

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued December 3, 2014

Decided July 21, 2015

No. 12-1459

NATIONAL ASSOCIATION FOR SURFACE FINISHING,
PETITIONER

v.

ENVIRONMENTAL PROTECTION AGENCY AND GINA
McCARTHY,
RESPONDENTS

CALIFORNIA COMMUNITIES AGAINST TOXICS, ET AL.,
INTERVENORS

Consolidated with 12-1460, 13-1147

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

Jerry Stouck argued the cause for petitioner National Association for Surface Finishing. With him on the briefs was *Christopher L. Bell*. *Joel F. Visser* and *Roger R. Martella Jr.* entered appearances.

Emma C. Cheuse argued the cause for petitioners Clean Air Council et al. With her on the briefs was *James S. Pew*. *Khushi K. Desai* entered an appearance.

Jonathan A. Wiener, Deputy Attorney General, Office of the Attorney General for the State of California, argued the cause for *amici curiae* California Air Resources Board, et al. With him on the brief were *Kamala D. Harris*, Attorney General, *Robert W. Byrne*, Senior Assistant Attorney General, *Gavin G. McCabe*, Supervising Deputy Attorney General, *Ross H. Hirsch*, Deputy Attorney General, *Eric T. Schneidermann*, Attorney General, Office of the Attorney General for the State of New York, *Michael J. Myers*, Assistant Attorney General, *Kurt R. Wiese*, and *Barbara B. Baird*.

William L. Wehrum, *Elizabeth L. Horner*, *Leslie A. Hulse*, and *Quentin Riegel* were on the brief for *amicus curiae* Chromium RTR Coalition in support of petitioner National Association for Surface Finishing.

John T. Suttles, *Myra D. Blake*, and *Patrice L. Simms* were on the brief for American Lung Association, et al. as *amici curiae* in support of environmental petitioners.

Scott L. Nelson and *Allison M. Zieve* were on the brief for *amicus curiae* United States Representative Henry A. Waxman in support of environmental petitioners.

T. Monique Peoples, Attorney, U.S. Department of Justice, argued the cause for respondents. With her on the brief were *Sam Hirsch*, Acting Assistant Attorney General, *Stephanie J. Talbert*, Attorney, and *Jan M. Tierney*, Attorney, U.S. Environmental Protection Agency.

Robert G. Dreher and *Jon M. Lipshultz*, Attorneys, U.S. Department of Justice, entered appearances.

Jerry Stouck and Christopher L. Bell were on the brief for intervenor-respondent National Association of Surface Finishing.

Emma C. Cheuse and James S. Pew were on the brief for environmental respondents-intervenors Clean Air Act Council, et al.

Before: GRIFFITH and PILLARD, *Circuit Judges*, and WILLIAMS, *Senior Circuit Judge*.

Opinion for the Court filed by *Circuit Judge PILLARD*.

PILLARD, *Circuit Judge*: In this case we consider a pair of challenges to a 2012 regulation promulgated by the U.S. Environmental Protection Agency (EPA), revising Clean Air Act standards for emissions of hexavalent chromium. Hexavalent chromium is a carcinogenic compound emitted into the air during various chrome-finishing processes at more than a thousand facilities across the country. The facilities regulated under the challenged rule provide final, shiny, corrosion-resistant coatings on the surfaces of products ranging from plumbing fixtures to airplane wings. The various finishing processes used at those facilities all have the unfortunate side effect of generating misty chromium emissions that, if not properly controlled, can cause cancer. Facilities limit those emissions through the use of devices that capture emissions from the finishing tanks, or with fume suppressants that inhibit chromium droplets from bursting from the tank surface into the air in the first place. The new rule imposes more stringent emissions limitations than its predecessor and mandates the phase-out of a category of fume suppressants containing the toxic compound perfluorooctyl sulfonate (PFOS).

Various environmental organizations and an industry association have filed petitions challenging EPA's revised rule. The environmental petitioners—the Clean Air Council, California Communities Against Toxics, and the Sierra Club—argue that the rule is too lax because EPA ignored relevant information and impermissibly considered costs in calculating revised emissions standards. The industry petitioner—the National Association for Surface Finishing (the Association)—argues that the rule is too stringent. The Association contends that EPA failed to make a determination of developments in practices, processes, or control technologies that the Association claims is a statutorily required precondition to rule revision, that the agency lacked adequate support in the record for phasing out the PFOS-based fume suppressants, and that EPA unreasonably assessed public health risk. The environmental petitioners and the Association intervened in each other's cases, and we consolidated the cases for review. We deny the petitions.

I.

Section 112 of the Clean Air Act requires EPA to promulgate, and periodically revise as appropriate, national emissions standards for hazardous air pollutants. See 42 U.S.C. § 7412(d). When Congress enacted that emissions standards program in 1970, it directed EPA to identify and regulate hazardous air pollutants. Dissatisfied with EPA's progress in identifying hazardous air pollutants, Congress amended the Act in 1990 to name nearly 200 such pollutants, including chromium compounds, and charged EPA with identifying sources of those pollutants and setting emissions standards for them. See 42 U.S.C. § 7412(b)(1), (c), (d); see also, e.g., *Mexichem Specialty Resins, Inc. v. EPA*, 787 F.3d 544, 549-50 (D.C. Cir. 2015); *Natural Res. Def. Council v. EPA* (“NRDC”), 529 F.3d 1077, 1079 (D.C. Cir. 2008). EPA

undertakes two basic regulatory tasks under section 112 that are relevant to this case: initial promulgation, followed by periodic review and potential revision, of emissions standards.

EPA promulgates an emissions standard for a given pollutant by first determining the average emissions already achieved by the top tier of least polluting emitters, then considering whether a more demanding standard might be practicable and cost effective, and, if so, setting a standard that pushes beyond current practice. For starters, the agency identifies the 12% of facilities that emit the pollutant at the lowest levels, and then calculates the average level of emissions achieved by those facilities. 42 U.S.C. § 7412(d)(3). That calculation is dubbed the “MACT floor” because it is based on “maximum achievable control technology,” and the standard EPA promulgates must not be less stringent than that performance “floor.” See *Mexichem*, 787 F.3d at 549-50 & n.2; *Nat’l Lime Ass’n v. EPA*, 233 F.3d 625, 629 (D.C. Cir. 2000). EPA then considers whether, taking into account costs, certain health and environmental effects, and energy requirements, a standard might be practicable that would go beyond the emissions reductions those existing facilities already achieve. See 42 U.S.C. § 7412(d)(2); *Nat’l Lime*, 233 F.3d at 629. If a more stringent standard is practicable in view of those factors, EPA promulgates a “beyond-the-floor” standard at that more stringent level; otherwise the agency sets the standard at the performance-based MACT floor. See *Mexichem*, 787 F.3d at 549-50.

EPA then periodically reviews and, if appropriate, revises the promulgated emissions standard, starting within eight years of the initial promulgation. That entails two distinct, parallel analyses: a recurring “technology review” under section 112(d)(6) and a one-time “risk review” under section

112(f)(2). In the technology review, EPA periodically assesses, no less often than every eight years, whether standards should be tightened in view of developments in technologies and practices since the standard's promulgation or last revision, and, in particular, the cost and feasibility of developments and corresponding emissions savings. See 42 U.S.C. § 7412(d)(6); *see also Ass'n of Battery Recyclers, Inc. v. EPA* ("ABR"), 716 F.3d 667, 673-74 (D.C. Cir. 2013).

Separately, in the one-time risk review, EPA addresses, within eight years of a standard's promulgation, lingering public health risk that the initial standard did not eliminate. See 42 U.S.C. § 7412(f)(2). To that end, EPA first considers whether the residual health risk is "acceptable," a threshold EPA generally interprets as carrying cancer incidence no greater than 100 in one million. 75 Fed. Reg. 65,068, 65,071-72 (Oct. 21, 2010); *see NRDC*, 529 F.3d at 1082. If the risk is not acceptable, EPA sets a more stringent standard regardless of cost to bring the risk down to an acceptable level. Even if a risk would be deemed acceptable because it is under that threshold, however, EPA considers whether a more stringent standard is "required in order to provide an ample margin of safety to public health." 42 U.S.C. § 7412(f)(2)(A). What determines whether a more stringent standard providing an ample margin of safety is statutorily required is the agency's consideration of health information as well as costs, economic impact, feasibility, and other relevant factors. *See id.*; *see also NRDC*, 529 F.3d at 1083; 75 Fed. Reg. at 65,072. If, taking those relevant considerations into account, further risk reductions are attainable beyond the "acceptable" threshold, they are required.

II.

Two decades ago, EPA promulgated standards restricting emissions of hexavalent chromium from the types of chromium electroplating and anodizing facilities regulated under the rule challenged in this case.¹ 60 Fed. Reg. 4,948 (Jan. 25, 1995). The agency has reviewed and revised those standards over the years. At issue here is the 2012 Final Rule that most recently updated them. *See* Final Rule, National Emissions Standards for Hazardous Air Pollutant Emissions: Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks; and Steel Pickling—HCl Process Facilities and Hydrochloric Acid Regeneration Plants, 77 Fed. Reg. 58,220 (Sept. 19, 2012).

The initial, 1995 rule set emissions limits and allowed facilities to demonstrate compliance with them either by directly measuring chromium emissions or by gauging the surface tension of the chemical baths in their finishing tanks. 60 Fed. Reg. at 4,953-54, 4,956, 4,959. The latter compliance option worked because of the “direct link between surface tension and emissions.” *Id.* at 4,959. As we explain below, surface tension describes how strongly a fluid sticks together where it meets the air. The surface tension of the chromium solution in which products are submerged during the finishing

¹ Electroplating facilities finish products by dipping them in a salty chemical solution containing chromium and passing an electrical current through the solution. That causes chromium particles to deposit onto the products’ submerged surfaces, forming a protective seal. Anodizing facilities use a distinct but similar process to create a protective oxidation film over products’ surfaces. The challenged rule also regulates steel pickling facilities, but those facilities were not part of the earlier rulemakings recounted herein and are not directly implicated by the challenges in this case.

process determines the force with which non-chromium gas bubbles generated in the process burst out of the solution in the finishing tanks. Reducing surface tension makes it easier for bubbles to pass through the solution into the air, which diminishes the force of bubble-bursting at the surface. That, in turn, reduces the amount of harmful chromium droplets that pop into the air and create misty toxic emissions. In a 2004 rulemaking, EPA reaffirmed and modified the option of compliance by controlling surface tension. 69 Fed. Reg. 42,885, 42,886-88 (July 19, 2004).²

Before issuing the Final Rule petitioners challenge, EPA published a 2010 notice of proposed rulemaking (Notice) and a 2012 supplemental notice of proposed rulemaking (Supplemental Notice). In the initial Notice, EPA proposed to determine that the data before the agency did not warrant tightening the existing emissions standards. 75 Fed. Reg. at 65,093-94. EPA nonetheless solicited additional data and comments. *Id.* at 65,125. Meanwhile, EPA proposed to phase out surfactant-based chemical fume suppressants containing the hazardous chemical PFOS. *Id.* at 65,094. Surfactants reduce the surface tension of solutions to which they are added. EPA concluded that less toxic, non-PFOS-based fume suppressants had proven effective at controlling surface tensions, even though they were not yet used extensively in the industry. The agency saw no reason why non-PFOS-based suppressants could not cost-effectively replace their toxic PFOS-containing counterparts, so the agency solicited input on its proposal to prohibit PFOS. *Id.*

² EPA did not timely conduct the full technology and risk reviews required by the statute, *see* 69 Fed. Reg. at 42,888-89—a timing failure not at issue in this case.

Nearly a year and a half later, after having received more accurate and comprehensive data in response to the Notice, EPA in the Supplemental Notice proposed to reverse its prior tentative determinations that more stringent emissions standards were unnecessary. 77 Fed. Reg. 6,628 (Feb. 8, 2012). EPA suggested that revised standards were warranted based on both its technology review and its risk review. *Id.* at 6,631-52. In its technology review, EPA noted its additional analyses based on new data and explained its proposed selection of feasible, cost-effective options to further limit emissions. *Id.* at 6,632, 6,638-45. EPA solicited information regarding whether the surface tension limits proposed in the Supplemental Notice were achievable using non-PFOS-based suppressants. *Id.* at 6,645. In its risk review, EPA proposed to conclude that cancer risk was well below the “acceptable” 100-in-one-million level, and that the same standards the agency was proposing as a result of the technology review would likewise provide the requisite “ample margin of safety” for purposes of its risk review. *Id.* at 6,648-49.

EPA issued the Final Rule in September 2012, adopting the emissions standards proposed in the Supplemental Notice. 77 Fed. Reg. at 58,225. EPA explained that additional information submitted during the interim period and additional analyses the agency had performed bolstered the determinations proposed in the Supplemental Notice. *Id.* at 58,225-26. EPA also finalized the phase-out of PFOS-based fume suppressants, emphasizing data the agency collected from Minnesota facilities that had been controlling surface tensions effectively using non-PFOS-based suppressants. *Id.* at 58,230, 58,236-37.

III.

This court applies the familiar, deferential standard announced in *Chevron, U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, to sustain any reasonable agency interpretation of ambiguity in the Clean Air Act. 467 U.S. 837, 842-44 (1984). We reverse EPA's determinations under the Act when they are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 42 U.S.C. § 7607(d)(9)(A). Under arbitrary-and-capricious review, EPA's determinations are "presumptively valid provided [they] meet[] a minimum rationality standard." *Natural Res. Def. Council, Inc. v. EPA*, 194 F.3d 130, 136 (D.C. Cir. 1999). We uphold EPA's determinations so long as "EPA acted within its delegated statutory authority, considered all of the relevant factors, and demonstrated a reasonable connection between the facts on the record and its decision." *Ethyl Corp. v. EPA*, 51 F.3d 1053, 1064 (D.C. Cir. 1995). We afford special deference "where the agency's decision rests on an evaluation of complex scientific data within the agency's technical expertise." *Troy Corp. v. Browner*, 120 F.3d 277, 283 (D.C. Cir. 1997).

The environmental petitioners challenge the Final Rule as too lax on the grounds that EPA unreasonably (1) declined to recalculate a technology-based emissions stringency floor that is independent of cost considerations, and (2) ignored emissions data from California in calculating revised standards. The Association challenges the rules as unauthorized and overly stringent on the grounds that EPA (1) did not adequately tie its revision of standards to technological "developments" that had occurred since the initial standard-promulgation, (2) concluded without sufficient evidentiary support that non-PFOS-based fume suppressants are capable of achieving the rule's emissions

limits, and (3) in its risk review, unreasonably failed to determine whether existing emissions limits provided the requisite margin of safety, deviated from the agency's prior determination that the requisite margin of safety had been attained, and relied on inaccurate data.

A.

The environmental petitioners contend that EPA was required to calculate a new MACT floor when it revised emissions standards pursuant to its technology review under section 112(d)(6). Subparagraph (d)(6) requires EPA, no less often than every eight years, to "review, and revise as necessary (taking into account developments in practices, processes, and control technologies) emission standards promulgated under" that section. 42 U.S.C. § 7412(d)(6). The environmental petitioners assert that EPA's revision of standards in its technology review must be treated as a "promulgation" of an emissions standard, such that it triggers the Clean Air Act's requirement that any promulgation must begin with EPA setting a MACT floor. They argue, in effect, that EPA must calculate a new MACT floor whenever the agency revises an existing emissions standard based on its periodic technology review under section 112(d)(6). A new MACT floor, if EPA set one, would be based purely on the achievements of the best-performing facilities in the industry after initial emissions standards had been operative for several years, and thus presumably would be more stringent than the existing MACT floor, and likely also more stringent than technology or risk-based revisions that take costs and other potentially constraining factors into account.

EPA itself has not so read the statute, and our precedent binds us to reject the environmental petitioners' argument that it must so read it.³ We initially confronted a version of this question in *NRDC*, a case in which EPA had conducted a technology review but determined that revision was not warranted. 529 F.3d at 1080. The parties in *NRDC* briefed the argument the environmental petitioners press here. We concluded that the agency was not required to recalculate the MACT floor at the outset of its technology review, at least where EPA had decided not to revise emissions standards as a result of that review. *Id.* at 1084.

We had occasion to address the issue more squarely in *ABR*, a case in which EPA had not only reviewed, but also revised, standards after a technology review. 716 F.3d at 670. The court in *ABR* was not persuaded by petitioners' contention—pressed again by the environmental petitioners here—that our decision in *NRDC* was inapposite on the ground that it dealt with an EPA review that yielded no revision of any standard. *ABR* emphasized that *NRDC* rested “on two independent conclusions,” and that in such a case, “the ruling on neither is obiter [dictum], but each is the judgment of the court, and of equal validity with the other.” *Id.* at 673 (internal quotation marks omitted). We held in *ABR* that the petitioners' argument that the agency must recalculate the MACT floor, “although far better developed

³ Neither this case nor any of our precedents addresses the distinct question whether, had EPA itself adopted the environmental petitioners' reading, its interpretation would be valid under *Chevron*.

than the identical claim in [NRDC], [was] barred by that decision.” *Id.*⁴

The environmental petitioners incorrectly suggest that our decisions on this point in *ABR* and *NRDC* were abrogated by our later decision in *White Stallion Energy Ctr., LLC v. EPA*, 748 F.3d 1222 (D.C. Cir. 2014), which the Supreme Court recently partially reversed in *Michigan v. EPA*, No. 14-46, 2015 WL 2473453, 576 U.S. __ (June 29, 2015).⁵ In

⁴ The environmental petitioners argue that this court “has never addressed or decided the statutory issue presented here: that revised standards promulgated following a § 112(d)(6) review are ‘emissions standards promulgated under this subsection’ and, therefore, subject to the stringency requirements in § 112(d)(2) and (d)(3).” *Envtl. Pet. Br.* 35. As they see it, *NRDC* addressed a different question, and *ABR* then erroneously treated the scant reasoning in *NRDC* as binding. *See id.* at 32-37. “Because *ABR* is directly at odds with clear statutory text that neither *ABR* nor *NRDC* addresses,” they request *en banc* action via an *Irons* footnote. *Id.* at 33, 37; *see Irons v. Diamond*, 670 F.2d 265, 267-68 & n.11 (D.C. Cir. 1981); Policy Statement on En Banc Endorsement of Panel Decisions (January 17, 1996). This is not, however, the kind of minor or marginal issue, nor one on which our precedents have been shown by intervening decisions to be clearly incorrect, such as might call for reversal in an *Irons* footnote.

⁵ The Supreme Court held in *Michigan* that EPA may not decline to consider cost as part of a required threshold inquiry under Clean Air Act section 112(n)(1)(A) into whether it is “appropriate and necessary” to regulate power plants. *Michigan, supra*, slip op. at 6-14; *see* 42 U.S.C. § 7412(n)(1)(A). The “unique” section 112(n)(1)(A) precondition to power-plant regulation that the Court reviewed in *Michigan* is “[q]uite apart from the hazardous-air-pollutants program” at issue here. *See Michigan, supra*, slip op. at 2. The “appropriate and necessary” provision that the Court held EPA unlawfully interpreted does not apply to the program that

White Stallion, we addressed EPA's interpretation of Clean Air Act section 112(n)(1)(A), and its relationship to section 112(d). 748 F.3d at 1242-44. Section 112(n)(1)(A) provides for EPA regulation of fossil-fuel-fired power plants when "appropriate and necessary." 42 U.S.C. § 7412(n)(1)(A). We sustained as reasonable EPA's interpretation of "under this section," as used in that provision, to refer to the entirety of section 112, such that the regulation required whenever section 112(n)(1)(A)'s "appropriate and necessary" criteria are met must comport with the procedures of the rest of section 112, including those of section 112(d), addressing emissions standards generally. 748 F.3d at 1243-44; *see* 42 U.S.C. § 7412(d). The environmental petitioners assert that the relationship between section 112(n)(1)(A), with its "regulate" as "appropriate and necessary" trigger, and section 112, governing hazardous air pollution regulation generally (including the setting of MACT floors under section 112(d)(2)-(3)), is the same as the relationship between section 112(d)(6), with its "review, and revise as necessary" language, and section 112(d)(2)-(3). However, *White Stallion* did not tie section 112(n)(1)(A) to section 112(d)(2)-(3) specifically, as the petitioners' analogy assumes. Nor did that decision address the distinction EPA makes here between initial promulgation under section 112(d)(2)-(3) and promulgation of revised standards as necessary under section 112(d)(6). We simply deferred to EPA's view that regulation triggered under section 112(n)(1)(A) must follow the procedures of section 112(d).

regulates hexavalent chromium emissions from chrome-plating facilities.

B.

The environmental petitioners also contend that EPA unreasonably disregarded, in both its technology and risk reviews, the emissions reductions and technological advancements achieved in California, where that state's more stringent emissions standards require facilities to employ more ambitious controls.

EPA took account of the California emissions data. In its technology and risk reviews, EPA estimates actual nationwide emissions and costs by extrapolating data collected from a sample of facilities across the country in order to establish baselines against which the agency can assess emissions decreases, health risk, and cost effectiveness associated with different practices, technologies, and emissions limitations. *See, e.g.*, 77 Fed. Reg. at 6,631-34. EPA did not ignore California's emissions data; it omitted it only from the dataset from which the agency extrapolated other states' emissions. *Id.* at 6,633-34. That was prudent as a matter of statistical accuracy because "California plants are not representative of emissions for non-California plants." *Id.* at 6,634; *see also* J.A. 531 (same in response to comments). EPA used California data, meanwhile, to estimate emissions for other plants in that state. 77 Fed. Reg. at 6,634. The agency thus "did not exclude the California [emissions] data from the overall analysis," but rather "treated the data from plants in California differently" so as to achieve a statistically accurate portrait of nationwide emissions. *Id.* EPA's approach was reasonable because extrapolating California's nationally unrepresentative data to the rest of the country would have distorted the emissions figures that EPA uses in its cost-effectiveness and risk analyses, whereas reliance on that data for California-specific estimates had no such distorting effect.

EPA also did not ignore California's technological advances in assessing the cost effectiveness of applying nationally the standards in effect in California. The agency acknowledged that California emissions standards require controls that are more stringent than those required elsewhere, and that they had been feasibly implemented in California. The agency weighed the costs and benefits of requiring those controls nationally, and concluded that the relatively minimal reductions in emissions and risk that could be expected from extending California-like controls across the country would not warrant the associated expense. EPA "considered the option of requiring controls similar to standards adopted in California, which would essentially require facilities to install high efficiency particulate air (HEPA) filters," but found that "overall costs for that option were significantly higher than . . . other options" EPA had examined, "and would have resulted in much greater economic impacts to small businesses." 77 Fed. Reg. at 58,227.

The agency further explained that "requirements similar to the California standards" were "not appropriate . . . to provide an ample margin of safety to protect public health" in light of "the high overall costs and economic impacts." *Id.* Responding to a comment that EPA had "failed to provide any explanation for not considering the California reductions," the agency explained that it had "evaluated . . . the controls used to comply with the standards in California" and concluded "that requiring these controls throughout the industry was not appropriate under either section 112(d)(6) [technology review] or section 112(f)(2) [risk review]." *Id.* at 58,231-32; *see also* 75 Fed. Reg. at 65,092-94 (assessing risk level and cost associated with HEPA filters). The environmental petitioners suggest that EPA should have performed additional analyses beyond that related to HEPA filters but, as the agency reasonably explained, EPA lacked

the necessary information to do so: EPA was not provided with, and was otherwise unaware of, the detailed explanations of the assumptions and methodology behind California cost analyses that the agency would have needed to parse California's data and accurately assess its applicability to the national regulatory context. *See, e.g.*, J.A. 543.

EPA took into account the statutorily required considerations of, *inter alia*, cost, emissions reductions, and health risk. The agency then provided a transparent, reasoned explanation of its decisions, considering all relevant information in the record. The statute does not mandate a particular method of cost-benefit analysis. Therefore, we defer to EPA's methodology as well as its ultimate balancing decisions. *See Husqvarna AB v. EPA*, 254 F.3d 195, 200 (D.C. Cir. 2001); *cf. Brown v. United States*, 327 F.3d 1198, 1205-06 (D.C. Cir. 2003) (deferring to an agency's reasoned methodology even under the less deferential *Skidmore* standard of review).⁶

C.

The Association, in the first of its three challenges, asserts that EPA unreasonably determined in its technology review that "developments" had occurred after the original rulemaking that required revision of the existing emissions standards. The statute calls on EPA to revise promulgated standards "as necessary (taking into account developments in

⁶ The environmental petitioners' related challenges to EPA's treatment of the California data—that the agency's disregard of that data derogated from its duty to consider all significant aspects of the statutory problem, and contravened the purpose of the Clean Air Act—also fail because they rest on the same false premise, addressed above, that EPA unreasonably disregarded the data.

practices, processes, and control technologies).” 42 U.S.C. § 7412(d)(6). EPA and the Association agree that the agency could not revise standards in its technology review unless such pertinent “developments” occurred after the 1995 rule. The Association argues, however, that EPA failed to identify the requisite “developments” and failed to specify how its revised standards were tied to them. The Association also suggests EPA was arbitrary and capricious in changing course: in 2010 its proposed determination was that “developments” did not warrant revision, but in 2012 EPA concluded that revision was warranted after all. The Association further argues that EPA’s statistical analysis of emissions data was unreasonably flawed.

EPA permissibly identified and took into account cognizable developments in practices, processes and control technologies. The agency interprets “developments” to encompass not only wholly new methods, but also technological “improvements . . . that could result in significant additional emission reduction.” 75 Fed. Reg. at 65,083. “Developments” thus include “improvements in efficiency, reduced costs or other changes that indicate that a previously considered option for reducing emissions may now be cost effective or technologically feasible.” 77 Fed. Reg. at 58,231.

The Association does not directly challenge those interpretations, but maintains that EPA failed to identify what specific “developments,” including technological “improvements,” occurred in this case that warranted revision. EPA identified several technologies, such as emissions elimination devices, HEPA filters, enclosing tank hoods, and fume suppressants. 77 Fed. Reg. at 6,632 (2012 Supplemental Notice referencing developments identified in 2010 Notice); 75 Fed. Reg. at 65,083, 65,093-94 (Notice

identifying the aforementioned developments); J.A. 152-54 (2010 technology review memorandum discussing the same). EPA further explained that, although the technologies were not brand new, improvements in the performance of some of them had resulted in emissions reductions. J.A. 516 (2012 response to comments); *see also* 77 Fed. Reg. at 6,631-32 (acknowledging data showing improved facility performance).

It suffices for EPA to assess and discuss the collective impact of the developments it has identified, and to revise standards appropriately in light thereof. Section 112(d)(6) simply requires that EPA “take[] into account developments in practices, processes, and control technologies” when considering whether to revise standards. The agency explained that it had examined what emissions levels could be achieved using various add-on control devices and fume suppressants, including developments the agency had previously identified. *See, e.g.*, 77 Fed. Reg. at 6,632. EPA went on to provide details regarding the costs and emissions reductions identified, and evaluated in the course of arriving at its conclusion that specified, best-available control technologies could cost-effectively meet more stringent emissions standards. *See, e.g., id.* at 6,640. The statute does not require EPA to identify a nexus between each distinct development and the revised standards. EPA’s decision-making was sufficiently clear and rational. *See Int’l Fabricare Inst. v. EPA*, 972 F.2d 384, 389 (D.C. Cir. 1992).

Moreover, the shift in EPA’s position from 2010 to 2012 was reasonable because the agency received intervening information relevant to its decision. *See, e.g., Sierra Club v. EPA*, 353 F.3d 976, 986-87 (D.C. Cir. 2004) (“[T]he adequacy of the underlying justification offered by the agency is the pertinent factor—not what the agency did on a different

record”). In 2010, EPA proposed to leave the existing emissions standards in place, not because no technological developments had occurred, but because the agency determined based on the data before it that requiring nationwide implementation of those technologies was not feasible, cost effective, and otherwise warranted. 75 Fed. Reg. at 65,093-95. EPA’s Notices solicited comments, however, and EPA contacted pollution control authorities to gain fuller, more accurate data. New data showed that facilities were performing better with respect to emissions than previously thought. 77 Fed. Reg. at 58,225-26, 58,231; 77 Fed. Reg. at 6,631-32. Reductions in emissions are, of course, relevant to the cost effectiveness of emissions-control technologies in controlling emissions. *See, e.g.*, J.A. 483-89 (2012 memorandum). The agency thus concluded, based on the improved data, that more stringent technology-based standards were cost effective and otherwise appropriate. *See* 77 Fed. Reg. at 58,225-26; 77 Fed. Reg. at 6,632-33, 6,638-45. EPA’s change in position therefore was not arbitrary and capricious.

Finally, the dataset EPA used to estimate facilities’ compliance rates—a component of the agency’s technology review—was not impermissibly small or inaccurate. The Association charges that EPA’s analysis was not designed to provide an accurate cross-section of the industry. It asserts that EPA did not sample facilities “on any statistical or representative basis,” and faults the agency for not requesting “all emissions data the states had in their files.” Ass’n Br. 30. EPA responds that it relied on data from a statistically significant number of facilities and a range that reflected “current, available information from facilities across all major regions of the country.” EPA Br. 50. Reacting to concerns raised after the 2010 Notice that the agency’s dataset was too small and unrepresentative, EPA sought detailed information

about emissions associated with various facility types. 77 Fed. Reg. at 6,631. EPA explained that emissions data available for collection is limited because many smaller facilities are not required to submit annual emissions inventories—an informational dearth in light of which EPA gathered what it concluded was the “best information available to the Agency” and “minimized the [statistical] uncertainties to the extent feasible.” J.A. 535-36. In the face of those challenges, the agency obtained information from 24 state and local agencies, as well as some information from the Association itself, to achieve a sample that included data from 301 operational plants. 77 Fed. Reg. at 6,631. EPA determined that conducting a more in-depth industry-wide survey, requiring more facilities to collect and submit additional data, would have been statistically unnecessary and would not have warranted the substantial burden on smaller facilities. J.A. 537.

Tellingly, the Association does not identify any specific, superior statistical threshold of data-gathering comprehensiveness that, in its view, would have been reasonable. Rather, acknowledging that a limited amount of emissions data is available to EPA, the Association simply criticizes the agency for not obtaining and evaluating more data. But “[w]e generally defer to an agency’s decision to proceed on the basis of imperfect scientific information, rather than to invest the resources to conduct the perfect study.” *NRDC*, 529 F.3d at 1086 (quoting *Sierra Club v. EPA*, 167 F.3d 658, 662 (D.C. Cir. 1999)). We recognize that EPA conceivably “could have used better data in conducting its risk analysis,” but that “misstates [our] inquiry under the arbitrary and capricious standard,” which is “whether EPA has acted reasonably, not whether it has acted flawlessly.” *Id.* (emphasis omitted). We cannot say that the size and representativeness of the dataset EPA used to estimate

compliance rates was statistically unreasonable, nor can we characterize as arbitrary EPA's considered judgment that collecting additional data was unnecessary and not worth the cost, keeping in mind the "wide latitude" we afford the agency in its data-gathering decisions. *Id.* (quoting *Sierra Club*, 167 F.3d at 662); *see also White Stallion*, 748 F.3d at 1247-48 ("EPA's data-collection process was reasonable, even if it may not have resulted in a perfect dataset."), *rev'd in part on other grounds, Michigan, supra*. We are satisfied that EPA's data-gathering and analysis was adequate.

D.

The Association further argues that EPA's decision to phase out PFOS-based fume suppressants was arbitrary and capricious. As we explain below, fume suppressants reduce finishing baths' surface tension and, consequently, their chromium emissions. The Association's claim hinges on its contention that there is inadequate support in the record showing that non-PFOS-based substitutes can effectively achieve the emissions limits required by the Final Rule. The Association does not challenge the compliance option that facilities have enjoyed since the original 1995 rule to measure the surface tension of their finishing baths rather than the emissions therefrom. *See* 60 Fed. Reg. at 4,953-54, 4,956. Nor does it seriously question that the administrative record shows that non-PFOS-based suppressants are capable of meeting the Final Rule's surface tension limits. Rather, the Association contends that EPA failed empirically to support the conclusion that the same emissions control will result from equal surface tension reductions, whether those reductions are achieved with non-PFOS-based suppressants or PFOS-based suppressants. To that end, the Association points to what it perceives as an absence of reliable studies that

measure the emissions from baths whose surface tension is controlled by non-PFOS-based suppressants.

The Association's challenge fails to appreciate the finding, documented in the record, that the relationship between surface tension and emissions does not depend on the identity of the suppressant used to achieve that surface tension. Reducing a finishing bath's surface tension reduces emissions from that bath. Surface tension describes a liquid's cohesive strength where the liquid meets the air. The higher the surface tension, the more the liquid will bulge when its surface is pressured and the more resistant it will be to allowing bubbles to break through. *E.g.*, J.A. 349. That is significant in the context of surface finishing because the electrolysis-induced finishing process generates bubbles of gas within the finishing solution. When those bubbles fizz up through the chromium-solution bath and pop upon hitting the surface, the bursting action sends tiny droplets of the solution into the air as mist. J.A. 440. Adding a surfactant-based fume suppressant to the finishing solution reduces its surface tension, which allows gases generated within the bath to pass through the surface of the solution more easily. That results in less forceful bubble-popping at the surface, which in turn diminishes the amount of chromium mist emitted. *E.g.*, 77 Fed. Reg. at 58,236-37; J.A. 349, 440-43. Because the physical relationship between surface tension and emissions exists independent of the specific tension-controlling agent, it is sufficient for EPA to rely on the evidence in the record establishing the relationship between non-PFOS-based suppressants and surface tension; EPA need not identify studies directly confirming the relationship between the specific surface tension controlling agent and the emission reduction.

That physical relationship between surface tension and emissions level is the basis of EPA's long-standing rule allowing facilities to demonstrate compliance with emissions standards by measuring finishing baths' surface tension rather than directly measuring their emissions. It is the established "direct link between surface tension and emissions" that has supported EPA's acceptance of surface tension control as a proxy for emissions control. 60 Fed. Reg. at 4,959 (1995 rule).

The 1995 rulemaking in which EPA determined to rely on the relationship between surface tension and emissions never suggested that the type of fume suppressant used to control surface tension matters to emissions level. *See id.* ("Based on data collected by the EPA, the [emissions] performance of an electroplating bath controlled with a wetting agent-type [i.e. chemical surfactant] fume suppressant can be determined by the surface tension of the bath."); *see also* 58 Fed. Reg. 65,768, 65,795 (Dec. 16, 1993) (original proposed rule) ("[M]easurement of the surface tension of the bath . . . at least once every 4 hours during operation of the tank would be sufficient to ensure continuous compliance with the emission limit.").

EPA explicitly confirmed in the 2004 rulemaking that the tension/emissions relationship does not depend on suppressant type when it recognized that "[s]ources will be in compliance with the emission limits provided the surface tension is maintained at or below the proposed limits, regardless of the type of fume suppressant used"; the data before the agency did not "indicate that emission control levels are a function of the type of fume suppressant used in the tank solution." 69 Fed. Reg. at 42,888.

EPA reiterated in 2012 that “emissions are a function of the surface tension” and that lower surface tension results in lower emissions “regardless of the specific chemicals used.” J.A. 479 (EPA memorandum cited in Final Rule); *see also* 77 Fed. Reg. at 58,237 (“It is our understanding that this relationship between surface tension and chromium emissions is dependent primarily on the surface tension of the tank and not on the product used to reduce surface tension.”). It is the property of surface tension on the bath, not some other reaction unique to the particular surfactant employed, that affects the force with which bubbles in the chromium bath burst and send droplets into the air. *See, e.g.*, J.A. 349, 440-43.

Neither logic nor the record supports the Association’s conclusory suggestion that emissions will vary, given a constant surface tension, depending on whether PFOS- or non-PFOS-based fume suppressants are used to achieve that surface tension. The Association points out that EPA’s statements in earlier rulemakings were made in the context of considering only various PFOS-based suppressants. That ignores the fact that EPA restated in 2012, in a memorandum in which it was also considering the effectiveness of non-PFOS-based suppressants, that the suppressant’s chemical identity is irrelevant. *See* J.A. 479, 482. Moreover, the Association provides no explanation and points to no evidence supporting its suggestion that the principle EPA earlier recognized does not apply to non-PFOS-based suppressants. If EPA had established, in a rulemaking involving various kitchen stoves, that water boils when it reaches 212°F regardless of the type of stove used, and later took that boiling point as a given in a rulemaking involving campfires, we would not require EPA to document the same scientific phenomenon of water boiling at 212°F in the new, campfire context—at least not where a petitioner proffered

nothing suggesting why the heat-source difference might matter. The Association's bare assertion that EPA needed to provide fresh empirical support for the applicability of the tension/emissions relationship in the context of non-PFOS-based suppressants is insufficient to undermine the documentation already in the record. "Agencies do not need to conduct experiments in order to rely on the prediction that an unsupported stone will fall." *Assoc'd Gas Distribs. v. FERC*, 824 F.2d 981, 1008-09 (D.C. Cir. 1987); *cf. Chamber of Commerce of U.S. v. SEC*, 412 F.3d 133, 142 (D.C. Cir. 2005) ("[W]e are acutely aware that an agency need not—indeed cannot—base its every action upon empirical data . . .").

The studies in the administrative record are consistent with EPA's understanding that surface tension is a reliable proxy for emissions regardless of the fume suppressant employed. A 2011 study expressly contemplates the PFOS/non-PFOS dichotomy and treats that difference as immaterial to the tension-emissions relationship. *See* J.A. 439-49 (Neil Patton & Gene Barlowe, Atotech, *Non-PFOS, Permanent Mist Suppressants for Hard Chromium Plating, Decorative Chromium Plating and Chromic Etch Applications* (2011)). The study identifies "mist suppressants" as a general category of surfactants, noting they all "work by reducing the surface tension of the solution." J.A. 442; *see id.* (stating without reference to the surfactant's chemical composition that reducing surface tension lowers mist generation). The study then identifies several characteristics of effective suppressants—including the ability to control surface tension and emissions, as well as unrelated criteria such as effect on plating quality—without suggesting that ability to meet those criteria depends on PFOS composition. J.A. 444. The study explains that earlier generations of non-PFOS-based suppressants were disfavored

not because of non-correlation between surface tension and emissions, but rather because they were less stable and tended chemically to foment a scum that degraded plating quality. J.A. 445. The authors go on to recognize that newer non-PFOS-based suppressants for years have been performing “just as well” as PFOS-based suppressants. J.A. 444-47. Other studies in the record, which measured only emissions directly and did not document emissions’ relationship to surface tension, are consistent with that understanding.⁷

Therefore, it suffices for EPA to show that non-PFOS-based suppressants are as effective at controlling surface tension as PFOS-based suppressants (which the Association does not contend are incapable of achieving the Final Rule’s surface tension limits). We conclude that the data from Minnesota facilities emphasized in the Final Rule shows that effectiveness. *See* 77 Fed. Reg. at 58,236-37. The Minnesota data show that non-PFOS-based suppressants perform, in the facilities’ experience, “pretty similarly” and pose “no noticeable differences” in comparison to PFOS-based suppressants. J.A. 415-16; *see* J.A. 417-21 (raw data

⁷ A 2011 Danish study and a 2012 German study directly compared emissions from PFOS and non-PFOS tanks without clearly recording surface tensions. *See* J.A. 410-13, 423-25. EPA interprets those studies as showing that non-PFOS-based suppressants are comparably effective at reducing emissions. *See* 77 Fed. Reg. at 58,237; J.A. 507-512. The Association responds that the studies failed to demonstrate that non-PFOS-based suppressants can meet the Final Rule’s emissions limitations. We need not opine on that question because, as discussed above, the established relationship between surface tension and emissions means that it suffices for EPA to rely on data demonstrating that non-PFOS-based suppressants meet the Final Rule’s surface tension limits.

supporting those observations); J.A. 482 (additional data analysis). The Association does not meaningfully argue otherwise, conceding that the Minnesota data “indicate that non-PFOS fume suppressants might be used to meet the new surface tension standards.” Ass’n Br. 41.

E.

The Association argues that EPA’s risk review under section 112(f)(2) was unreasonable, for three reasons.⁸

First, the Association asserts that EPA failed to make a finding in the Final Rule that a revised standard was “required in order to provide an ample margin of safety to public health.” 42 U.S.C. § 7412(f)(2). However, EPA did not skip the step of determining in the Final Rule that revised standards were required to provide an ample margin of safety. The agency expressly stated that it was “promulgating standards under Section 112(f) to provide an ample margin of safety.” 77 Fed. Reg. at 58,226; *see also id.* at 58,229 (“[A]fter considering all the health and cost factors . . . , the agency has determined that . . . [the revised standard] will provide an ample margin of safety . . .”).

The Association argues that EPA’s determinations that revised standards *would* provide an ample margin of safety did not contain a determination that they were *required* to

⁸ While we affirm EPA’s determinations under section 112(f)(2), we note that even if we disapproved of them, the same emissions standards would survive because EPA determined that they were independently warranted by its technology review under section 112(d)(6). *See* 77 Fed. Reg. at 58,224-25; 77 Fed. Reg. at 6,648. The Association’s counsel acknowledged as much at argument. Oral Arg. Tr. at 16:20-17:8.

provide that margin. That is simply not the case. In response to comments, for instance, the agency reiterated its understanding that section 112(f)(2) mandates revision when, “required to provide an ample margin of safety.” J.A. 527. The agency has consistently viewed itself as “required to propose emissions standards . . . that reduce risk to a level that is acceptable and provides an ample margin of safety.” 75 Fed. Reg. at 65,091. It is precisely as a result of the further consideration and context-based determination that additional risk reductions can be achieved cost effectively and in light of other statutorily relevant factors that the agency’s obligation arises to tighten standards to provide an “ample margin of safety.” EPA’s determination that revision was required was therefore at least implicit.

Second, the Association argues that any finding EPA may have made in 2012 that the revised standards were required to protect the public health was an arbitrary and capricious reversal of its earlier 2010 determination. The Association contends, more specifically, that it was unreasonable for EPA to conclude in 2010 that the requisite “ample margin of safety” was in place, but to conclude in 2012 that revised standards were necessary to achieve such a margin of safety—and to do so at the same time that EPA acknowledged that health risks were equal to or lower than it had thought they were in 2010. EPA’s “ample margin of safety” determination does not hinge solely on public health risk, however; it may also take into account “*costs and economic impacts*, technological feasibility, and other [non-health] factors.” *NRDC*, 529 F.3d at 1083 (internal quotation marks omitted). That being the case, the fact that EPA considered a prior standard to provide an ample margin of safety under older data does not prevent EPA from determining that new data on cost and feasibility require a more stringent standard. In this case, EPA gained significant new data between 2010

and 2012 that changed its calculus about cost effectiveness and feasibility. 77 Fed. Reg. at 58,225-26; J.A. 521-22 (response to comments). EPA's change in position was therefore reasonable. See *Sierra Club*, 353 F.3d 986-87; cf. *Nat'l Ass'n of Mfrs. v. EPA*, 750 F.3d 921, 925 (D.C. Cir. 2014) ("[W]e do not assign 'presumptive validity' to the prior [standards]; the question is whether EPA reasonably explains the current standards.").

Lastly, the Association characterizes EPA's statistical methodology for estimating emissions (and, consequently, cancer risk) as unreasonably flawed. It asserts that the sample of facilities on which EPA based its emissions estimates in the Supplemental Notice included many facilities that were either closed or not subject to regulation, or that emissions estimates from those facilities were inaccurately high.

The Association identified inaccuracies in the sample EPA had used by contacting facilities in that sample and comparing the information they provided against EPA's assumptions. It also reported that those inaccuracies were corroborated by a supplemental sample it generated to check the accuracy of EPA's model. J.A. 284-305, 312-27 (March 2012 submission in response to Supplemental Notice). The Association claims that its supplemental data show that EPA's initial sample was unacceptably unrepresentative of the larger population of facilities.

EPA responded by adjusting its data inputs, removing all the data that the Association had identified as coming from closed facilities or those that did not emit hexavalent chromium, and added the more specific, verifiable data that the Association had provided. 77 Fed. Reg. at 58,235; J.A. 546-47 (response to comment); see also J.A. 637-38 (EPA correspondence to the Association further explaining the

adjustments). EPA declined, however, to incorporate any of the Association's data that the agency determined was too vague or lacking in detail to be reliable and susceptible of incorporation into its predictive model. J.A. 638. EPA also declined to adopt the Association's extrapolations from its supplemental data sample because, the agency explained, the Association did not provide sufficient information about its sampling methodology for EPA to discern whether the supplemental data sample was collected in a statistically representative, reliable fashion. J.A. 647.

The Association has never challenged EPA's predictive model, as distinct from the data inputs into that model. EPA thus retained the "Monte Carlo" statistical technique of extrapolating an estimate of emissions from all facilities from actual emissions data from a smaller sample of facilities. EPA re-ran its model based on a dataset adjusted as just described, and determined that the resulting emissions estimates supported its risk conclusions. 77 Fed. Reg. at 58,225-30, 58,235-36.

We conclude that EPA's methodology passes muster. Keeping in mind the "wide latitude" we afford EPA's expertise-informed choice of data-gathering methodology, we find that EPA's data-collection process was reasonable. See *NRDC*, 529 F.3d at 1086 (quoting *Sierra Club*, 167 F.3d at 662); see also *White Stallion*, 748 F.3d at 1247-48. The Association contends that EPA's response to its submission—adjusting the inputs of its dataset—was insufficient. But we must bear in mind that "statistical analysis is perhaps the prime example of those areas of technical wilderness into which judicial expeditions are best limited to ascertaining the lay of the land." *Appalachian Power Co. v. EPA*, 135 F.3d 791, 802 (D.C. Cir. 1998). We uphold EPA's model as long as the agency "explain[s] the assumptions and methodology

used in preparing the model” and “provide[s] a complete analytic defense” should the model be challenged. *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 535 (D.C. Cir. 1983) (internal quotation marks omitted). As outlined above, EPA provided such an explanation and defense of how and why it formulated the sample and conducted the analysis that it did. *See, e.g.*, 77 Fed. Reg. at 58,235; *see also* J.A. 467-472 (memorandum specifically explaining and defending EPA’s revised emissions simulation). Moreover, the Association does not explain why the level of uncertainty resulting from EPA’s ultimate sample and analysis was statistically unacceptable, nor does it offer any superior method that it contends EPA should have used instead.

* * *

For the reasons above, we deny the petitions for review and uphold the Final Rule.

So ordered.