost-effective option for achieving beyond-the-floor emission reductions, noting that these combined control technologies would also control for dioxins and dibenzofurans. *Id.* at 63,276–77. For fluidized bed incinerators, EPA concluded that "[i]n light of the technical feasibility, costs, energy, and nonair quality health and environmental impacts" discussed in the rule, it was not reasonable to establish beyond-the-floor MACT standards for new and existing fluidized bed incinerators. *Id.* at 63,277.

EPA also proposed monitoring requirements for all new and existing sewage sludge incinerators. *Id.* at 63,277–82. In relevant part, EPA proposed initial and annual emissions performance tests for most pollutants, with continuous monitoring as an alternative, and control device parameter monitoring for certain control technologies. *Id.* at 63,277. EPA specifically required continuous emissions monitoring for carbon monoxide on new sewage sludge incinerators, although continuous emissions monitoring for carbon

monoxide remained optional for existing incinerators, and optional for all other pollutants. *Id.* at 63,278, 63,281.

2. Final Rule

EPA promulgated the final rule setting emission limits for sewage sludge incinerators on March 21, 2011. 76 Fed. Reg. 15,372. The final rule remained substantially similar to the proposed rule, regulating sewage sludge incinerators under § 129 and generally adopting the methodology for setting the MACT floors stated in the proposed rule. *Id.* at 15,382–92.

The final rule did contain a few substantive changes. While EPA had proposed setting all new incinerator MACT floors on the best-performing fluidized bed incinerator, in the final rule it decided to set a separate MACT floor for new multiple hearth incinerators. *Id.* at 15,384. EPA explained that it had been persuaded by comments pointing out that under the proposed regulations, any source that exceeded a threshold in modification costs would be considered a new unit. *See* 40 C.F.R. § 60.4775 (defining a new sewage sludge incinerator as a unit that "[c]ommenced modification after September 21, 2011"); 40 C.F.R. § 60.4930 (defining modification as "a change to an existing [sewage sludge incinerator] later than September 21, 2011 and that meets one of two criteria"). Because it did not want to discourage municipalities from modifying multiple hearth incinerators, and because there was otherwise no technical reason why municipalities could not build new multiple hearth incinerators, EPA explained it decided to establish separate new incinerator MACT floors. 76 Fed Reg. at 15,384.

In setting the new multiple hearth incinerator MACT floors, EPA's upper prediction limit analysis on what it

deemed the best-performing multiple hearth incinerators yielded MACT floors for two pollutants that were less stringent (*i.e.*, a higher emission limit) than what it had calculated for existing multiple hearth incinerators. EPA set the new multiple hearth incinerator floors for these two pollutants—hydrogen chloride and sulfur dioxide—at the same level as existing multiple hearth incinerator floors, reasoning that new incinerator MACT floors could not be less stringent than existing incinerator MACT floors. *Id.* at 15,388–89.

EPA also deviated from the proposed rule by deciding not to set beyond-the-floor standards for any pollutants. *Id.* at 15,380. In the final rule, EPA explained that the cost of requiring the additional contemplated control technology to reduce mercury was $80,000 to $100,000 per pound removed, and that, based on this cost and other factors, it determined that beyond-the-floor standards were no longer appropriate. *Id.* at 15,394.

EPA also made minor changes to its MACT floor dataset, such as reducing its inventory of incinerators to 204, and consequently, reducing the numbers of incinerators needed to represent 12 percent to 18 multiple hearth incinerators and 8 fluidized bed incinerators. *Id.* at 15,387. Although the reduction in inventory decreased the number of incinerators necessary to represent 12 percent, EPA still did not have emissions data from 12 percent of incinerators for certain pollutants. While commenters attempted to supplement that dataset by submitting emissions stack test data that EPA requested in the proposed rule, EPA rejected that data because commenters had not substantiated it with emission test reports. *Id.*

In the final rule, EPA candidly noted that its MACT floor methodology—including the emissions testing dataset from less than 12 percent of incinerators—was motivated in part by the impending court-ordered deadline to establish emission standards. EPA explained that "given the court-ordered deadline for EPA to issue the final [sewage sludge incinerator] rule, it was not possible to undertake the time-consuming process of sending an [information collection request] to all the affected [sewage sludge incinerators] consistent with the requirements of the [Paperwork Reduction Act]." *Id.* at 15,386.

EPA also responded to comments criticizing EPA for not using data available to it to set MACT floors, including data about variability in sewage sludge metal concentrations collected from the Clean Water Act regulations. EPA responded that the upper prediction limit and its survey of units from nine different states adequately accounted for variability. *Id.* at 15,391. EPA further stated that it "did not have sufficient information at proposal to consider if it were appropriate to incorporate variability based on sludge content," explaining that the data commenters submitted was not adequately supported and therefore insufficient to clarify the effect of sewage sludge variability on emissions. *Id.*

Sierra Club and NACWA filed petitions for reconsideration of EPA's final rule. EPA denied both petitions. *See* 77 Fed Reg. 25,087 (Apr. 27, 2012). Sierra Club filed a petition for review in this court. NACWA, joined by the Hatfield Township Municipal Authority, also filed a petition for review. We have consolidated all petitions for review.

II. NACWA'S AND SIERRA CLUB'S PETITIONS FOR REVIEW

A. EPA'S AUTHORITY TO REGULATE SEWAGE SLUDGE INCINERATORS

We first address NACWA's contention that EPA violated the Clean Air Act by setting emission standards for sewage sludge incinerators under § 129 rather than § 112. Specifically, NACWA asserts that § 129(g)(1)'s definition of "solid waste incineration unit" excludes sewage sludge incinerators.

Section 129(g)(1) defines a 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 (including single and multiple residences, hotels, and motels)." 42 U.S.C. § 7429(g)(1). In interpreting the phrase "solid waste material from commercial or industrial establishments or the general public," EPA explained in its final rule that "[s]ewage sludge clearly originates from the general public, including residential and commercial facilities. Simply because the waste is treated at a [publicly-owned treatment work] prior to combustion does not change the original source of the sewage sludge." 76 Fed. Reg. at 15,383.

In contrast to EPA's interpretation, NACWA argues that the words "from . . . the general public" "refer only to the proximate source of the solid waste material in question," covering, for example, trash a municipality collects from a house and transports to a municipal incinerator, but not a waste product that the municipality itself creates. NACWA Br. at 21–22. Because the sewage sludge incinerated by a publicly-owned treatment work is the product of the *treatment*

of domestic sewage, NACWA asserts that sewage sludge comes from the publicly-owned treatment work, and not "from . . . the general public" that produces the domestic sewage. *Id.* at 19

Because NACWA asks us to review EPA's construction of § 129 as authorizing EPA to regulate sewage sludge incinerators under the category of "other . . . solid waste incineration units," *see* 76 Fed. Reg. at 15,383 (citing 42 U.S.C. § 7429), we apply *Chevron v. NRDC* to determine whether EPA is entitled to deference in its interpretation. *See* 467 U.S. 837, 842 (1984). Under *Chevron*, we first determine whether the statute unambiguously forbids EPA's interpretation. *Id.* at 842–43. If the statute is silent or ambiguous, we then question whether EPA's interpretation is based on a permissible construction of the statute. *Id.* at 843.

At first glance, the definition of solid waste incineration units in § 129(g)(1) appears ambiguous, a reality even NACWA acknowledges. *See* NACWA Br. at 21 ("Read alone, the word 'from' does not reveal whether it refers to the proximate source of the material or whether it refers instead to a distant 'original' source of the material."); *see also* Oral Arg. Tr. at 5:19–23, 7:4–10, 10:5–19 (conceding that, without any other context, § 129 "would carry the meaning that EPA has ascribed to it"). Among the dictionary definitions of "from" is "a function word to indicate the source or original or moving force of something: as . . . the place of origin, source, or derivation of a material or immaterial thing." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 913 (1981). Thus, W.B. Yeats may proclaim, "All creation is [from] conflict," and not necessarily mean that creation springs directly from conflict rather than through intermediate consequences of conflict, while one who states that a man "took a dime [from] his pocket" could only be understood to

mean that the dime originated from a specific location on a specific person. *Id*. Because the word "from" in § 129(g)(1) may be susceptible to either sense of the word, we agree with both parties that the phrase "from . . . the general public," standing alone, is textually ambiguous. *Cf. Environmental Defense Fund v. EPA*, 167 F.3d 641, 652 (D.C. Cir. 1999) (Williams, J., dissenting) (explaining that the phrase "comes from" is ambiguous—for example, "A layabout who says he 'comes from a hardworking family' can be telling the truth even if all his relatives are dead.").

But textual ambiguity is not the end of the matter, as we have held that "a statute may foreclose an agency's preferred interpretation despite such textual ambiguities," an analysis we undertake by "exhaust[ing] the traditional tools of statutory construction to determine whether a congressional act admits of plain meaning." *Catawba County v. EPA*, 571 F.3d 20, 35 (D.C. Cir. 2009); *Arizona Public Service Co. v. EPA*, 211 F.3d 1280, 1287 (D.C. Cir. 2000). Thus, although both NACWA and EPA acknowledge § 129(g)(1)'s apparent textual ambiguity, both parties also argue that the statute unambiguously resolves in their favor. EPA relies on our opinion in *NRDC v. EPA*, 489 F.3d 1250 (D.C. Cir. 2007), in which we interpreted the definition of "solid waste incineration unit" to be very broad, while NACWA relies primarily on the words surrounding "from" and on the overall structure of the Clean Air Act and the Clean Water Act.

We begin with NACWA's argument that "from . . . the general public" requires a proximate cause interpretation, lest the words "general public" become superfluous. NACWA asserts that because all waste has its origin in the general public at some point, Congress could have simply defined a solid waste incinerator as "a unit . . . which combusts any solid waste material" without having to add "from

commercial or industrial establishments or the general public." *See* 42 U.S.C. § 7429(g)(1). But even if we take as true NACWA's assertion that *all* solid waste "originates" from the general public, and NACWA's assertion that EPA's interpretation of § 129(g)(1) would therefore cover *all* units that incinerate solid waste (except those specifically excluded in § 129(g)(1)), the "'preference for avoiding surplusage constructions is not absolute.'" *Amoco Products Co. v. Watson*, 410 F.3d 722, 734 (D.C. Cir. 2005) (quoting *Lamie v. U.S. Trustee*, 540 U.S. 526, 536 (2004)). In some cases, redundancy may reflect the broad purpose of a congressional statute. *See Babbitt v. Sweet Home Chapter of Communities for a Greater Oregon*, 515 U.S. 687, 698 n.11 (1995).

Although defining a covered incinerator as one that combusts solid waste "from commercial or industrial establishments or the general public" suggests some limitation on the coverage of § 129(g)(1) based on the source of the waste, the extent of that limitation is unclear. Congress may have intended to define solid waste incinerators to exclude specific categories of incinerators beyond the express exceptions listed in § 129(g)(1); for example, incinerators combusting waste directly produced by state or local government sources. But it also may have intended to give the definition of § 129(g)(1) a broad scope, with "the general public" functioning as something akin to a catchall. Thus, the fact that the three broad categories of sources of solid waste listed in § 129(g)(1)—commercial and industrial establishments, and the general public—*may* be surplusage under EPA's original source interpretation does not unambiguously mean that Congress intended for the word "from" to have NACWA's proximate source interpretation. In any event, if Congress indeed unambiguously intended to exclude municipal sewage sludge incinerators from the definition of § 129(g)(1), it chose a strange way to go about it.

NACWA also asserts as factually incorrect EPA's statement that "[s]ewage sludge clearly originates from the general public, including residential and commercial facilities," arguing that sewage sludge does not "originate" until a publicly-owned treatment work treats raw sewage. NACWA Br. at 22–24. In support of this argument, NACWA cites EPA regulations in which EPA recognized that sewage sludge results from wastewater treatment and is distinct from domestic sewage, and to a Clean Water Act provision from which one may infer that the production of sewage sludge is, by statutory definition, part of a publicly-owned treatment work. *See* 33 U.S.C. § 1292(2)(A); 40 C.F.R. §§ 60.4930, 60.5250; Joint Appendix 986–87.

NACWA's argument, however, fails to address how EPA's original source interpretation of "from"—*i.e.*, that the general public is a "but-for" cause of sewage sludge—renders the treatment facility that creates sewage sludge relevant. For example, one could say "bread comes from fields of wheat," and be understood, or say "bread comes from the baker," and also be understood. The fact that several intermediate processes had to occur to produce the bread—transporting wheat from the field, adding different ingredients to produce dough, or heating the dough in an oven—does not negate the validity of a sentence that uses "from" to link the bread to the source of an important ingredient. As we noted above, WEBSTER'S, *supra* 17, at 913, at least one dictionary defines "from" as a function word used to indicate, among other meanings, "the place of *origin*, source or derivation of a material or immaterial thing." (emphasis added). Thus, the fact that the sewage sludge may not exist in that form until treated at a publicly-owned treatment work does not unambiguously invalidate EPA's original source interpretation that sewage sludge is from the general public,

even if EPA's interpretation is some steps removed. While it is also true that other EPA regulations recognize that sewage sludge is distinct from domestic sewage, these regulations are not dispositive of EPA's interpretation of § 129(g)(1). Put differently, the fact that EPA determined in other regulations that sewage sludge and domestic sewage are distinct does not preclude EPA from recognizing that sewage sludge would not exist but for domestic sewage, and does not prevent EPA from interpreting "from . . . the general public" as meaning the original, but-for source of sewage sludge.

In addition to its textual arguments, NACWA asserts that EPA's interpretation of § 129(g)(1) conflicts with § 112(e)(5), which states that EPA "shall promulgate standards pursuant to subsection (d) of this section applicable to publicly owned treatment works (as defined in title II of the Federal Water Pollution Control Act) not later than 5 years after November 15, 1990." NACWA argues that when § 112(e)(5) is read in conjunction with the Clean Water Act, which NACWA claims defines publicly-owned treatment works to include sewage sludge incinerators, EPA must establish emission standards for the entirety of a publicly-owned treatment work pursuant to § 112(d). Because EPA may only establish emission standards for a source exclusively under either § 112(d) or § 129(a), *see* 42 U.S.C. § 7429(h)(2), NACWA maintains that § 112(e)(5) supports its interpretation that Congress did not intend for EPA to regulate sewage sludge incinerators under §129(g)(1).

We agree with EPA, however, that § 112(e)(5) is simply a timing provision, and does not prevent EPA from regulating aspects of a publicly-owned treatment work to which more specific provisions apply. *See FTC. v. Manager, Retail Credit Co., Miami Branch Office*, 515 F.2d 988, 993 (D.C. Cir. 1975) ("The principle that a specific statutory provision

prevails over a more general provision is established beyond question."). If we accept EPA's interpretation of "from . . . the general public," § 129 would govern sewage sludge incinerators, and the exclusivity provision of § 129(h)(2) would render § 112 not "applicable to" sewage sludge incinerators, leaving no conflict between the texts. Thus, the overall structure of the Clean Air Act does not unambiguously require NACWA's interpretation of the word "from."

In fact, when EPA issued its rule proposing emission standards for publicly-owned treatment works as required by § 112(e)(5), it established standards for certain processes at publicly-owned treatment works while deciding to regulate sewage sludge incinerators under § 129, a decision that went unchallenged at the time. *See* National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works, 63 Fed. Reg. 66,084, 66087 (Dec. 1, 1998) (Proposed Rule); 64 Fed. Reg. 57,572 (Oct. 26, 1999) (Final Rule). Though EPA's decision in 1998 to regulate sewage sludge incinerators under § 129 does not prove that its interpretation is correct in the present, the fact that it established standards for other processes within publicly-owned treatment works under its § 112 authority demonstrates that sewage sludge incinerators are not the only aspect of a publicly-owned treatment work to which § 112 may be "applicable." *See* 40 C.F.R. Part 63, Subpart VVV.

We therefore conclude that the traditional tools of statutory construction do not demonstrate that § 129(g)(1) unambiguously excludes sewage sludge incinerators. But we also disagree with EPA that our opinion in *NRDC v. EPA*, 489 F.3d 1250 (D.C. Cir. 2007), unambiguously resolves § 129(g)(1) in EPA's favor.

In *NRDC*, we heard challenges to an EPA rule that defined "commercial or industrial waste" to include solid waste combusted at incinerators that did not provide for energy recovery or operated without energy recovery. *Id.* at 1258 (citing 70 Fed. Reg. at 55,572). Defining "commercial or industrial waste" in this way effectively created exceptions to the definition of "solid waste incineration unit" beyond those written in the statute. *Id*. We vacated and remanded EPA's rule, rejecting its argument that it was resolving an ambiguity created by Congress's failure to define "commercial or industrial waste." *Id.* As we explained, Congress's use of the word "any" in the definitional phrase "*any* facility which combusts *any* solid waste from commercial or industrial establishments" rendered the phrase clear and unambiguous, and EPA had no authority to create exceptions not explicitly listed in the statute through its definition of "commercial or industrial waste." *See id.* at 1259–60.

Because the resolution of the present issue depends on the role of the word "from" in this statute, however, our discussion about the broad scope of § 129(g)(1)'s definition of "solid waste incineration unit" based on the word "any" is largely irrelevant. As we noted in *NRDC*, "The word 'any' is usually understood to be all inclusive," 489 F.3d at 1257 (internal citation omitted), and EPA presented no compelling reason "why 'any' should not mean 'any.'" *Id.* at 1260 (internal citation omitted). In contrast, "from" is susceptible to different meanings and renders § 129(g)(1) ambiguous—even when viewed in light of the traditional tools of statutory construction—such that either NACWA's or EPA's interpretation of § 129(g)(1) is plausible.

Having determined that the phrase "from . . . the general public" is ambiguous under *Chevron* step one, we now apply

Chevron step two to determine whether EPA's interpretation "is based on a permissible construction of the statute." *Chevron*, 467 U.S. at 843. If EPA's "choice represents a reasonable accommodation of conflicting policies that were committed to [EPA]'s care by the statute, we should not disturb it unless it appears from the statute or its legislative history that the accommodation is not one Congress would have sanctioned." *Id.* at 845 (internal quotation marks omitted).

NACWA first asserts that EPA's interpretation of § 129(g)(1) is unreasonable under *Chevron* step two because EPA advanced a new rationale for its interpretation of § 129(g)(1) for the first time in its denial of reconsideration to NACWA. Specifically, NACWA cites EPA's reasoning that its conclusion on the coverage of § 129(g)(1) "is based on a reasonable interpretation of two provisions of the [Clean Air Act], so as to give both meaning," and that "it is reasonable for the EPA to consider both provisions and to conclude that . . . section 129(g)'s all-encompassing definition of <u>solid waste incineration unit</u> requires regulation" under § 129. Joint Appendix 1092 (EPA's letter denying NACWA's petition for reconsideration). NACWA argues that EPA's explanation is irrational not only because EPA allegedly raised it for the first time in the denial of reconsideration, but also because it amounts to a conclusory statement and because it fails to consider the importance of other environmental statutes. We find these arguments unconvincing. EPA explained in its final rule that it viewed § 112(e)(5) as merely a timing provision, and further stated that to interpret § 112(e)(5) more broadly "would conflict with section 129(g) and with the DC Circuit's [*sic*] interpretation of section 129(g)." 76 Fed. Reg. at 15,383. EPA's reasoning in denying NACWA's petition for reconsideration is not only consistent with its reasoning in the final rule, but also a

reasonable interpretation of the statute for the reasons we have just explained.

Second, NACWA argues EPA's construction of § 129(g)(1) is unreasonable because it ignores legislative history and the policies underlying the Clean Water Act's provisions on sewage sludge incineration. NACWA contends that the discussion of wastewater treatment facilities in the legislative history of § 112, and the absence of any reference to sewage sludge or sewage sludge incinerators in § 129, demonstrate that Congress intended EPA to regulate all aspects of publicly-owned treatment works only under § 112. But though the legislative history on § 112 mentions wastewater treatment plants—an unsurprising fact in the context of a section stating the date by when EPA must issue § 112(d) emission standards applicable to publicly-owned treatment works—NACWA has cited no language in the legislative history pertaining to sewage sludge incinerators. We need not determine whether legislative history can generally suffice to render an agency's interpretation invalid at *Chevron* step two. Nothing in the legislative history cited by NACWA suggests that Congress would not have sanctioned EPA's interpretation of § 129(g)(1) as including sewage sludge incinerators or EPA's interpretation of § 112(e)(5) as being a timing provision.

NACWA also contends that one of the congressional objectives of the Clean Water Act is to "maintain[] local flexibility and control over the means for managing sewage sludge," and that adopting EPA's interpretation of § 129 would usurp local control. NACWA Br. at 27–28; *see* 33 U.S.C. § 1345(e) ("The determination of the manner of disposal or use of sludge is a local determination . . . ."). We agree with EPA, however, that this argument is largely irrelevant to whether it reasonably interpreted § 129.

Establishing MACT standards for sewage sludge incinerators does not, as a purely legal matter, remove local control over which method of sewage sludge disposal to use. Even if the presumably increased costs associated with emission standards would affect a municipality's decision on how to dispose of sewage sludge, 33 U.S.C. § 1345(e) is not so strongly worded as to completely insulate a municipality's decision-making process from EPA rulemaking.

To sum, we conclude that the phrase "from . . . the general public" is ambiguous. Because EPA's original source interpretation of that phrase is permissible, we give deference to its interpretation of the definition of "solid waste incineration unit," and uphold its authority to establish emission standards for sewage sludge incinerators under § 129.

B. CHALLENGES TO THE MACT FLOOR METHODOLOGY

Petitioners NACWA and Sierra Club both challenge the adequacy of EPA's methodology in determining the MACT floors for existing units. Both challenge EPA's decision to set MACT floors on emissions data from less than 12 percent of sewage sludge incinerators, albeit on different legal theories. *See* NACWA Br. at 32–37 (asserting that EPA's failure to base MACT floors on less than 12 percent of incinerators violates § 129); Sierra Club Br. at 28–30 (asserting that EPA's failure to base MACT floors on less than 12 percent of incinerators is arbitrary and capricious).

Both petitioners also criticize distinct but related aspects of EPA's rulemaking. Sierra Club contends that EPA's method of selecting the best performers based on control technology is unlawful and arbitrary, pointing to other factors that may influence emission levels. *See* Sierra Club Br. at

18–23. NACWA argues that EPA failed to demonstrate that the data it used to set MACT floors represented the performance of the best-performing sewage sludge incinerators, contending that EPA failed to consider variability in sewage sludge contents and its effect on emission levels and that the upper prediction limit does not account for that variability. *See* NACWA Br. at 38–42. Sierra Club also challenges EPA's use of the upper prediction limit, arguing that EPA does not demonstrate that the upper prediction limit represented the "average emissions limitation achieved" and was therefore unlawful and arbitrary. Beyond these related arguments, Sierra Club argues that EPA's method for accounting for non-detect data is flawed.

In promulgating the MACT standards for sewage sludge incinerators, EPA took a different approach than it has in other MACT standard regulations that have come before us on petitions for review. First, EPA collected its MACT floor dataset—*i.e.*, the emission levels of "the best performing 12 percent of units" for the existing incinerator MACT floors—by targeting the sewage sludge incinerators it believed to employ the best air pollution control technology for emissions testing. *See* 75 Fed. Reg. at 63,269–70. Second, after it had collected emissions data for the MACT floor dataset, EPA applied a statistical analysis, which it termed the "upper prediction limit," to account for variability. *See* 75 Fed. Reg. at 63,269, 63,271 (explaining that EPA "must exercise its judgment, based on an evaluation of the relevant factors and available data, to determine the level of emissions control that has been achieved by the best performing [sewage sludge incinerators] under variable conditions.").

Both steps in this approach involved several different estimations and assumptions. For example, because EPA chose to limit its information collection requests to nine

municipalities, it had to estimate which sewage sludge incinerators would have the lowest emissions, which it chose to do based on the air pollution control technology the incinerators used. *See* 75 Fed. Reg. at 63,270. And because EPA's limited emission testing did not yield data for 12 percent of incinerators for every pollutant, it used a statistical technique to estimate whether a dataset of fewer than 12 percent of incinerators could estimate the best-performing 12 percent of incinerators. *Id.* Because every test did not produce usable data, EPA used an approximation to account for emissions test data too low to be accurately measured by monitoring equipment. *Id.* at 63,272. EPA also estimated the variability of the sewage sludge incinerators—what they would achieve under a range of operating conditions—by applying the upper prediction limit. *Id.* at 63,271.

We have accorded *Chevron* deference to EPA's interpretation of § 129 as allowing it to estimate MACT floors, noting that 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." *Sierra Club v. EPA*, 167 F.3d 658, 661–62 (D.C. Cir. 1999). Although EPA would ideally set MACT floors by surveying all existing incinerators and identifying the best-performing 12 percent of units with hard data, we have not required EPA to go that far, recognizing that "EPA typically has wide latitude in determining the extent of data-gathering necessary to solve a problem." *Id.* at 662; *see also id.* at 661 (noting that Sierra Club, in arguing that case, had "disavowed any interpretation that would require measuring the performance of every last unit"); Oral Arg. Tr. at 53:25–54:9 (statement from EPA's attorney stating, "EPA in a perfect world would have data from all 204 units"). Instead, we explained that the plain meaning of § 129(a)(2) does not

"exclude estimation, either by sampling or by some other reliable means." *Sierra Club*, 167 F.3d at 662. But we have not given EPA free rein in its estimation techniques. EPA "must demonstrate with substantial evidence — not mere assertions" that its estimation "allows a reasonable inference as to the performance of the top 12 percent of units." *Id.* at 663; *Northeast Maryland Waste Disposal Authority*, 358 F.3d at 954 (internal quotation marks omitted).

Relying on *Sierra Club*'s holding that EPA may estimate "the average emissions limitation achieved by the best performing 12 percent" without violating the Clean Air Act, we have often held EPA's attempts to estimate the performance of the top 12 percent units to be lawful in theory. But we have often held that, in practice, EPA could not support the assumptions underlying its estimations with substantial evidence. For example, in *Sierra Club*, EPA based existing medical waste incinerator MACT floors on emission limits established by state regulations, assuming that "all [medical waste incinerators] are . . . achieving their [regulatory] limits." *Id.* at 663 (second alteration in original). Although we held that EPA could, in theory, use regulatory data as a proxy, EPA's use of the data in that case to estimate the performance of the top 12 percent was arbitrary and capricious because the state emission limits were substantially higher than emissions from an uncontrolled incinerator, rendering the regulatory data a meaningless proxy for emission levels from medical waste incinerators. *See id.* at 663–64 (explaining that while the average emission level from uncontrolled incinerators was 2,770 parts per million volume, the average of the state emission limits appeared to be 5,227 parts per million volume); *see also Northeast Maryland Waste Disposal Authority*, 358 F.3d at 953–54 (rejecting EPA's use of state emission levels for the same reason as in *Sierra Club*).

In *Sierra Club*, we also discussed a method EPA used to set new incinerator MACT floors, which are required to be "no less stringent than the emissions control that is achieved in practice by the best controlled similar unit." *See* 167 F.3d at 664–65; 42 U.S.C. § 7429(a)(2). In setting new incinerator MACT floors, EPA had chosen what it believed to be the most effective control technology used by an incinerator in each category, identified the highest level of emissions (*i.e.*, worst) recorded by any incinerator using that technology, and then increased that value by 10 percent. *Sierra Club*, 167 F.3d at 665. Selecting the control technology used by sources with the lowest emission levels and then setting MACT floors at the levels achieved by the worst performing source, which we termed the "MACT approach" in later cases, was supposed to account for the fact that the best-controlled similar unit will not consistently achieve the same emission level. *See Cement Kiln Recycling Coaliation v. EPA*, 255 F.3d 855, 861 (D.C. Cir. 2001). In other words, as we explained in *Sierra Club*, it is reasonable to expect that the incinerator on which the MACT floors are based should be able to "achieve" the MACT floor "in practice," which it could not do unless "achieved in practice" meant "achieved under the worst foreseeable circumstances." 167 F.3d at 665. But though EPA may account for variability and set MACT floors at the emission levels achieved by the best-controlled source under the worst foreseeable circumstances, we concluded in *Sierra Club* that EPA had not adequately explained why adopting the MACT approach would achieve that goal, and remanded the medical waste incinerator MACT standards to EPA for further clarification. *Id.*

In later cases, we addressed EPA's attempts to expand its MACT approach to developing existing source MACT floors. *See National Lime Ass'n v. EPA*, 233 F.3d 625, 632 (D.C. Cir.

2000); *Cement Kiln*, 255 F.3d at 859; *Sierra Club v. EPA*, 479 F.3d 875, 879–880, 882–83 (D.C. Cir. 2007) ("*Brick MACT*"). For example, in *Cement Kiln*, EPA identified the best-performing 12 percent of sources by emission levels, identified the control technology used by sources with emission levels equivalent to or lower than the median of that 12 percent, and then set the MACT floor at the worst emission level achieved by any source using that control technology. 255 F.3d at 859. As in *Sierra Club*, EPA's rationale in setting the MACT floors on the worst performer using MACT technology was to account for variability in the emission levels "achieved" by the best-performing 12 percent. *See id.* at 862, 865–66. While we explained this approach could be lawful in theory if, for example, control technology was completely or significantly determinative of a source's emission levels, we nevertheless concluded that EPA had not adequately demonstrated with substantial evidence that its estimation was reasonable. *Id.* at 863–66. Because factors apart from air pollution control technology could affect emission levels, we concluded that EPA's assumption that the worst-performing unit could represent the best-performing units was flawed. *Id.* at 866; *see also Brick MACT*, 479 F.3d at 882 ("Given *Cement Kiln's* holding that EPA may not use emission levels of the worst performers . . . without a demonstrated relationship between the two, we conclude that the emission floors . . . violate the [Clean Air Act]."); *id.* at 883 ("EPA's decision to base floors exclusively on technology even though non-technology factors affect emission levels violates the [Clean Air Act].").

As these cases demonstrate, establishing MACT floors is no simple task. Determining the best performing sources is not even as straightforward as simply collecting emission test data from all incinerators and ranking them, as incinerators that have low emission levels one day may have very high

emission levels under the worst foreseeable conditions (for example, if an incinerator experiences a spike in sludge pollutant concentrations during certain times of the year). Recognizing that variability in the performance of sources can make identifying the best-performing sources based on short-term emissions data a nearly impossible task, we have upheld EPA's estimation of MACT floors in at least one case. In *Mossville Environmental Action Now v. EPA*, 370 F.3d 1232 (D.C. Cir. 2004), EPA explained that great variability in emissions among sources it sought to regulate made comparing sources and selecting the best-performing units virtually impossible, and so set the MACT standards for the pollutant at issue at the level of preexisting EPA emission standards. *See id.* at 1240 ("With comparisons between plants impossible, and emission variations not related to technological performance, the EPA claims it was unable to select the best [performing] sources."). Because EPA pointed out that the source with the overall lowest long-term emission of the pollutant at issue barely satisfied the preexisting emission standards, we upheld EPA's estimation that its preexisting emission standards for that pollutant reasonably represented the average emission levels of that pollutant for the best-performing units. *Id.* at 1242.

With this background in mind, we turn to the petitioners' challenges to the MACT floor methodology EPA used in setting emission standards for sewage sludge incinerators. As we explained, EPA's approach to setting MACT floors had essentially two steps: (a) determining the best-performing sewage sludge incinerators and gathering data; and (b) applying the upper prediction limit to the collected dataset to account for variability.

To determine the best-performing incinerators, EPA, mindful of our holding in past MACT floor cases, has devised

a different approach than it has in other rulemaking we have reviewed. First, EPA identified the incinerators it believed would have the lowest emissions based on the type of unit and installed air pollution controls. 75 Fed. Reg. at 63,270. EPA then conducted emission tests from these incinerators to develop its MACT floor dataset, which it supplemented with data from state environmental agency public databases. *Id.* Because some test runs yielded emissions data at a level that EPA's testing equipment could not accurately measure, EPA developed a method for incorporating this non-detect data. *Id.* at 63,273.

This method of using technology to set MACT floors differs from the "MACT approach" discussed in *Cement Kiln* and *Brick MACT*. In those cases, EPA had first identified the sources with the lowest emissions, then identified the primary emission control technology used by those sources, and then set the MACT floors based on sources that used that technology. *See Cement Kiln*, 255 F.3d at 859; *Brick MACT*, 479 F.3d at 879. In contrast, EPA has, in this rulemaking, selected which sewage sludge incinerators to survey based on their control technology, without first determining their emission levels relative to other sources. *See* Revised MACT Floor Memo at 6 ("To select the surveyed owners, EPA reviewed the inventory of [sewage sludge incinerators] for the control devices being operated, and identified a subset of units *expected to have the lowest emissions* based on the type of unit and the installed air pollution controls." (emphasis added)).

Even after selectively identifying and collecting data from incinerators, EPA did not collect data on every § 129 pollutant from 12 percent of sources. For example, while EPA estimated in the final rule that it would need data on eighteen multiple hearth incinerators to meet the 12 percent

requirement, the number of multiple hearth incinerators for which it had data (including supplemental reports from state environmental agency databases) ranged from nineteen to five incinerators depending on the pollutant. *See* Revised MACT Floor Memo at 7. Believing that § 129(a)(2) required it to have data representative of at least 12 percent of incinerators, EPA devised a method of estimating whether a limited dataset could be representative of the best-performing 12 percent of units. Specifically, EPA applied a statistical analysis on the underrepresented pollutant datasets to estimate whether it had enough observations from testing incinerators to represent the best-performing 12 percent of incinerators. *See* 75 Fed. Reg. 63,270; Revised MACT Floor Memo at 7–8. Applying this statistical analysis to its MACT floor dataset yielded an estimate of an estimate; in other words, the limited dataset to which EPA was applying this statistical analysis was itself already the result of EPA's estimating the best performers based on control technology.

After it had collected its dataset, EPA applied the upper prediction limit to estimate variability in sewage sludge incinerator emissions, stating its belief that the MACT floors had to be set at such a level that the best-performing incinerators "can expect to meet 'every day and under all operating conditions.'" 75 Fed. Reg. at 63,269 (quoting *Mossville Environmental Action Now*, 370 F.3d at 1241–42). We will address challenges to EPA's estimations in the following order: (1) whether EPA may use control technology as a proxy for best-performing incinerators; (2) whether EPA did not adequately account for variability in the characteristics of sewage sludge fed into the sewage sludge incinerators, and whether it may account for variability with the upper prediction limit; (3) whether EPA may apply a statistical equation to determine whether EPA had a sufficient dataset to be representative of the best-performing 12 percent; and (4)

whether EPA may incorporate non-detect data by comparing calculated MACT floors to a value that is three times the representative detection level.

1. Identifying the best-performing incinerators based on control technology

We first address Sierra Club's challenge to EPA's selection of the best-performing units based on the type of unit and installed air pollution control technology. In addressing Sierra Club's argument that EPA did not establish that non-technology factors do not affect emissions, we admit some confusion over whether NACWA is also arguing that EPA acted arbitrarily in its selection of best performers by failing to account for variability, or whether its argument is that EPA failed to account for the variability experienced by the best-performing units it selected. *See* NACWA Br. at 39 ("Commenters argued that EPA's targeted selection of nine [publicly-owned treatment works] based solely on type of pollution control makes it impossible for EPA to assume that the data are representative of the best-performing [sewage sludge incinerators] across the entire category.") (citing NACWA Comments, Joint Appendix 24–25). *But see* NACWA Br. at 41 ("Because these data show the great variability of these pollutants, commenters urged EPA to determine the emission rates achieved by the best-performing sources under the full range of operating conditions."). The closeness of these two arguments is hardly surprising given that variability in incinerator operating conditions may make the "best performing 12 percent of units" a moving target, particularly when EPA uses emission levels as the metric for "best performing." But while both NACWA's and Sierra Club's arguments on this point share a similar element—EPA's alleged failure to account for sewage sludge variability makes its MACT floor methodology arbitrary and

capricious—Sierra Club focuses on EPA's assumption about control technology installed on the incinerator, while NACWA focuses on EPA's assumptions about the effect of sewage sludge characteristics on emission levels. Because these contentions are different in kind, we will address them separately.

We begin with Sierra Club's allegation that EPA's estimate of the best-performing 12 percent of units is unlawful and arbitrary. In arguing that this estimate is unlawful, Sierra Club relies on *Cement Kiln*, asserting that EPA's estimation technique can be upheld only if air pollution control technologies are "the *only* factor determining emission levels." *Id.* (quoting 255 F.3d at 863). Because EPA conceded that some non-technology factors affected emission levels, even accounting for Clean Water Act Part 503 regulations, *see* 75 Fed. Reg. at 63,270, Sierra Club argues that EPA's method of estimating is *per se* unlawful.

Sierra Club reads our holding in *Cement Kiln* too strictly. Later in our opinion in *Cement Kiln*, we explained that "if [EPA] can demonstrate with substantial evidence – not mere assertions – that MACT technology *significantly* controls emissions, or that factors other than the control have a *negligible* effect, the MACT approach could be a reasonable means of satisfying the statute's requirements." 255 F.3d at 866 (emphases added). Unsurprisingly, EPA cited this portion of our opinion when responding to Sierra Club's challenge to using control technology as a proxy for the best-performing incinerators. EPA Br. at 55. Sierra Club asserts that EPA cannot justify its approach under this softer standard, arguing that the significant/negligible standard is dicta. *See* Sierra Club Reply Br. at 3–4.

While Sierra Club may be correct that this statement is dicta, we now elevate it to holding. First, our statement in *Cement Kiln* that the MACT approach would satisfy the statute "if pollution control technology were the *only* factor determining emission levels" was a direct quote from our opinion in *National Lime*, where the statement was itself dicta. 255 F.3d at 863 (quoting *National Lime*, 233 F.3d at 633); *see National Lime*, 233 F.3d at 633 (summarizing an argument made by Sierra Club that we could not consider because it was not properly raised). Moreover, in *Cement Kiln*, we did not rely on the presence of *any* other factor influencing emission levels to hold that EPA's MACT approach failed to satisfy the statutory requirements for setting MACT floors, instead resting our holding on the bases that several non-control factors could influence emission levels, and that EPA's difficulty in quantifying these factors was no excuse for failing to demonstrate its estimate was reasonable. *Cement Kiln*, 255 F.3d at 863–65.

Second, if we are to give any substance to EPA's ability to *estimate* the best performing units based on control technology, we must allow EPA to use air pollution control technology as a proxy for emission levels even if the correlation between control technology and emission levels is imperfect because non-control factors have a negligible effect on emissions. This is so because an estimate, by definition, will not accurately account for every variable that may affect emissions. WEBSTER'S, *supra* 17, at 778 (defining "estimate" as meaning "to judge the value, worth, or significance of: *esp*: to arrive at (a value judgment that is often valid but *incomplete*, approximate, or tentative)") (emphasis added). Were we to adopt the strict standard Sierra Club argues applies, we would effectively be prohibiting EPA from using this estimation technique, as we find it impossible to imagine any situation where there is a perfect correlation between

control technology and emissions. *See Cement Kiln*, 255 F.3d at 871 ("[W]e do not expect the impossible of the [EPA]. Floors need not be perfect mirrors of the best performers' emissions."). Thus, the fact that air pollution control technology is not the only factor affecting emission levels does not render EPA's use of control technologies to identify best performers *per se* unlawful.

EPA, however, must still demonstrate that its estimate is reasonable. In justifying its approach of "specifically [seeking] emissions data from those municipalities that have installed and operate more than one of the controls that EPA identified as achieving the most reductions possible for the Section 129 pollutants," EPA Br. at 56, EPA points to Clean Water Act regulations on sewage sludge disposal as accounting for non-control technology factors. *See* 40 C.F.R. Part 503, Subpart E. These regulations include a requirement that incinerators comply with Clean Air Act emission standards for beryllium and mercury, *see* 40 C.F.R. § 503.43(a)–(b), and set limits for the average daily concentrations of lead, cadmium, and other metals in the sewage sludge that is fed into an incinerator. *See* 40 C.F.R. § 503.43(c)–(d). EPA explained in the rulemaking, and now before us, that sewage sludge incinerators "receive a more homogenous type of waste to burn," and that because of the Part 503 standards sewage sludge incinerators "are already incorporating management practices and measures to reduce waste and limit the concentration of pollutants in [sewage sludge]." *See* Revised MACT Floor Memo at 6–7; 75 Fed. Reg. at 63,270.

It is true that EPA has pointed to some evidence of reduced variability among sewage sludge incinerators, a showing EPA failed to make in other MACT floor cases. *See, e.g.*, *Sierra Club*, 167 F.3d at 662–64 (concluding that

assumption that States would set emission limits at a level near what incinerators achieved in practice to be unsupported and contradicted by the record); *Cement Kiln*, 255 F.3d at 865 (determining that EPA did not attempt to support its assumption that emission levels were solely dependent on control technologies, instead explaining that for some pollutants, the "factors other than technology that affect emissions . . . are difficult to quantify for the definition of MACT") (internal quotation marks omitted). Nevertheless, EPA concedes "that there is *some* variation of Section 129 pollutants present in the waste that is burned at individual sewage sludge incinerators." EPA Br. at 58. The question thus remains: can EPA demonstrate with substantial evidence that *some* variation in pollutants has a negligible effect on sewage sludge incinerators, or that non-technology factors aside from sewage sludge content have a negligible effect on emissions?

Sierra Club argues that EPA has not made that demonstration, pointing out that EPA's assumption does not account for the fact that incinerator emissions are "affected by the fuels they use, the age and design of the individual unit, the specific quality and age of control devices at individual units, the training and skill of the operators, and the care with which they run individual units." Sierra Club Br. at 18–19 (internal quotation marks omitted). We found this argument persuasive in *Cement Kiln*, *see* 255 F.3d at 862–65, and again agree with Sierra Club here. The fact that publicly-owned treatment works are already required to limit pollutant concentrations in sewage sludge before incineration does not establish that other variations in the operation of sewage sludge incinerators and the air pollution control technology they use will have only a negligible effect in emissions. Without evidence that air pollution control technology will achieve substantially the same performance across

incinerators without regard to the particular incinerator on which it is installed, EPA has made only a "mere assertion" that its regulations account for non-technology factors and that the type of air pollution control technology used by an incinerator is significantly determinative of emissions. *See* 76 Fed. Reg. at 15,392; *Cement Kiln*, 255 F.3d at 866.

Sierra Club also argues that variations in sewage sludge pollutant content are a factor affecting emission levels apart from the air control technology in use by a sewage sludge incinerator. Responding to EPA's arguments that the Part 503 regulations already require publicly-owned treatment works to "apply[] non-technology measures to reduce emissions" and therefore produce a more homogenous waste, Sierra Club argues that "[e]ven if correct, these arguments merely show that the units EPA selected as best performers have varying sludge inputs and that these inputs affect sewage sludge incinerators' emissions less than they affect emissions from other categories of incinerators." Sierra Club Br. at 19. Although this is a fair point, it is more relevant to NACWA's argument that EPA failed to account for variability in sewage sludge pollutants when collecting its dataset, a point we address more comprehensively in the following section.

Suffice it to say, unless EPA can demonstrate that the relatively reduced variations in sewage sludge characteristics have a negligible effect on emissions, Sierra Club's argument that non-technology factors affect emissions seems even more meritorious. *See Cement Kiln*, 255 F.3d at 864 (citing, in support of its holding, an EPA technical memorandum in which EPA observed that the variability in emissions among sources using MACT technology "indicate[d] that the air pollution control device system type . . . may not be the only important consideration affecting [dioxin/furan] control; other factors such as combustion quality *and waste composition* . . .

may also be of importance.") (emphasis added) (second alteration in original). As we will discuss in the next section, EPA has alluded to evidence that may demonstrate a low correlation between sewage sludge characteristics and emissions. *See* Joint Appendix 1095 (Letter Denying NACWA's Petition for Reconsideration) (citing data gathered during EPA's information collection request that showed that "the contents of . . . pollutants in the sludge itself has little relationship to the emissions of the pollutants, because these pollutants are removed by the control devices."). But as we will also discuss in the following section, citing this evidence for the first time in denying a petition for reconsideration may be an insufficient basis upon which to defend EPA's position that its Part 503 regulations account for non-technology factors.

To bolster its argument that non-technology factors have a non-negligible effect on emission levels, Sierra Club points out that some incinerators EPA did not survey for data collection reported superior performance to those EPA did survey, undercutting EPA's assumption that control technology is the only factor controlling emission levels. For example, Sierra Club cites comments submitted by Palo Alto, which reported that its program of reducing mercury inputs was effective in reducing mercury emissions to a level far below the existing unit MACT floor, and which was not included in the best-performing 12 percent. *See* Joint Appendix 628–29. Sierra Club also notes that the supplemental data EPA took from state environmental agency public databases showed emission levels lower than those EPA decided to survey—a fact EPA candidly acknowledges. *See* 76 Fed. Reg. 15,387 ("For some pollutants, the emissions from these supplemental test reports were lower than those from the nine [surveyed] sources."). This is evidence, Sierra

Club argues, that EPA's estimate of the best performers based on control technology is arbitrary and capricious.

EPA responds that it did not have to consider the Palo Alto incinerator's reported emission level, because Palo Alto failed to comply with EPA's instruction in the proposed rule to provide "supporting documentation" when submitting additional emissions stack test data in its comments. *See* 75 Fed. Reg. at 63,270. Because EPA could not verify the accuracy of Palo Alto's asserted emission levels, EPA explains that it was unable to draw any correlation between Palo Alto's sewage sludge management practices and a reduction in mercury emissions. In the past, we have upheld EPA's rejection of data it determined deficient, explaining that we give substantial deference to an agency's expert scientific judgment. Similarly, when EPA requests that commenters substantiate their reported emission test data, and they do not comply, EPA "[is] not obligated under its policy" to compare its collected results with the unsubstantiated data that commenters submit. *See Edison Electric Institute v. EPA*, 2 F.3d 438, 448 (D.C. Cir. 1993) *Id.* at 449. Thus, we agree with EPA that it deserves deference for its decision not to draw any correlations between Palo Alto's change in management practice and a reduction in mercury emissions based on the data submitted.

EPA, however, does not respond to Sierra Club's argument that the fact that randomly selected incinerators from state environmental agency databases had emission levels lower than those from the incinerators EPA chose to survey based on technology demonstrates that EPA's use of control technology is unreasonable. Instead, it explains that the supplemental information from state environmental agency databases "included emissions test data from facilities/units that met the same criteria EPA used in issuing

information collection requests, *i.e.*, units with more than one of the controls that EPA identified as achieving the most reductions possible for the Section 129 pollutants." EPA Br. at 56–57; *compare* Joint Appendix 979 (listing incinerators from which EPA collected emissions test data and the control technologies they used), *with* Joint Appendix 1012–1040 (listing incinerator emission test data collected from state environmental agency databases along with control technologies used). But EPA did not state this rationale in the rulemaking, and we cannot "accept appellate counsel's *post hoc* rationalizations for agency action." *Motor Vehicles Manufacturer's Ass'n v. State Farm Mutual Auto Insurance Co.*, 463 U.S. 29, 50 (1983). And before this court, EPA does not claim that it specifically searched state environmental agency databases for data from sewage sludge incinerators that use what it considered the best-performing technology, explaining only that the supplemental data "included" emissions data from facilities that had one or more of the controls identified. Even taking as true that the incinerators for which EPA had data in supplemental testing used similar air pollution controls as the incinerators it selected, the fact that similarly-controlled incinerators achieve lower emission levels suggests that non-technology factors have a non-negligible effect on emission levels.

Therefore, we agree with Sierra Club that EPA has not demonstrated with substantial evidence that non-control technology factors apart from sewage sludge content, like variations in age, design, or operation of the incinerators themselves, would have a negligible effect on incinerator emissions. That EPA's supplemental test reports show superior performance to the incinerators EPA chose for information collection requests is strong evidence that the *type* of air pollution control technology used itself is not significantly determinative of emissions. Nevertheless,

because EPA may be able to explain why non-control technology factors have a negligible effect on emissions and why the data it used from supplemental test reports outperform the units it identified as best, we remand this portion of the rulemaking to EPA for further explanation without vacating the MACT floor regulations.

2. Accounting for variability

We now address NACWA's and Sierra Club's challenges to EPA's method of accounting for variability. In the proposed rule, EPA explained that it was accounting for intra-unit variability using a statistical tool it termed the upper prediction limit, and was relying on the Part 503 regulations to account for variability in sewage sludge pollutant concentration between incinerators. *See* 75 Fed. Reg. at 63,270–71. Because the upper prediction limit is not a straightforward method of accounting for variability, we first review and elaborate on this concept. The 99 percent upper prediction limit "represents the value which one can expect the mean of future 3-run performance tests from the best-performing 12 percent of sources to fall below, with 99 percent confidence, based upon the results of the independent sample of observations from the best-performing sources." 75 Fed. Reg. at 63,271. EPA calculated the upper prediction limit using the following formula:

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

In this formula, n represents the number of test runs (*i.e.*, the sample size), m represents the number of test runs in a compliance average, $\bar{x}$ represents the mean, s represents the

standard deviation (*i.e.*, a value representing how much variation exists from the mean within a dataset), and $t(0.99, n–1)$ represents a value called the t-statistic, which is a number based on the number of test runs and EPA's desired 99 percent significance. *Id.* Because of the role of the standard deviation in this formula, greater variation within a dataset will produce a higher upper prediction limit. And because EPA incorporated the upper prediction limit into its analysis by setting the MACT floor at the level of the upper prediction limit (unless its methodology for addressing non-detect data, which we will discuss below, yielded a higher result), a higher upper prediction limit means a higher MACT floor.

For existing incinerators, EPA did not apply the upper prediction limit to each 3-run test for each incinerator, but instead applied it to the entire dataset it collected for a pollutant. *See id.*; *see, e.g.*, Revised MACT Floor Memo Attachment B-8. For example, when setting the MACT floor for sulfur dioxide, for which EPA had 63 test runs, EPA calculated the upper prediction limit using a sample size of 63, a mean and standard deviation based on all 63 test runs, a desired 3-run compliance average, and a desired confidence level of 99 percent. *See* 75 Fed. Reg. at 63,271; Revised MACT Floor Memo Attachment B-8. The resulting value calculated by the upper prediction limit appears to represent, with 99 percent confidence, the value EPA predicts a 3-run average from an imaginary incinerator—representative of the mean and variation among the best-performing 12 percent incinerators—could achieve. Predicting the value that a "3-run average" will fall below appears confusing at first glance—but we note that the focus of the upper prediction limit is on the average, and not the values of the three runs used to derive that future average. Thus if the upper prediction limit (*i.e.*, MACT floor) were 5, it would not matter

whether the 3-run test was 5-5-5, or 1-5-9, as both 3-run tests average to 5. Designing the upper prediction limit this way appears to give incinerators testing for compliance with the MACT standards some leeway in variations among emissions between test runs. *See* 75 Fed. Reg. at 63,269.

During the comment period Sierra Club, but not NACWA, challenged EPA's use of the upper prediction limit. *See* Joint Appendix 608. Although NACWA did not criticize the upper prediction limit as a method for addressing variability in its comments, it did assert that EPA failed to account for variability in sewage sludge characteristics resulting from regional and seasonal variability. *See id.* 670–72. NACWA also challenged EPA's use of the Clean Water Act Part 503 regulatory data in its rulemaking, asserting that EPA's assumption that sewage sludge was homogenous was demonstrably false based on that data. For example, NACWA pointed out that the monthly average lead concentration in sewage sludge in January 2009 was 62.23 mg/dry kg for southerly incinerators and 97.00 mg/dry kg for westerly incinerators, while the monthly average lead concentration in July 2009 was 123.14 mg/dry kg for southerly incinerators and 218.55 mg/dry kg for westerly incinerators. *Id.* 671. NACWA argued that because EPA regulations required publicly-owned treatment works to report this data to EPA, s*ee* 40 C.F.R. § 503.48, EPA had access to the data and should have used it during rulemaking to account for variability. *Id.* 671–72. Moreover, NACWA noted that the Part 503 regulations did not even address all § 129 pollutants. *See id.* 672.

In the final rule, EPA defended its use of the upper prediction limit against Sierra Club's criticisms. *See* 76 Fed. Reg. at 15,389. In response to NACWA's comments, EPA explained that it collected emissions data from nine different

facilities in nine different states, claiming that these facilities were "located in a mix of northern, southern, eastern, and western states," each with its "own unique sludge characteristics from different residential and commercial populations." *Id.* at 15,391. EPA stated that it felt the dataset had "sufficient variation in regions, climates and populations" to "adequately incorporate[] variability in wastewater treatment systems across the U.S.," and that it had "also incorporated variability using the [upper prediction limit]." *Id.*

Both petitioners now challenge EPA's use of the upper prediction limit to account for variability among sewage sludge incinerators. Sierra Club contends that the upper prediction limit is unlawful as applied to existing incinerator datasets because it does not represent the "average" emissions limitation achieved by the best-performing 12 percent of incinerators, a fact inconsistent with EPA's statements that the upper prediction limit is "based on" an average. Sierra Club asserts that the upper prediction limit is unlawful as applied to new sources as well, stating that "the upper prediction limit is not an estimate of what the best unit actually 'achieved in practice.'" Sierra Club Br. at 25.

Sierra Club also argues that EPA's use of the upper prediction limit is arbitrary and capricious because EPA does not provide an explanation of how the upper prediction limit represents the emissions level achieved by the best performing units under the worst reasonably foreseeable conditions. To support its arbitrary and capricious argument, Sierra Club points to the fact that, by applying the upper prediction limit, EPA calculated a MACT floor for the best-controlled unit that was higher than the floor based on the average emissions limitations achieved by the top 12 percent of units. *See* 76 Fed. Reg. at 15,388–89. Sierra Club also

alleges that EPA has been inconsistent with its use of the upper prediction limit, using the upper prediction limit to set the MACT floors but not using it to identify incinerators in the first place.

NACWA does not challenge EPA's use of the upper prediction limit as broadly as Sierra Club, explaining that "using the 99 [percent] [upper prediction limit] method to account for variability in emission performance is not prohibited by statute, nor is it unreasonable, provided EPA uses representative data from the congressionally required 12 [percent] of units." NACWA Intervenor Br. at 7. Instead, NACWA challenges EPA's justification that the upper prediction limit adequately accounts for variability in a dataset that itself is not reflective of the variety of conditions in which sewage sludge incinerators operate, asserting that "the [upper prediction limit] cannot account for variability among [sewage sludge incinerators] unless the underlying data are representative of the category as a whole." In other words, NACWA argues that because EPA failed to take into account regional and seasonal variability in sewage sludge pollutant concentrations and failed to use the Part 503 data showing variability in sewage sludge characteristics in its analysis, EPA produced a limited dataset that was not representative of the "emission rates achieved by the best-performing sources under the full range of operating conditions." NACWA Br. at 41.

EPA's responses to both Sierra Club's and NACWA's arguments are somewhat conclusory, relying primarily on its explanation in the Revised MACT Floor Memo rather than addressing the petitioners' legal arguments. Responding to Sierra Club, EPA asserts that it did not "simply 'pick a number'" in setting the upper prediction limit, and explains that the reason why some new incinerator MACT floors were

higher than existing incinerator MACT floors was because of the smaller datasets with greater variation. EPA Br. at 52. EPA argues that NACWA's criticism of the upper prediction limit is "overly simplistic," explaining that "EPA's use of the [upper prediction limit] to account for variability also addressed any emissions variability due to differences in sludge content," and that if NACWA's approach were accepted, "it would account for variability in sludge content on top of the variability in emission levels that are already accounted for through the [upper prediction limit]." EPA Br. at 50–51.

Before stepping into the morass of arguments on the upper prediction limit, we take a moment to revisit the statutory source of EPA's obligation to set MACT floors. Section 129(a)(2) requires existing MACT floors to be no less stringent than "the average emissions limitation achieved by the best performing 12 percent of units." As we noted in *Sierra Club*, "this phrase on its own says nothing about how the performance of the best units is to be calculated." 167 F.3d at 661. In the past, we have primarily relied on *Sierra Club* when reviewing MACT standards to state that EPA can reasonably estimate the performance of the best units. But underlying *Sierra Club*'s holding is also the proposition that, because EPA can interpret ambiguous statutes under *Chevron*, EPA can decide what value the MACT floors are supposed to represent, as long as that decision is a reasonable interpretation of the statute. *See id.* at 661–62.

In this case, EPA has explained that its "long-standing interpretation [of section 129] is that the combination of section 129(a)(4), requiring numerical standards for each enumerated pollutant, and section 129(a)(2), requiring that each such standard be at least as stringent as the MACT floor, supports that floors be derived for each pollutant based on the

emissions levels achieved for each pollutant." 75 Fed. Reg. at 63,269. And in the final rule, EPA clarified that it was "using lowest emissions limitation as the measure of best performance." 76 Fed. Reg. at 15,389.

But even with these explicit interpretations of § 129(a)(2) as guidelines, the phrase "average emissions limitation achieved by the best performing 12 percent of units" could be interpreted several different ways, with several different variations of what the MACT floor is supposed to represent. For example, and without prejudging the legality of these different interpretations, EPA could interpret the "average emissions limitation achieved by the best performing 12 percent of units" to mean the average of the emission levels achieved by the best-performing units based on EPA's short-term emission test data, without regard to the range of conditions under which the incinerators operate. In that case, the MACT floors would simply be an average of the emissions data EPA collected from the best-performing units.

The phrase could also mean the average of the emission levels that each best-performing unit achieved under the worst foreseeable circumstances. If EPA were to take this interpretation, it would seem sensible to determine the population of the best-performing units based on which units achieve the lowest emission levels under the worst foreseeable conditions, and then average those emission levels.

Based on EPA's method of determining MACT floors in this case and its response to Sierra Club's comments, however, it seems EPA has adopted yet another interpretation of the phrase "average emissions limitation achieved by the best performing 12 percent of units." In the final rule, EPA cited Sierra Club's comments that § 129(a)(2)

"unambiguously requires EPA to set floors reflecting the 'average' emission level achieved by the best sources" and that "although EPA may consider variability in estimating an individual source's actual performance over time, nothing in the [Clean Air Act] or the case law even suggests that EPA may account for differences in performance between sources except as § 129 provides, by averaging the emission levels achieved by the sources in the top 12 percent." 76 Fed. Reg. at 15,389. EPA responded that "[b]ecause the [upper prediction limit] represents the value which we 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 [upper prediction limit] reflects average emissions." *Id.*

It is not clear to us, however, that the "average emissions limitation achieved by the best performing 12 percent" would refer to the future average of a 3-run test that EPA predicts a source in the best-performing 12 percent will fall below with 99 percent confidence. Instead, the word "average" as referred to in the standard for existing unit MACT floors seems to mean the average emissions limitation that the existing population of the best-performing 12 percent of incinerators has achieved, not the average of a future 3-run test conducted for compliance purposes.

This is not to say that the upper prediction limit, which EPA applied to the average of the emission levels recorded while testing the best-performing 12 percent, would violate the statutory standard established in § 129. Under its method, EPA seems to have effectively modeled an imaginary incinerator based on the short-term emissions test data from incinerators in what EPA considers the best-performing 12 percent of units. Using the average, the standard deviation of the dataset, and the number of data points, EPA claims its

statistical formula models, with 99 percent confidence, the upper limit of what that imaginary incinerator would achieve based on the distribution of the dataset. Given that EPA believes that it must set MACT floors "that the best performing sources can meet 'every day and under all operating conditions,'" it seems plausible to state that this predicted emission level represents the "average emissions limitation achieved by the best performing 12 percent of units." *See* 75 Fed. Reg. at 63,269 (quoting *Mossville Environmental Action Now*, 370 F.3d at 1241–42).

EPA has not interpreted "average emissions limitation achieved" this way, however, and because we "may not supply a reasoned basis for the agency's action that the agency itself has not given," we can only adjudge EPA's interpretation based on essentially one sentence from the Federal Register. *Bowman Transportation, Inc. v. Arkansas-Best Freight System, Inc.*, 419 U.S. 281, 285–86 (1974); *see* 76 Fed. Reg. at 15,389. The need for further explanation is especially acute when EPA's approach of using the upper prediction limit and its interpretation of "average emissions limitation achieved" are both departures from the approaches EPA has taken in setting MACT floors in earlier cases. As to the interpretation of "average" specifically, EPA has not previously interpreted the phrase "average emissions limitation achieved" to refer to the average of a future 3-run test, but instead the average emissions levels of the best-performing 12 percent of sources for which EPA had data (or the average of the proxies EPA used to estimate those emission levels). *See Sierra Club*, 167 F.3d at 661 ("[EPA] selected the 12 percent of the incinerator population subject to the strictest controls and set the floor level for the subcategory by averaging the emissions limitations governing those incinerators."); *National Lime*, 233 F.3d at 630 ("To set existing source emission floors, EPA . . . . identified the

technology used by the median plant out of the best twelve percent of plants for which it had information and set the existing source emission floor at the emission level of the worst performing plant in its database using that technology."); *Cement Kiln*, 255 F.3d at 859 (explaining that for existing sources, EPA identified the best-performing 12 percent of sources, then identified the emission control technology used by sources with emission levels equivalent to or lower than the median of the best-performing 12 percent, and then set the MACT floor at the worst emission level achieved by any source using that technology); *Northeast Maryland Waste Disposal Authority*, 358 F.3d at 953 ("For each pollutant, EPA calculated the MACT floor by averaging the most stringent 12% of state permit limits in each class.").

Although EPA may be able to justify its novel interpretation that "average" means the average of a future 3-run compliance test, one sentence in the Federal Register is not enough of a basis to uphold EPA's new approach to incorporating variability against arbitrary and capricious review. Accordingly, on remand, we expect EPA to clarify how the upper prediction limit represents the "average emissions limitation achieved by the best performing 12 percent." *See Sierra Club*, 167 F.3d at 664 (remanding EPA's MACT floor determination, because "[i]t is possible that EPA may be able to explain it").

We now turn to Sierra Club's related challenge to the upper prediction limit as arbitrary because "EPA provides no support for the notion that the upper prediction limit for the single best-performing unit reflects that unit's actual performance, even under the 'worst reasonably foreseeable' circumstances.'" Sierra Club Br. at 26. While it is true that EPA did not even use the phrase "worse foreseeable circumstances" in its rulemaking, it did explain its belief that

it must set MACT floors that the "best performing sources can expect to meet 'every day and under all operating conditions.'" 75 Fed. Reg. at 63,269 (quoting *Mossville Environmental Action Now*, 370 F.3d at 1241–42). Not only are these standards approximately equivalent, EPA is not wedded to our "worse foreseeable circumstances" interpretation of "achieved in practice." *See Sierra Club*, 167 F.3d at 665 (explaining that "EPA would be justified in setting the floors at a level that is a reasonable estimate of the performance of the 'best controlled similar unit' under the worst reasonably foreseeable circumstances," adding "we use the subjunctive because it is not clear from the record that the agency was doing this"). More substantively, EPA's citation to *Mossville Environmental Action Now* in the same section as EPA's description of the upper prediction limit may be enough to reasonably discern EPA's justification for the upper prediction limit, even if EPA has not directly stated how it justifies the upper prediction limit as a method for accounting for variability in light of the Clean Air Act and our case law. *See Bowman Transportation*, 419 U.S. at 286.

Although it may be sufficiently clear that EPA's prediction of the best-performing incinerators' upper limit represents standards these incinerators can "meet every day and under all operating conditions," EPA has not clearly explained how the upper prediction limit itself operates to predict this value with sufficient accuracy. In the *Brick MACT* case, we held that EPA's use of the MACT approach violated the Clean Air Act because "it . . . failed to show that the emission levels achieved by the worst performers using a given pollution control device actually predict the range of emission levels achieved by the best performers using that device." 479 F.3d at 882. Similarly, EPA provides little explanation on *how* the upper prediction limit can actually predict the upper limit EPA expects the best-performing unit

or units to achieve. As Sierra Club pointed out, the upper prediction limit's predictive ability does appear somewhat doubtful when it produces a higher MACT floor for an incinerator with raw test data ranging from 0.31 to 2.26 than for a group of incinerators with raw test data ranging from 0.31 to 40.32 and a mean of 9.38. *See* Revised MACT Floor Memo Attachment B-8 (Sulfur dioxide emissions test data for existing multiple hearth incinerator floor); *id.* Attachment D-8 (Sulfur dioxide emissions test data for new multiple hearth incinerator floor). As EPA stated in explaining this apparently illogical result, a smaller dataset may have greater variability, and thus a higher upper prediction limit. But if the upper prediction limit can vary so much depending on the size of the dataset, EPA should explain on remand why the upper prediction limit is a reasonable estimate of what an incinerator would achieve under the worst foreseeable conditions for incinerators with smaller datasets. Put differently, if collecting more data has such a significant effect on the upper prediction limit, presumably producing a more accurate estimate of what that incinerator would "achieve in practice," EPA should explain why the upper prediction limit could still be considered accurate given a small dataset.

While it is true that we "owe particular deference to EPA when its rulemakings rest upon matters of scientific and statistical judgment within the agency's sphere of special competence and statutory jurisdiction," *American Coke & Chemicals Institute v. EPA*, 452 F.3d 930, 941 (D.C. Cir. 2006), EPA must still articulate a "rational connection between the facts found and the choice made." *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962). Because we are already remanding the upper prediction limit, we encourage EPA to elaborate *how* the statistical formula it uses can predict the upper limit of incinerator emissions. We 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, particularly when the "facts found"—the MACT floor datasets—demonstrate flaws in the formula.

We now turn to NACWA's arguments that EPA failed to account for variability in sewage sludge characteristics, beginning with NACWA's argument that the upper prediction limit cannot account for this sort of variability. *See* NACWA Br. at 39; EPA Br. at 51 ("EPA's use of the [upper prediction limit] to account for variability also addressed any emissions variability due to differences in sludge content."). Before discussing NACWA's challenges to EPA's method of accounting for variability, however, we take a moment to note a distinction NACWA appears to draw in its brief, in which it argues that its analyses on the Part 503 data "demonstrate that there is significant variability in metals concentrations *among* [publicly-owned treatment works] and *within* a [publicly owned treatment work]." NACWA Br. at 42. As we will explain below, we agree with NACWA that under the rationale EPA expressed during rulemaking regarding variability, EPA should have accounted for variability in sewage sludge characteristics *within* a publicly-owned treatment work or better explained why that variability was irrelevant. It is unclear, however, whether EPA needed to account for variability *among* publicly-owned treatment works.

First, we agree with NACWA that EPA has not adequately explained how the upper prediction limit can address variability in sewage sludge characteristics, particularly given the context in which it described the upper prediction limit in the proposed rule and the Revised MACT Floor Memo. EPA explained in the proposed rule and in its Revised MACT Floor Memo that "[t]he types of variability

that EPA attempts to account for include operational distinctions between and within tests at the same unit." 75 Fed. Reg. at 63,269; Revised MACT Floor Memo at 4–5. As to existing incinerator MACT floors, EPA stated that "[b]y including multiple emissions tests from units with a test average in the top 12 percent, EPA can evaluate intra-unit variability of emissions tests over time, considering variability in control device performance, unit operations, and fuels fired during the test. . . . [T]he [upper prediction limit] was used for the [sewage sludge incinerator] MACT floor variability analysis." 75 Fed. Reg. at 63,271; Revised MACT Floor Memo at 11–12. These statements appear to contradict EPA's implied position in the final rule (and express position on petition for review) that the upper prediction limit can account for more than intra-unit variability. *See* 76 Fed. Reg. at 15,391 (explaining, in response to NACWA's comments that EPA failed to account for variability in sewage sludge characteristics, that in addition to collecting emissions information from facilities in nine different states, "[w]e have also incorporated variability using the [upper prediction limit]."); EPA Br. at 51.

Not only is EPA contradictory on whether the upper prediction limit accounts for more than intra-unit variability, NACWA's argument that the underlying dataset must already be representative of variability in sewage sludge characteristics before applying the upper prediction limit is persuasive, at least as applied to variability within a publicly-owned treatment work. Assuming that NACWA's summary of monthly average sewage sludge pollutant concentrations in its comments is accurate, short-term emissions testing done in January when the monthly average lead concentration is lowest may not be representative of incinerators' performance in July, when the monthly average lead concentration is almost double. *See* Joint Appendix 671 (NACWA

Comments). If sewage sludge incinerator emissions increase based on sewage sludge pollutant concentrations, then it would seem to follow that the average emission levels of sewage sludge incinerators in July would be higher than the average in January. *Cf. Sierra Club*, 167 F.3d at 666 ("The EPA does not deny that the waste stream reductions the Sierra Club calls for would reduce pollution. The less mercury in, the less mercury out, and the less chlorinated plastic in, the less HCl out."). And assuming that the standard deviation does not change from month-to-month, it would also follow that the upper prediction limit, and thus the MACT floor, would be higher for a dataset based on July emission testing.

As with the other aspects of the upper prediction limit, however, EPA may be able to explain and clarify on remand its position on whether the upper prediction limit can account for variability in sewage sludge content. EPA may also be able to explain why NACWA is incorrect in asserting that EPA needs to base its upper prediction limit on a representative dataset. Alternatively, EPA could adopt an interpretation of "average emissions limitation achieved by the best performing 12 percent of units" that does not require EPA to determine what the best-performing units achieve under the worst foreseeable conditions.

Having determined that EPA did not make clear whether the upper prediction limit accounts only for intra-unit variability, we now turn to NACWA's remaining and related arguments on EPA's variability analysis. We start first with NACWA's argument that EPA failed to demonstrate that its MACT floor dataset represented the best-performing 12 percent of incinerators because it failed to adequately account for variability in sewage sludge characteristics. NACWA maintains that sewage sludge characteristics can vary not only by geographic region, but also by seasons, differences in

wastewater treatment technologies, and the sanitary wastes received from the communities served by publicly-owned treatment works. *See* Joint Appendix 671 (summarizing month-to-month variability in sewage sludge pollutant concentrations based on Part 503 data); *id.* at 1075 (summarizing the minimum, maximum, median, and 25th and 75th percentile sewage sludge pollutant concentration for several different publicly-owned treatment works operating sewage sludge incinerators). Moreover, NACWA criticizes EPA for not factoring sewage sludge variability into its MACT floor methodology, noting that EPA has had twenty years of data on sewage sludge from the Part 503 regulations, which require regulated entities to report information about pollutant concentrations to EPA. *See* 40 C.F.R. § 503.48.

NACWA argues that this limited testing is problematic, implying that if EPA used a limited dataset that is not representative of the full range of conditions experienced by sewage sludge incinerators, and set MACT floors on that dataset without accounting for the significant variation in sewage sludge, it could underestimate the emissions limitation achieved by the best-performing incinerators. For example, if the concentration of a pollutant in sewage sludge is lower in the winter but higher in the summer, basing MACT floors only on a dataset of emission tests taken during the winter would underestimate the emissions limitation achieved under the worst foreseeable conditions. Relatedly, if sewage sludge pollutant concentrations are naturally higher at a sewage sludge incinerator in one region versus another incinerator in a different region, NACWA appears to assert that EPA must account for these variations in its dataset.

EPA, in addition to responding that the upper prediction limit accounts for variability, asserts that NACWA "fails to explain how the alleged variations in the metals content in

sludge affects the emissions performance of the best performing units." Instead, EPA contends, "NACWA simply points to data submitted under the [Clean Water Act] Part 503 regulations without demonstrating whether and how the pollutant content of sludge affects emissions." EPA Br. at 51. EPA further explains that "air pollution control devices generally used by the best performing sewage sludge incinerators result in significant pollutant reductions between the incoming sludge feed and outgoing emissions," and thus that "any differences in pollutant concentrations in the sludge feed should have minimal impact on emissions because the pollutants contained in the sludge feed itself are removed by air pollution control devices." *Id.*

EPA did not cite to the record in its brief for these factual assertions. Nor are these assertions in the final rule's section responding to NACWA's comments on this point, in which EPA responded not that there was a low correlation between emissions and sewage sludge pollutant concentrations, but instead that "[w]e requested additional information in the [notice of proposed rulemaking], but did not receive adequate sampling data from the best-performing sources." 76 Fed. Reg. at 15,391. Upon review of the record, the only place we could find support for EPA's factual assertion was in its letter denying NACWA's petition for reconsideration. There, EPA explained that it had collected sludge content data at the same time as the emissions tests, and that because it found a "high reduction in pollutant levels between incoming sludge and emissions due to add-on controls, the variation in the lead content in the sludge . . . did not affect the emissions performance of those sources." Joint Appendix 1095 (Letter Denying NACWA's Petition for Reconsideration).

But even assuming that EPA intended to rely on this assertion in defending its rulemaking on the current petition

for review, it is not clear to us that a rationale offered for the first time in a petition for reconsideration is sufficient to be a ground upon which we can judge the propriety of EPA's action. We could find no case discussing the propriety of judging an agency's action based on a statement made for the first time in a denial of a petition for reconsideration, but it seems to be a weak basis for upholding agency action. This is particularly true when a petitioner has raised an objection during the comment period that gave an agency the opportunity to respond to the objection before the denial of reconsideration. *See* 76 Fed. Reg. at 15,391 (summarizing several statements from commenters, including that "emissions from [sewage sludge incinerators] are affected not just by control technology but also by other factors including the contents of the sludge that a unit is burning," and that "the proposed standards does [*sic*] not take into account that [mercury, cadmium, lead, hydrogen chloride and sulfur dioxide] emissions are a function of the sludge content of [mercury, cadmium, lead], chlorine, and sulfur"). A purpose of notice-and-comment provisions under the APA (and presumably of the more elaborate procedural safeguards in § 307 of the Clean Air Act) is "to ensure that affected parties have an opportunity to participate in and influence agency decision making at an early stage, when the agency is likely to give real consideration to alternative ideas." *New Jersey, Department of Environmental Protection v. EPA*, 626 F.2d 1038, 1049 (D.C. Cir. 1980). By waiting until the petition for reconsideration to respond to a comment that had been raised during the comment period, EPA deprives the affected party of the opportunity to respond to EPA's rationale and influence agency action at an earlier stage. Thus, just as we will not entertain an argument raised for the first time in a reply brief to prevent sandbagging of appellees and respondents, we are reluctant to affirm based on a factual assertion raised for the first time in an agency's denial of a petition for

reconsideration when the agency had an opportunity to raise that point at an earlier point in the rulemaking process. *See Mohamad v. Rajoub*, 634 F.3d 604, 608 (D.C. Cir. 2011). On remand, however, EPA may elaborate upon and explain the data that led it to conclude a low correlation between sewage sludge concentrations and emissions, using that conclusion to support the reasonableness of its estimate if it finds that approach appropriate.

Because EPA did not provide evidence during rulemaking that there was a low correlation between sewage sludge pollutants and actual emissions, we address EPA's argument that NACWA did not establish a correlation between sewage sludge pollutant contents and emissions. EPA is mistaken in putting the burden of establishing this correlation on NACWA. While EPA could arguably have interpreted § 129(a)(2) in a way that does not require it to account for variability, in which case NACWA would need to argue why EPA's interpretation is not "based on a permissible construction of the statute," *Chevron*, 467 U.S. at 843, having 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. *See Northeast Maryland Waste Disposal Authority*, 358 F.3d at 954. If EPA is arguing its estimated MACT floors are reasonable based on the assumption that its limited dataset allows it to account for the worst foreseeable conditions because sewage sludge variability will have a negligible effect on emissions, EPA, and not NACWA, bears the burden of demonstrating that this assumption is correct.

EPA's related argument that NACWA "failed to demonstrate why data from more units across more states during different times of the year would have led to a better determination of the best performers, why the representative

data that EPA did collect prevented EPA from reasonably determining the best performers, or how consideration of [Clean Water Act] Part 503 data or stack test data would have changed the results" suffers from similar flaws. EPA Br. at 52. Although EPA did not have to consider emissions stack test data that commenters submitted without appropriate documentation, *see supra* at 42, we disagree with EPA that NACWA has the burden of showing why more data would better determine best performers. It seems self-evident that more data from a broader span of time would have helped support (or defeat) EPA's assumptions about the extent to which sewage sludge variability affects emission levels, and if EPA wanted to justify a limited dataset from a smaller timespan as being representative, it, and not NACWA, bears the burden of making that demonstration. Moreover, EPA's argument that NACWA did not demonstrate how more data would have prevented EPA from reasonably determining the best performers is unavailing. The representative data EPA collected did not prevent or assist it from determining the best performers, as EPA had already determined the best-performing incinerators based on control technology with no additional input from NACWA required. In fact, calling the data "representative" implies that EPA believes it targeted the best performers even regardless of what the data actually showed.

While we agree with NACWA that EPA may have been unduly dismissive of the fact that there is significant sewage sludge variability within a publicly-owned treatment work, NACWA's claim that EPA must account for variability *among* publicly-owned treatment works raises statutory issues beyond the scope of the issues NACWA raised in its petition for review. Specifically, by asserting that EPA must account for variability *among* publicly-owned treatment works because the publicly-owned treatment works have limited

control over the pollutant concentration in their sewage sludge, NACWA appears to be urging a different interpretation of the "average emissions limitation achieved by the best performing 12 percent of units" than the one EPA has adopted.

In this rulemaking EPA explained that it "is using lowest emissions limitation as the measure of best performance." 76 Fed. Reg. at 15,389. Thus, by arguing that EPA must account for variability in sewage sludge content over which a publicly-owned treatment work has no control, NACWA is essentially requesting that EPA adopt a different interpretation of the phrase "average emissions limitation achieved by the best performing 12 percent of units." For example, if an incinerator, through bad luck, receives 100 units of pollutants in its sewage sludge, and manages to emit only 50 units of pollutants, it could be said to be a better performer than an incinerator that receives, through good luck, only 30 units but emits 25 units of pollutants. But under EPA's interpretation of "best performing," the reduction in emissions from uncontrolled conditions to controlled conditions is irrelevant—the best-performing incinerators are those that emit the lowest levels of pollutants, and so the incinerator with an emission level of 25 would be the better performer. Where EPA explains that a best performer is determined by its emission level, apparently in absolute terms, the logical consequence of NACWA's argument is that the "best performing" incinerators must be those that are the most effective at removing pollutants from incinerated waste before emitting pollutants from the stack. In fact, NACWA expressly states its desire for a different interpretation in its comments on the proposed rule, explaining that "[w]ithout the use of long-term data to support the level of emission standards, this variability makes numeric technology-based limits impractical and infeasible and should provide EPA

strong motivation to look to other regulatory options." Joint Appendix 671. Relatedly, NACWA's comments also urged EPA to apply a "variability factor," based on the variability in sewage sludge characteristics, to the stack test data.

While it may be true that a publicly-owned treatment work's obligation to manage all sewage that enters into the sanitary sewer system distinguishes it from commercial or industrial incinerators that have more control over what waste they combust, this fact does not present a unique scenario in setting MACT floors. As a concurring opinion noted in the *Brick MACT* case, there seems to be a paradox in § 112's directions on setting MACT standards (which is almost identically worded to § 129). *See* 479 F.3d at 884–85 (Williams, J., concurring). Specifically, the statute "calls for emissions standards that are the most stringent that EPA finds to be 'achievable,' taking into account a variety of factors including cost," while also requiring that "the standards 'shall not be less stringent' than the emission control that have been 'achieved in practice.'" *Id.* at 884 (internal citations omitted). Thus, implicit in the statute's requirements is that the standard for what is achievable will be more stringent than the floors that are based on past achievement. *Id.* But if meeting the floors is prohibitively costly for an incinerator "because of conditions specific to those plants," for example, because "the required technology cannot, given local inputs whose use is essential, achieve the floor," then it would seem that what some plants have achieved is not achievable for other plants. As applied here, where incinerators have limited control over sewage sludge that can vary significantly in its pollutant concentrations, this criticism of the MACT standards seems especially pointed.

Even if this were true, however, NACWA has not argued that § 129 requires EPA to account for variability in sewage

sludge inputs among publicly-owned treatment works, or that EPA's interpretation of the statute as basing "best performers" on the "lowest emission levels" is impermissible. Nor has NACWA argued that EPA acted arbitrarily or capriciously by not basing MACT floors on a more "sewage sludge-diverse" dataset or by not applying a variability factor to account for variations in sewage sludge characteristics. Moreover, NACWA's urging that EPA adopt a variability factor may put EPA in conflict with its own interpretation of what "best performing" means. If EPA applies a variability factor, based on the heaviest sewage sludge pollutant concentrations experienced by publicly-owned treatment works, to an incinerator for which it has already estimated emission levels under the worst foreseeable circumstances, the MACT floor could no longer be said to reflect what that incinerator "achieved." Instead, applying a variability factor would be akin to EPA's approach in other cases to set MACT floors based on the emissions of the worst performer using MACT technology, which EPA attempted to justify "by claiming that floors must be achievable by all sources using MACT technology." *Cement Kiln*, 255 F.3d at 861. While we have recognized the paradox in requiring all incinerators to comply with a floor based on what some incinerators achieved in the past but which may be unachievable to other incinerators, we have roundly rejected an interpretation of § 129 that would require EPA to set the MACT floors at levels achievable by all sources. *See Brick MACT*, 479 F.3d at 880 ("'EPA may not deviate from *section 7412(d)(3)*'s requirement that floors reflect what the best performers actually achieve by claiming that floors must be achievable by all sources using MACT technology.'") (quoting *Cement Kiln*, 255 F.3d at 861).

But while we conclude that NACWA has not argued a legal basis for why EPA should account for variability in sewage sludge characteristics among publicly-owned

treatment works, we are somewhat confused by EPA's defense of its variability analysis in the final rule, particularly given its statement that it is using the "lowest emissions limitation as the measure of best performance." 76 Fed. Reg. at 15,389. In the proposed rule, EPA made no mention of deriving a dataset representative of variability *among* publicly-owned treatment works. *See* 75 Fed. Reg. at 63,269–72. But in the final rule, EPA responded to comments that EPA did not adequately account for variability by explaining that it had "gathered [emissions information] from nine different facilities located in nine different states" and that the facilities surveyed, when "combined together," "represent sufficient variations in regions, climates and populations that adequately incorporates variability in wastewater treatment systems across the U.S." 76 Fed. Reg. at 15,389. "[V]ariations in regions, climates and populations," however, seem irrelevant in the hunt for the lowest emitting incinerators. *See id.* If EPA did consider sewage sludge incinerators to be a unique type of incinerator and did seek to develop a dataset that was geographically and demographically diverse, then it should reconcile that goal with its statement that the best-performing units are the lowest emitting. And if EPA does seek to develop a dataset representative of variability among sewage sludge incinerators, it needs to address NACWA's contentions that some of its MACT floors are not actually geographically representative. *See* NACWA Br. at 33–34 (demonstrating that fluidized bed incinerator MACT floors were based only on publicly-owned treatment works in Michigan, Minnesota, Pennsylvania, and North Carolina).

To sum, while we determine that EPA's use of the upper prediction limit may be lawful, we are remanding this portion of its rulemaking for further explanation on the issues of how the upper prediction limit represents the "average emissions

limitation achieved," how the upper prediction limit is a reasonable method of predicting the upper limit of the best-performing incinerators, and how the upper prediction limit accounts for variability in incinerator performance when it is not based on a dataset representative of the best-performing incinerators under the worst-performing conditions. We further conclude that NACWA's arguments that EPA must consider variability in sewage sludge characteristics among publicly-owned treatment works are meritless because NACWA has not argued any legal basis invoking either the statutory language or arbitrary-and-capricious review why EPA is compelled to account for that sort of variability. But because EPA's discussion of its efforts to create a representative dataset seems in conflict with its assertion that the best-performing incinerators are those with the lowest emission levels, we also remand for EPA to reconcile this point.

3. Adequacy of the MACT floor dataset

We now address Sierra Club's and NACWA's argument that EPA unlawfully and arbitrarily set certain MACT floors on datasets comprising less than 12 percent of the population of sewage sludge incinerators. In its rulemaking, EPA candidly admitted its data collection efforts yielded a dataset that comprised less than 12 percent of existing incinerators for certain pollutants. *See* 75 Fed. Reg. at 63,270 ("EPA does not have actual emissions test data for the population of units that represent the best-performing 12 percent . . . ."). EPA nevertheless concluded that the lack of data for at least 12 percent of incinerators did not prevent it from setting MACT floors, as it had "conducted a statistical analysis to verify the minimum number of observations needed to accurately characterize the distribution of the 12 percent of units in each category," and had determined that the data it used "m[et] or

exceed[ed] the number of observations necessary to provide an accurate representation of that data." 76 Fed. Reg. at 15,387. EPA's only explanation for why its use of this technique was appropriate was that "emission data are normally distributed [*i.e.*, on a bell curve], or can be transformed to be normally distributed." Revised MACT Floor Memo at 8.

On petition for review, NACWA argues that EPA's failure to collect sufficient data violates § 129, which, unlike § 112, requires EPA to set the MACT floor on the top 12 percent of performing units without the qualifier "for which the Administrator has emissions information." *Compare* 42 U.S.C. § 7429(a)(2), *with id.* § 7412(d). Thus, NACWA asserts, EPA may not extrapolate information about the "best performing units" from less than 12 percent of such units in light of Congress's unqualified directive on setting solid waste incinerator MACT floors.

NACWA is incorrect that EPA's decision to set MACT floors on less than 12 percent of data is *per se* unlawful. In concluding that the law allows EPA to estimate the "average emissions limitation achieved by the best performing 12 percent of units," we have not determined any requirement that EPA have at least a representative sample of 12 percent of the population of incinerators. Instead, we have explained that the existing incinerator MACT floor standard "does not by its plain meaning exclude estimation either by sampling *or by some other reliable means*." *Sierra Club*, 167 F.3d at 662 (emphasis added). Thus, the fact that EPA does not possess data directly collected from 12 percent of incinerators does not make its estimate inherently unlawful. *Cf. Mossville Environmental Action Now*, 370 F.3d at 1241 (allowing EPA to use one data point—EPA's preexisting emission standard—to establish an existing source MACT floor,

because the preexisting standard was "just barely satisfied by the plant with the lowest overall long term [emission of the pollutant at issue]").

While NACWA simply asserts EPA cannot lawfully set existing incinerator MACT floors on fewer than 12 percent of incinerators, Sierra Club goes further and argues that EPA acted arbitrarily and capriciously in setting MACT floors representative of the best performing 12 percent on less than 12 percent of data. Sierra Club contends that EPA fails to demonstrate or even claim that "emissions from the units for which it has data are representative of emissions from the ones for which it lacks data," repeating its argument that incinerators for which EPA lacks data may be achieving lower emission levels than those for which it has data. Sierra Club. Br. at 29. This appears to be the equivalent of arguing that EPA cannot compound its error in estimating the best performing 12 percent by assuming that an imperfect dataset can represent other potentially superior incinerators that should be included in the top 12 percent.

The point that errors in one estimate will be further compounded by another estimate is a fair one. If the MACT technology approach to selecting best performing incinerators was 75 percent accurate, and EPA's statistical equation represented a larger sample size with 80 percent accuracy, each estimate, alone, may be sufficiently reasonable. But if EPA combined the two and applied an 80 percent accurate formula to a 75 percent accurate estimate of best performers based on technology, the underlying result may be too imprecise to be considered reasonable. And this does not even account for the fact that EPA's MACT floor methodology layers another estimate—the upper prediction limit—to account for variability.

Sierra Club is also correct that EPA has "base[d] estimates of the performance of one group of units on the performance of a different group without demonstrating that this approach yields accurate estimates." Sierra Club Br. at 29. EPA did so in this case by using a statistical formula for determining the minimum number of observations necessary to adequately characterize the population of the best performing 12 percent of units, which is as follows:

$$n = \frac{NZ^2pq}{E^2(N-1) + Z^2pq}$$

Revised MACT Floor Memo at 8. In this formula, *n* represents the minimum number of observations required, *N* represents the population size, *Z* represents a value associated with a specific confidence level, *E* represents the level of precision or error tolerance, *p* represents the degree of variability in observations, and *q* represents one minus *p*. We note that none of the variables in this formula are fixed or based on the dataset, aside from *N*, the population size, leaving EPA to select the value for most variables; in this case, a 90% confidence level, a precision level of 20%, and a degree of variability of 0.5. Revised Mact Floor Memo at 8–9.

The flexibility in defining variables in this formula is of some concern, as the reasonableness of EPA's statistical extrapolation depends on variables for which EPA sets values. Our confidence in this statistical methodology is hardly heartened by the fact that the minimum number of observations EPA calculated (11 for fluidized bed incinerators and 14 for multiple hearth incinerators), were both just one shy of the number of observations EPA actually collected for the pollutant with the least amount of test data (12 for fluidized bed incinerators and 15 for multiple hearth

incinerators). Revised MACT Floor Memo at 9. To illustrate how much the result can vary, had EPA chosen a precision level of 15% instead of 20%, the minimum number of observations required for fluidized bed incinerators would have increased from 11 to 14. Changing the specific confidence level from 90% to 95%[3] increases the minimum number of observations from 11 to 13.[4] To EPA's credit, it chose a value for variability that would maximize the number of observations required, and explained it chose that value to overestimate the number of minimum observations needed. Revised MACT Floor Memo at 8–9. But for the rest of the variables, EPA selected values which could have been determinative of the validity of its dataset without explaining why it selected those numbers. That EPA could have determined the statutory sufficiency of its dataset by choosing values does not mean that EPA did so, but at a minimum EPA must explain why it chose the values it did. "[A]n agency may not pluck a number out of thin air when it promulgates rules in which percentage terms play a critical role." *WJG Telephone Co. v. FCC*, 675 F.2d 386, 388–89 (D.C. Cir. 1982).

---

[3] In entering values into EPA's statistical equation, we assumed a Z-score for a 95% confidence level as 1.960. *See http://people.richland.edu/james/lecture/m170/ch08-int.html* (noting the 90% confidence level Z-score is 1.645, the same used by EPA to calculate the minimum number of observations required in its MACT floor analysis); *see* Revised MACT Floor Memo at 8.

[4] As in *Sierra Club*, we note that "[o]ur observations are based on our own analysis of EPA's data, and we may have omitted some crucial step in the process." 167 F.3d at 664. But as we also noted in *Sierra Club*, and will explain in more detail, this "exercise highlights the need for additional explanation even if our calculation is wrong." *Id.*

In addition to not explaining why it chose the values it did for its statistical equation, EPA has not clarified how this statistical method can allow a limited dataset to approximate a larger portion of the population. In laying out the equation, EPA cited a study titled "Sample Size Requirements for Studying Small Populations in Gerontology Research" from the journal "Health Services Outcomes Research Methodologies." S*ee* Revised MACT Floor Memo at 8, 18. But EPA provided no justification for how this equation could allow it to extrapolate the best performing 12 percent from an insufficient dataset, other than to state, "Because the emission data are normally distributed, or can be transformed to normally distributed . . . a statistical technique can be employed to determine the minimum number of observations needed to accurately characterize the distribution of the best performing 12 percent of units." Revised MACT Floor Memo at 8. As we explained with the upper prediction limit, while it is true that we "owe particular deference to EPA when its rulemakings rest upon matters of scientific and statistical judgment within the agency's sphere of special competence and statutory jurisdiction," EPA must still articulate a "rational connection between the facts found and the choice made." *Burlington Truck Lines*, 371 U.S. at 168; *American Coke & Chemicals Institute*, 452 F.3d at 941. If EPA chooses to use statistics as a shortcut for meeting the Congressional mandate to set MACT floors, it must justify its statistical analysis with greater detail than "a statistical technique can be employed" when "data [are] normally distributed." Although EPA does not need to fill the Federal Register with treatises on statistics, it must specify in greater detail *why* the equation it is using can accomplish the purpose for which EPA is using the equation. This is not only required as part of EPA's obligation to demonstrate the reasonableness of its estimates with substantial evidence, but also to prevent an agency from

using opaque statistical justification to cover a deficiency in its dataset.

As with the upper prediction limit, EPA's use of this statistical technique is not unlawful as long as EPA can demonstrate with substantial evidence why it reasonably estimates the performance of incinerators for which it has no data. Because this demonstration requires more detail than EPA gave here, we remand this portion of the rulemaking for further explanation on why EPA can use this formula to estimate gaps in its data and an explanation of why EPA chose the variables it did.

4. Incorporating non-detect data

Sierra Club challenges EPA's method of accounting for certain emissions data that was not quality-assured. When collecting data on certain pollutants from sewage sludge incinerators, EPA encountered "non-detect data"—*i.e.*, emission levels too low to register in an emissions test. *See* Revised MACT Floor Memo at 14–15. In the rulemaking, EPA explained that it would use a two-part test based on the method detection level, which is the "minimum concentration of a pollutant that can be measured with confidence that the level is greater than zero." EPA Br. at 61 n.20; Revised MACT Floor Memo at 14–15.

Because the method detection level varies depending on several factors, EPA first established a value it termed the "representative method detection level," which it defined as "the highest test-specific method detection level reported in a data set that is also equal to or less than the average emission calculated for the data set." Revised MACT Floor Memo at 14–15. In other words, if a specific emissions test registered a non-detect at a value higher than the average emission level,

EPA excluded it as a candidate for the representative method detection level to "minimiz[e] the effect of a test[] with an inordinately high method detection level." *Id.*

The second step in incorporating non-detect data was to multiply the representative method detection level by three and compare it to the calculated floor emission limit for that pollutant. *Id.* EPA's rationale for choosing to multiply the representative method detection level by three, rather than using the method detection level itself, was to reduce the effect of measurement imprecision. EPA explained that at values around the method detection level, measurement imprecision is around 40 to 50 percent. *Id.* at 14. As values increase above the method detection level, the testing becomes more accurate, with around 10 to 15 percent measurement imprecision at three times the method detection level. *Id.*

If the calculated emission limit was greater than the representative method detection level times three, EPA concluded that its calculation adequately addressed measurement variability, and thus would set the calculated emission limit as the MACT floor. *Id.* If the calculated emission level was less than the representative method detection level, EPA concluded that its calculation did not adequately account for measurement variability, and the representative method detection level would become the MACT floor. *Id.* EPA used this method to set the four out of the forty MACT floors it established for sewage sludge incinerators. *See* Revised MACT Floor Memo at 19.

Sierra Club argues that EPA's method of incorporating non-detect data is unlawful because it does not reflect what the best performers actually achieve, as required by § 129(a)(2). *See Brick MACT*, 479 F.3d at 880 (interpreting §

112). Sierra Club also contends that the three times representative method detection level value is not a reasonable estimate of the emission levels achieved by an incinerator when a test produces non-detect data.

We agree with EPA that its method of incorporating non-detect data is reasonable, and not arbitrary or capricious. We do not expect EPA to perform the impossible, s*ee Cement Kiln*, 255 F.3d at 871, and that includes recording emission levels that are not accurately detectable with its current emissions testing technology. As EPA explains the issue, emission levels from zero up to some value above the method detection level cannot be stated with accuracy. Because any emission level EPA selects at that point will necessarily be an estimate, EPA adopted a method to account for measurement imprecision that has a rational basis in the correlation between increased emission values and increased testing precision.

Although Sierra Club argued in its comments that EPA should have at the very least assumed that non-detect data was at the detection limit, it did not offer any evidence that EPA was incorrect in explaining why, given the measurement imprecision at the method detection level, a non-detect test run would always yield emissions data below the method detection level. Because we owe significant deference to EPA in areas of its technical expertise, we reject Sierra Club's challenge to EPA's method of addressing non-detect data.

C. SETTING CERTAIN NEW MULTIPLE HEARTH INCINERATOR MACT FLOORS AT EXISTING MULTIPLE HEARTH INCINERATOR MACT FLOOR EMISSION LEVELS

Although EPA had explained in its proposed rule that it was proposing new incinerator MACT floors for all sewage sludge incinerators based only on fluidized bed incinerator emission data, in the final rule it set separate new incinerator MACT floors for both subcategories in response to industry commenters. *See* 76 Fed. Reg. at 15,384. When EPA applied the upper prediction limit to the best performing multiple hearth incinerator for each pollutant, however, it yielded new multiple hearth incinerator MACT floors for hydrogen chloride and sulfur dioxide that were higher than than the existing multiple hearth incinerator MACT floors. *See* 76 Fed. Reg. at 15,388–89. Reasoning that new incinerator MACT floors could not be less stringent than existing incinerator MACT floors, EPA set the new multiple hearth incinerator MACT floors for hydrogen chloride and sulfur dioxide at the existing multiple hearth incinerator MACT floors. *See id.*

Sierra Club challenges this decision, arguing, among other things, that this decision does not at all attempt to satisfy § 129(a)(2)'s requirement that the new incinerator MACT floor be set at the level the best-controlled units actually achieved. But because we are remanding the portions of EPA's rulemaking establishing the upper prediction limit, in part to further explain why the upper prediction limit is a reasonable estimate given that it can fluctuate so much depending on variability, we decline to consider Sierra Club's challenge at this time.

D. BEYOND-THE-FLOOR STANDARDS

In the final rule, EPA explained that it chose not to adopt beyond-the-floor standards for existing incinerators, primarily based on its determination that additional control technologies would not be cost-effective, and mentioned nothing about setting beyond-the-floor standards for new incinerators. 76 Fed. Reg. at 15,394. Sierra Club challenges EPA's determination not to set beyond-the-floor standards for existing units based on cost-effectiveness considerations. Sierra Club also challenges EPA's decision not to set beyond-the-floor standards for new multiple hearth incinerators even though it provided no comment on this issue, explaining that because EPA did not adopt new multiple hearth incinerators MACT floors until the final rule it was impracticable to do so. *See* 75 Fed. Reg. at 63,272 (deciding to set all new sewage sludge incinerator MACT floors at the level of the best-performing fluidized bed incinerators); 42 U.S.C. § 7607(d)(7)(B).

1. Deciding not to set beyond-the-floor standards for existing units

In challenging EPA's decision not to set beyond-the-floor standards for existing units, Sierra Club argues that § 129(a)(2) "unambiguously requires the 'maximum' degree of reduction that can be achieved considering cost and other statutory factors." Sierra Club Br. at 36. Allowing EPA to determine whether a cost-per-ton reduction is appropriate, Sierra Club asserts, would give EPA greater discretion than § 129 allows, as Congress requires more from EPA in § 129 than to undertake a cost-benefit analysis. But in arguing that EPA abused its discretion in determining the maximum degree of reduction in emissions that is achievable for sewage sludge incinerators, "*taking into consideration the cost of*

achieving such emission reduction," Sierra Club 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." *See Husqvarna AB v. EPA*, 254 F.3d 195, 199 (D.C. Cir. 2001) (quoting *Baltimore Gas & Electric Co. v. NRDC*, 462 U.S. 87, 103 (1983)).

EPA argues that § 129(a)(2) does not require it to establish a beyond-the-floor standard regardless of costs, explaining that we have upheld a similar cost-effectiveness analysis in the past based on a similarly-worded statute. *See Husqvarna*, 254 F.3d at 200 (requiring EPA to promulgate standards that "shall achieve the greatest degree of emission reduction achievable through the application of technology which [EPA] determines will be available for the engines or vehicles to which such standards apply, giving appropriate consideration to the cost of applying such technology within the period of time available to manufacturers and to noise, energy, and safety factors associated with the application of such technology") (quoting 42 U.S.C. § 7547(a)(3)). We agree. In *Husqvarna*, we explained that because the similarly worded statute did not "mandate a specific method of cost analysis, we find reasonable the EPA's choice to consider costs on the per ton of emissions removed basis." *Id.* (citing 65 Fed. Reg. 24,300). This applies equally here to EPA's decision to consider costs on the per pound of mercury emissions removed basis.

Sierra Club also asserts that EPA's cost-effectiveness analysis is arbitrary and capricious because EPA only considered the cost of proposed beyond-the-floor technology options in reductions of mercury, without also considering the benefit that these proposed technology options would have in reducing other pollutants. But in the proposed rule, EPA estimated the emission reductions to both dioxins and

mercury from different control technology options, attributing the cost solely to mercury because "99.9 percent of the emissions reduction [from applying beyond-the-floor technologies] is associated with [mercury]." 75 Fed. Reg. at 63,277. In the final rule, EPA evaluated adding a fabric filter in combination with the beyond-the-floor technologies it discussed in its proposed rule, and again attributed reductions solely to mercury. 76 Fed. Reg. at 15,393–94. Although EPA did not explain in the final rule why it did not consider the cost in terms of pounds removed of other pollutants, its failure to do so was not arbitrary and capricious, particularly given that Congress gave EPA broad discretion in considering whether to go beyond-the-floor. *See* 42 U.S.C. § 7429(a)(2).

Finally, Sierra Club argues that EPA violated § 129 because it did not consider "methods and technologies for removal or destruction of pollutants before . . . combustion" as required by § 129(a)(3). As evidence that pre-combustion methods can significantly reduce emission levels, Sierra Club again cites Palo Alto's comments in which the city described its source control program. This program involved "assist[ing] in authoring California legislation that eliminated mercury in thermometers, certain switches, and novelty items"; "requir[ing] amalgam separators at dental facilities"; and operating "an ongoing drop-off program for all types of mercury-containing equipment." Joint Appendix 628–29 (Palo Alto Comments).

EPA responds that § 129 "does not authorize EPA to regulate the sources of sewage sludge under the [Clean Air Act], and no commenter cited any authority to the contrary," which was the same position it explained to commenters. EPA Br. at 73; *see* Joint Appendix 1011. Because § 129(a)(3) is ambiguous as to the extent of pre-combustion emission reduction methods EPA should consider, and because Palo

Alto's program goes far beyond the scope of activities that occur at publicly-owned treatment works and their sewage sludge incinerators, we uphold EPA's decision not to consider source control in its beyond-the-floor analysis as a reasonable interpretation of § 129.

2. Deciding not to set beyond-the-floor standards for new multiple hearth incinerators

EPA asserts that Sierra Club has waived the issue of beyond-the-floor standards for new multiple hearth incinerators by failing to comment on this issue. We agree. The Clean Air Act's judicial review provision limits judicial review to objections "raised with reasonable specificity during the period for public comment." 42 U.S.C. § 7607(d)(7)(B). If it was "impracticable to raise such objection within such time" and the "objection is of central relevance to the outcome of the rule," an objecting party may petition for reconsideration and we may review a denial of that petition. 42 U.S.C. § 7607(d)(7)(B). If a petitioner has not satisfied 42 U.S.C. § 7607(d)(7)(B)'s exhaustion requirements in raising its objections before EPA, we do not have jurisdiction to hear that objection on a petition for review. *Portland Cement Ass'n v. EPA*, 665 F.3d 177, 185 (D.C. Cir. 2011).

In promulgating the sewage sludge incinerator rule, EPA explained in the proposed rulemaking that while it was proposing that all new incinerator MACT floors be based on data from the best-performing fluidized bed incinerator, it was "aware that owners and operators with modified [multiple hearth] units may have concerns regarding meeting the new source limits." 75 Fed. Reg. at 63,272. In light of that, EPA "request[ed] comment on th[e] proposed approach," even providing a proposal of potential MACT floor emission limits

"[t]o assist commenters with their evaluation of the proposal." *Id.*

EPA's request for comment and proposed new multiple hearth incinerator MACT floors put Sierra Club on notice that EPA was seriously considering deviating from its proposed new incinerator MACT floors for new multiple hearth incinerators. Although the potential MACT standards for new multiple hearth incinerators were more stringent than the MACT standards EPA ultimately adopted, Sierra Club had EPA's MACT floor dataset, which included raw data from emissions test and a list of the control devices used by the units EPA considered the best performing. *Compare* 75 Fed. Reg. at 63,272 (tabulating proposed new multiple hearth incinerator MACT standards), *with* 76 Fed. Reg. at 15,388–89 (tabulating final new multiple hearth incinerator MACT standards); *see* Joint Appendix 607 (Sierra Club comments citing EPA's MACT floor analysis and commenting on EPA's dataset).

While it is true that "we do not require telepathy," and are reluctant to require advocates for affected groups to anticipate every contingency lest we encourage strategic vagueness by agencies, we nevertheless "require some degree of foresight on the part of commenters." *Portland Cement Ass'n*, 665 F.3d at 186. Because Sierra Club was on notice that EPA was considering setting new multiple hearth incinerator MACT floors and because it had access to the dataset EPA would use in setting new multiple hearth incinerator floors, we conclude that it was practicable for Sierra Club to comment on beyond-the-floor standards for new multiple hearth incinerator MACT floors. Accordingly, we will not consider Sierra Club's argument regarding new multiple hearth incinerator beyond-the-floor standards. *See* 42 U.S.C. § 7607(d)(7)(B).

E. SUBCATEGORIZING SEWAGE SLUDGE INCINERATORS

NACWA challenges EPA's decision to create only two subcategories for sewage sludge incinerators. In its rulemaking, EPA proposed subcategorizing sewage sludge incinerators into multiple hearth and fluidized bed incinerators, and proposed no other categories or subdivisions. *See* 75 Fed. Reg. at 63,268. EPA invited comment on whether other combustor designs were used at sewage sludge incinerators, requesting emissions information from stack tests conducted on those designs. *Id.*

Commenters responded and requested that EPA further subcategorize "based on size of the [sewage sludge incinerator], type of sewage sludge incinerated, limited use units, and distance over which the [incinerator] would need to transport its sludge for disposal." 76 Fed. Reg. at 15,384. But EPA adopted only the two subcategories it proposed, explaining that it did "not have data to support distinguishing units based on class, type, or size," and that "[w]ithout such information," it did "not have a basis for concluding that these types of units should be based in a different subcategory." *Id.*

NACWA challenges EPA's decision not to subcategorize further, asserting that it had identified "back-up and emergency" sewage sludge incinerators, and other unique categories, that would have a difficult time meeting the sewage sludge incinerator rule's testing obligations. As its legal basis, NACWA asserts that EPA failed to respond adequately to its substantive comment, as required under 42 U.S.C. § 7607(d)(6)(B), and that EPA's claim that it did not have data is arbitrary because commenters had submitted information about these special-use sewage sludge incinerators.

We agree with EPA that its decision to create subcategories only for multiple hearth and fluidized bed incinerators was not arbitrary or capricious. We have held that EPA has authority to subcategorize within Congressionally mandated categories under § 129(a)(2). *See Northeast Maryland Waste Disposal Authority*, 358 F.3d at 946–47. We have also held that EPA's subcategorization authority under § 112 involves an expert determination, placing a heavy burden on a challenger to overcome deference to EPA's "articulated rational connection between the facts found and the choice made." *NRDC v. EPA*, 489 F.3d 1364, 1375 (D.C. Cir. 2007).

EPA's decision here appears well within its expert determination. Perhaps recognizing the deference we owe EPA in its decision to subcategorize, NACWA does not challenge EPA's authority to do so, but instead asserts procedural challenges. We do not find these challenges meritorious. EPA rationally stated its policy to require emission information from stack tests on the combustion designs that commenters wanted EPA to accommodate into a separate subcategory. Although NACWA identified different classes of incinerators and discussed differences in sewage sludge variability that it felt justified further subcategorization, it does not cite any emissions information from stack tests it submitted for the special-circumstance sewage sludge incinerators for which it desired subcategorization. EPA "was not obligated under its policy" to create new subcategories or to offer a further response on NACWA's request for further subcategorization, and we will uphold its decision not to create additional subcategories beyond the multiple hearth and fluidized bed incinerators. *See Edison Electric Institute*, 2 F.3d at 449.

F. MONITORING

Section 129(c) requires incinerator operators "to monitor emissions from the unit at the point at which such emissions are emitted into the ambient air . . . and at such other points as necessary to protect public health and the environment," and "to monitor such other parameters relating to the operation of the unit and its pollution control technology" as EPA deems appropriate. In the final rule, EPA required all new and existing sewage sludge incinerators to "demonstrate initial and annual compliance with the emission limits using EPA-approved emission test methods." 76 Fed. Reg. at 15,377. EPA gave existing incinerators the option of continuous emissions monitoring in lieu of initial and annual tests, and required continuous parameter monitoring. *Id.* For new incinerators, EPA made continuous emissions monitoring mandatory for carbon monoxide, and optional for other pollutants in lieu of initial and annual emissions testing, and required continuous parameter monitoring. *Id.*

Sierra Club argues that EPA violates the statute by only requiring parameter monitoring and not mandating continuous emissions monitoring for all pollutants on all incinerators. EPA responds that Congress gave it the discretion to require parameter monitoring as appropriate, and that its combination of initial and annual emissions testing combined with parameter monitoring serves to meet § 129's monitoring requirement. We agree with EPA that § 129(c)(1) does not require continuous emissions monitoring and that its monitoring requirements in the sewage sludge incinerator rule satisfy § 129's statutory requirement.

Under 42 U.S.C. § 7661c, EPA "may by rule prescribe procedures and methods for determining compliance and for monitoring and analysis of pollutants regulated under this

Act, but continuous emissions monitoring need not be required if alternative methods are available that provide sufficiently reliable and timely information for determining compliance." 42 U.S.C. § 7661c(b). Although this section appears to clarify the Clean Air Act's mandate that EPA's permit programs include monitoring and reporting requirements, it is evidence supporting EPA's interpretation of § 129's monitoring requirement as requiring assurance of compliance with emission standards, but not continuous emissions monitoring. Sierra Club provides no legal authority to the contrary. Determining whether specified testing and monitoring requirements assure compliance with EPA's emission standards "requires a high level of technical expertise," and because Sierra Club has not given us any reason to doubt that EPA's requirements will effectively assure compliance, "we must defer to the informed discretion" of EPA. *National Lime*, 233 F.3d at 635 (quoting *Marsh v. Oregon Natural Resources Council*, 490 U.S. 360, 377 (1989)).

III. MAXWEST'S INTERVENTION

MaxWest Environmental Systems, the developer of a "proprietary biosolids management process that converts biosolids into syngas," used in units MaxWest terms as "gasifiers," challenges EPA's treatment (or lack thereof) of gasifiers in the final rule. *See* Intervenor MaxWest Br. at 1–2, 9–21. EPA asserts several grounds why we need not reach MaxWest's arguments, including that MaxWest lacks standing and that the issues it raises are outside the scope of those raised by the petitioners.

"[B]ecause Article III standing is a prerequisite to a federal court's exercise of jurisdiction," we "cannot proceed at all in any cause" unless we first determine that a party

seeking to be heard has satisfied the three-part test of *Lujan*. *Sinochem International Co. v. Malay International Shipping Corp.*, 549 U.S. 422, 430 (2007); *New England Power Generators Ass'n v. FERC*, 707 F.3d 364, 368 (D.C. Cir. 2013). But while we cannot assume hypothetical jurisdiction to decide the merits of a case, we have leeway "to choose among threshold grounds for denying audience to a case on the merits" because "jurisdiction is vital only if the court proposes to issue a judgment on the merits." *Sinochem*, 549 U.S. at 431 (internal alteration omitted) (quoting *Intec USA, L.L.C. v. Engle*, 467 F.3d 1038, 1041 (7th Cir. 2006)). Thus, we need not resolve MaxWest's standing to intervene if we can dispose of its intervention on another threshold ground that does not require us to reach the merits of MaxWest's arguments. *See id.* (explaining that a federal court need not determine whether it has jurisdiction when deciding, for example, not to exercise supplemental jurisdiction over state law claims on discretionary grounds or to abstain under *Younger v. Harris*).

The alternative threshold ground for rejecting MaxWest's intervention is that MaxWest's issues are outside the scope of those raised by NACWA. None of the six petitioners' briefs filed in this case mention MaxWest's gasification process. When we allowed MaxWest to intervene out of time, we warned it that "an intervening party may join issue only on a matter that has been brought before the court by another party." *NACWA v. EPA*, No. 11-1131, Doc. 1344244 at 2 (D.C. Cir. filed Nov. 28, 2011) (citing *Beethoven.com LLC v. Librarian of Congress*, 394 F.3d 939, 946 (D.C. Cir. 2005)). MaxWest has not heeded our warning. Its bare assertion that it modeled its statement of issues after NACWA's does not change the fact that its substantive arguments are unrelated to the issues raised by NACWA and Sierra Club. *See* MaxWest

Reply Br. at 8–10. Therefore, we will not consider MaxWest's arguments.

IV. CONCLUSION

For the foregoing reasons, we remand to EPA portions of its rule for further explanation without vacating the current MACT standards. Specifically, we direct EPA to clarify why its Clean Water Act Part 503 regulations control for other non-technology factors. We also direct EPA to clarify issues related to its upper prediction limit and variability analysis. In particular, EPA should explain why the upper prediction limit represents the "average emissions limitation achieved by the best performing 12 percent of" incinerators; why the upper prediction limit reasonably estimates the worst foreseeable operating conditions; and why the upper prediction limit can account for more than intra-unit variability, as EPA claimed it could on petition for review. Finally, we direct EPA to elaborate on how it can use a statistical method to determine whether a limited dataset is representative of incinerators for which it has no data, and to explain why it chose the variables it did for that statistical analysis.[5]

In all other respects, we uphold EPA's rule against the petitioners' challenges. Because the issues MaxWest raised in its intervenor brief are outside the scope raised by the petitioners, we do not consider its arguments.

So ordered.

---

[5] We do not, of course, mean to suggest that EPA is bound to reach the same conclusion upon reexamination of the record for purposes of explanation. Should EPA find itself unable to support its conclusions, it is, of course, free to reach different ones.