

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued January 9, 2007

Decided February 9, 2007

No. 01-1046

KENNECOTT GREENS CREEK MINING COMPANY,
PETITIONER

v.

MINE SAFETY AND HEALTH ADMINISTRATION AND
SECRETARY OF LABOR,
RESPONDENTS

UNITED STEEL, PAPER AND FORESTRY, RUBBER,
MANUFACTURING, ENERGY, ALLIED INDUSTRIAL AND
SERVICE WORKERS INTERNATIONAL UNION, AFL-CIO, ET AL.,
INTERVENORS

Consolidated with
01-1124, 01-1146,
05-1255, 05-1291, 05-1296, 05-1312, 05-1314,
06-1184, 06-1194, 06-1204, 06-1205, 06-1223, 06-1225

On Petitions for Review of Final Standards of the
Federal Mine Safety and Health Administration

Henry Chajet and *Thomas C. Means* argued the causes for
petitioners. With them on the briefs were *Edward M. Green*,
David Farber, *Harold P. Quinn, Jr.*, *Laura E. Beverage*, *John*

K. McDonald, Michael T. Heenan, Margaret S. Lopez, and William K. Doran. Kurt E. Blase entered an appearance.

Edward D. Sieger, Senior Appellate Attorney, U.S. Department of Labor, argued the cause for respondent. With him on the brief was *Nathaniel I. Spiller*, Assistant Deputy Solicitor. *Allen H. Feldman*, Attorney, entered an appearance.

Daniel M. Kovalik and *Randy S. Rabinowitz* were on the brief for intervenor United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union.

Before: GINSBURG, *Chief Judge*; SENTELLE, *Circuit Judge*; and EDWARDS, *Senior Circuit Judge*.

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

SENTELLE, *Circuit Judge*: Several mining industry groups and mine operators petition for review of three Mine Safety and Health Administration (“MSHA”) rules that regulate diesel particulate matter (“DPM”) in underground metal and non-metal mines. Petitioners contend that MSHA did not have sufficient evidence that DPM presents a risk to miners’ health, that MSHA unreasonably chose to regulate other substances as surrogates for DPM, and that the DPM exposure limits in the new rules cannot feasibly be achieved by mine operators. Petitioners also assert that MSHA unlawfully granted medical evaluation and transfer rights to workers who are required to wear respirators, and that MSHA’s final implementation timetable was not a logical outgrowth of the proposed rules. We find these arguments to be without merit, and we deny the petitions for review.

I.

Diesel exhaust is comprised of both gasses and particulate matter. The challenged rules regulate only the particulate components of diesel exhaust. Other provisions of MSHA rules, not at issue in this case, regulate exposure to diesel exhaust gasses. See 30 C.F.R. § 57.5001.

On January 19, 2001, MSHA promulgated rules setting concentration limits for diesel particulate matter in underground metal and non-metal mines.¹ *Diesel Particulate Matter Exposure*, 66 Fed. Reg. 5706 (2001) (“2001 Rules”). First, MSHA conducted a risk assessment for DPM. The agency determined that miners were exposed to very high levels of DPM, and that this exposure can cause numerous adverse health effects, including eye irritation, respiratory problems, and lung cancer. *Id.* at 5752-5855. MSHA concluded that it was necessary to regulate DPM exposure to protect miners from these risks. *Id.* at 5855. Second, the agency determined that there was no reliable way to measure DPM directly for compliance purposes. *Id.* at 5718. Therefore, MSHA chose to regulate total carbon (“TC”) as a surrogate for DPM. *Id.* at 5726-27. Total carbon was deemed to be a reliable surrogate because there was evidence in the record that TC makes up approximately 80-85% of DPM, and that this is a consistent relationship. *Id.* In the 2001 Rules, MSHA set concentration limits of 400 micrograms of TC (effective July 2002) and 160

¹In 2001, MSHA also promulgated rules regulating diesel engine exhaust in coal mines. See *Diesel Particulate Matter Exposure of Underground Coal Miners*, 66 Fed. Reg. 5526 (2001) (codified at 30 C.F.R. pt. 72). Those rules were not challenged, and have been in force since 2001.

micrograms of TC (effective January 2006).² *Id.* at 5706-07. During the rulemaking, several commenters argued that TC was an unreliable surrogate for DPM because it was susceptible to interference from other organic carbon compounds, such as tobacco smoke and oil mist. However, MSHA concluded that it could avoid these problems by collecting samples a sufficient distance away from possible sources of interference. *Id.* at 5726-30. Lastly, in its 2001 Rules, MSHA determined that mine operators could feasibly comply with the new DPM exposure limits. *Id.* at 5884-90. The agency identified numerous control technologies that could be used to reduce DPM emissions, including exhaust filters, environmental cabs, low-emission engines, improved ventilation systems, low sulfur fuels, and better training and maintenance. *Id.* at 5888-90.

Several parties petitioned for review of the 2001 Rules. MSHA conceded that there were problems with the rules – especially regarding the use of TC as a surrogate for DPM – and agreed to conduct further research to address the problem of interference with TC sampling. After a study of 31 mines, MSHA, the miners’ unions, and the industry groups agreed to several changes to the 2001 Rules. The effective date for the 400 TC interim limit was postponed until July 2003. *Diesel Particulate Matter Exposure*, 67 Fed. Reg. 47,296, 47,298-99 (2002). Also, MSHA concluded that TC was an unreliable proxy for DPM in certain circumstances, and promised to initiate an expedited rulemaking to change the DPM surrogate from total carbon to elemental carbon (“EC”). *Id.*

²All exposure limits in MSHA’s rulemakings are expressed in terms of micrograms per cubic meter. For simplicity, we will refer to the limits only in terms of the exposure limit and the substance being regulated (*i.e.* 160 TC instead of 160 TC $\mu\text{g}/\text{m}^3$).

In a rulemaking completed in June 2005, MSHA made several changes to its 2001 Rules. *Diesel Particulate Matter Exposure*, 70 Fed. Reg. 32,868 (2005) (“2005 Rules”). Most importantly, MSHA converted the interim DPM limit from 400 TC to 308 EC, based on a TC-to-EC conversion factor of 1.3 to 1. *Id.* at 32,944. This conversion factor was calculated based on data from samples in the 31-mine study. *Id.* The agency expressed confidence that this sampling and conversion methodology “produces a reasonable estimate of TC without interferences.” *Id.* However, the agency did not convert the final limit from EC to TC – it kept that limit at 160 TC, pending further rulemaking. *Id.* at 32,870. In the 2005 Rules, MSHA also made two key changes with respect to feasibility. First, the rules state that mine operators must require miners to wear respirators if “controls do not reduce a miner’s exposure to the DPM limit, controls are infeasible, or controls do not produce significant reductions in DPM exposures.” *Id.* at 32,915-16. Second, MSHA permitted mine operators to seek a one-year renewable extension of the compliance deadline if they could show that they were unable to meet the DPM exposure limits. *Id.* at 32,951-53.

In September 2005, MSHA sought comments on several more proposed changes to the DPM rules. *Diesel Particulate Matter Exposure*, 70 Fed. Reg. 53,280 (2005) (“2005 Proposed Rules”). The agency noted that mine operators were having some difficulties with new filter and engine technologies, and thus proposed extending the effective date for the final limit of 160 TC to 2011 (with a five-year graduated phase-in period). *Id.* at 53,282-84, 53,288. It also proposed adding medical evaluation and transfer rights for miners who would be forced to wear respirators because their employers were not in compliance with the DPM exposure limits. *Id.* at 53,289-90.

In May 2006, MSHA once again amended the DPM rules. *Diesel Particulate Matter Exposure*, 71 Fed. Reg. 28,924 (2006) (“2006 Rules”). The 2006 Rules departed from MSHA’s 2005 proposal by postponing the effective date for the 160 TC final limit for only two years to May 2008. They also set a new interim limit of 350 TC, effective January 2007. *Id.* at 28,977-78. MSHA promised to initiate a separate rulemaking to convert these final limits from TC to the more reliable EC. *Id.* at 28,983. With respect to feasibility, the agency determined that several types of DPM control technologies were becoming more readily available, and that mine operators could use these technologies to meet the DPM exposure limits. *Id.* at 28,933-40. The 2006 Rules also adopted the agency’s proposal to grant medical evaluation and transfer rights to miners who must wear respirators because the mines in which they work are not in compliance with the DPM exposure limits. *Id.* at 28,986-91.

The National Mine Association, the National Stone, Sand & Gravel Association, and several mine operators petitioned for review of MSHA’s 2001, 2005, and 2006 rules, alleging that the rules are arbitrary and capricious and contrary to law. The United Steelworkers Union intervened on behalf of MSHA in defense of the DPM rules.

II.

Petitioners first challenge MSHA’s risk assessment for diesel particulate matter. In particular, they argue that: (1) MSHA failed to demonstrate that DPM presents a substantial risk to miners’ health; (2) MSHA failed to consider whether pre-existing regulations on diesel exhaust gasses are sufficient to protect miners from the risks of DPM; and (3) MSHA disregarded the fact that newer engines might increase the number of harmful “nanoparticles” in mines. We review MSHA’s risk assessment under the Administrative Procedure

Act, which states that reviewing courts shall “hold unlawful and set aside” any agency action that is “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” 5 U.S.C. § 706(2)(A). Under the arbitrary and capricious test, we must ensure that the agency has “examine[d] the relevant data and articulate[d] a satisfactory explanation for its action including a rational connection between the facts found and the choice made.” *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (internal quotation marks omitted).

The Mine Act states that MSHA shall “develop, promulgate, and revise as may be appropriate, improved mandatory health or safety standards for the protection of life and prevention of injuries in coal or other mines.” 30 U.S.C. § 811(a). Moreover, the Act states:

The Secretary, in promulgating mandatory standards dealing with toxic materials or harmful physical agents under this subsection, shall set standards which most adequately assure on the basis of the best available evidence that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standard for the period of his working life. Development of mandatory standards under this subsection shall be based upon research, demonstrations, experiments, and such other information as may be appropriate.

Id. § 811(a)(6)(A). Thus, before promulgating a health or safety standard under the Mine Act, MSHA must show that the substance being regulated presents a risk of “material impairment of health or functional capacity” for miners who are regularly exposed to the substance. Under the applicable standard, courts extend deference to MSHA’s determinations as

to which substances present such a risk. In a case involving MSHA's regulation of oxygen levels in mines, we noted that "[a]t most . . . the agency was required to identify a significant risk associated with having no oxygen standard at all." *Nat'l Mining Ass'n v. MSHA*, 116 F.3d 520, 528 (D.C. Cir. 1997). Moreover, we emphasized that "the Secretary was entitled to err on the side of overprotection by setting a fully adequate margin of safety." *Id.* (internal quotation marks omitted).

Here, MSHA has adequately demonstrated that DPM presents a significant risk to the health and safety of miners. In the 2001 Rules, MSHA conducted an exhaustive risk assessment that was based upon an analysis of the relevant data and scientific literature. 66 Fed. Reg. at 5752-5855. First, the agency cited several studies that showed that miners were exposed to DPM at much higher levels than workers in other occupations. *Id.* at 5753-64. More specifically, MSHA determined that "median dpm concentrations observed in some underground mines are up to 200 times as high as mean environmental exposures in the most heavily polluted urban areas, and up to 10 times as high as median exposures estimated for the most heavily exposed workers in other occupational groups." *Id.* at 5764.

Next, MSHA determined that numerous adverse health effects are causally related to heightened DPM exposure. *Id.* at 5764-5822. The agency identified several studies that found links between DPM exposure and acute health effects, such as eye irritation, decreases in pulmonary function, and bronchial inflammation. *Id.* at 5767-70. More significantly, MSHA concluded that miners who are regularly exposed to DPM will face a heightened risk of developing lung cancer. In reaching this conclusion, MSHA analyzed 47 epidemiological studies (from 1957 to 1999) as well as two "meta-analyses" that aggregated the data from the earlier studies. *Id.* at 5773-82.

“Some degree of association between occupational dpm exposure and an excess prevalence of lung cancer was reported in 41 of the 47 studies reviewed by MSHA.” *Id.* at 5775. Moreover, the agency reasonably explained why it discounted the findings of the six studies that did not find a causal link between DPM exposure and lung cancer risk. Three of these studies did not allow for a sufficiently long latency period between exposure and evaluation, and a fourth study used too small of a cohort. *Id.* at 5783. And five of the six “negative” studies did not have statistically significant results, whereas 25 of the 41 “positive” studies did find a statistically significant link between DPM exposure and lung cancer risk. *Id.* at 5785. MSHA concluded that:

Although no epidemiologic study is flawless, studies of both cohort and case-control design have quite consistently shown that chronic exposure to diesel exhaust, in a variety of occupational circumstances, is associated with an increased risk of lung cancer. . . . With only rare exceptions, involving too few workers and/or observation periods too short to have a good chance of detecting excess cancer risk, the human studies have shown a greater risk of lung cancer among exposed workers than among comparable unexposed workers.

Id. at 5825. We hold that MSHA corralled more than enough evidence in support of its risk assessment, and that the agency reasonably explained why it did not rely on the studies that cut against its conclusions.

Petitioners argue that MSHA’s risk assessment was flawed because the agency failed to consider whether pre-existing limitations on diesel exhaust gasses might also provide adequate protection against exposure to diesel particulate matter. However, this argument ignores the fact that DPM presents

health risks independent of the risks posed by diesel exhaust gasses. MSHA's risk assessment in the 2001 Rules focused *only* on the specific risks caused by exposure to diesel particulate matter. See 66 Fed. Reg. at 5764 (noting that MSHA's risk assessment "reviews the various health effects . . . that may be associated with *dpm* exposures") (emphasis added). As explained above, the agency reasonably determined that DPM is a "toxic material or harmful physical agent" that poses a significant risk to the health of miners. Accordingly, MSHA was authorized by the Mine Act to promulgate exposure limits for DPM independent of the agency's pre-existing rules regulating diesel exhaust gasses. See 30 U.S.C. § 811(a)(6). Indeed, the agency emphasized that "MSHA will, of course, continue to enforce the limits applicable to diesel gasses, but this enforcement will be separate from the enforcement of the *dpm* concentration limits under the final *dpm* rule." 2001 Rules, 66 Fed. Reg. at 5856. Thus, we hold that MSHA reasonably chose to promulgate separate rules for diesel particulate matter based upon the agency's determination that DPM – in its own right – presents significant risks to the health and safety of miners that are distinct from the health risks posed by diesel exhaust gasses.

Petitioners also assert that MSHA's risk analysis was flawed because it failed to take into consideration the effects of "confounders" such as miners' use of tobacco products. However, in the 2001 Rules, MSHA specifically identified eighteen published epidemiological studies that controlled for tobacco use, five of which also controlled for asbestos exposure. *Id.* at 5787. Even controlling for tobacco use, "[a]ll but one of these 18 studies reported some degree of excess risk associated with occupational exposure to diesel particulate, with statistically significant results reported in eight." *Id.*

Finally, petitioners contend that MSHA's risk assessment was arbitrary and capricious because it disregarded the fact that

newer, cleaner engines – which are often necessary to reduce DPM exposure – may increase the number of dangerous “nanoparticles” in mines. We disagree. As explained above, a substantial body of scientific evidence has identified a statistically significant causal connection between DPM exposure and lung cancer risk. In contrast, the risks from nanoparticles are currently speculative at best – in the 2001 rulemaking, MSHA noted that nanoparticles “may” be more harmful than larger particles, but that “much more medical research and diesel emission studies are needed to fully characterize diesel nanoparticles emissions and their impact on human health.” *Id.* at 5738. MSHA’s actions in the face of this evidence were entirely reasonable. The agency chose to promulgate rules immediately to regulate the *known* risks from DPM, while conducting further research into the *potential* health effects of nanoparticles. We cannot hold that this course of action was arbitrary and capricious.

Under the Mine Act, MSHA is given a significant degree of deference in its identification of substances that present significant risks to the health and safety of miners. *See Nat’l Mining Ass’n*, 116 F.3d at 527-28. Here, MSHA conducted an exhaustive survey of the relevant evidence and concluded that exposure to diesel particulate matter may place miners at a heightened risk of developing lung cancer and other health problems. We see no reason to disrupt this conclusion, and thus we deny the petitions for review with respect to MSHA’s threshold risk assessment.

III.

In its rulemakings, MSHA concluded that it did not have a reliable method of measuring DPM directly at low concentration levels. *See* 2001 Rules, 66 Fed. Reg. at 5718. Accordingly, the agency chose to regulate total carbon (“TC”) and elemental

carbon (“EC”) as surrogates for DPM. Petitioners raise several challenges to MSHA’s use of these surrogates. In particular, petitioners argue that TC and EC are flawed proxies for DPM because TC is sensitive to interference from other carbon-based sources, and because there is no reliable and consistent method for converting DPM to EC and TC. We agree with the petitioners that TC and EC are not perfect substitutes for DPM. But our standard of review under the arbitrary and capricious test is only reasonableness, not perfection. *See State Farm*, 463 U.S. at 43 (requiring the agency to “articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made”). Additionally, “we will give an extreme degree of deference to the agency when it ‘is evaluating scientific data within its technical expertise.’” *Hüls Am., Inc. v. Browner*, 83 F.3d 445, 452 (D.C. Cir. 1996) (quoting *Int’l Fabricare Inst. v. EPA*, 972 F.2d 384, 389 (D.C. Cir. 1992)). On the record before us, we cannot hold that MSHA acted arbitrarily and capriciously by using TC and EC as surrogates for DPM.

At the outset, we note that there is nothing inherently problematic with an agency regulating one substance as a surrogate for another substance. In other areas of environmental law, this Court has held that “[t]he EPA may use a surrogate to regulate hazardous pollutants if it is ‘reasonable’ to do so.” *Nat’l Lime Ass’n v. EPA*, 233 F.3d 625, 637 (D.C. Cir. 2000). For example, we have upheld the EPA’s use of hydrocarbons (“HC”) as a surrogate for fine particulate matter (“PM”), explaining that:

EPA regulated HC emissions as a means of controlling fine PM emissions and pollution. The Agency reasonably determined that regulating HC would control PM pollution both because HC itself contributes to such pollution, and because HC provides a good proxy for regulating fine PM

emissions.

Bluewater Network v. EPA, 370 F.3d 1, 18 (D.C. Cir. 2004). *See also Sierra Club v. EPA*, 353 F.3d 976, 985 (D.C. Cir. 2004) (upholding the EPA's regulation of particulate matter as a surrogate for hazardous air particles because there were "[s]trong direct correlations" between the surrogate and the target substance).

In the instant case, MSHA reasonably chose to use TC as a surrogate for DPM. Based on the results of several studies, MSHA determined that TC "accounts for 80-85% of the total dpm concentration when low sulfur fuel is used." 2001 Rules, 66 Fed. Reg. at 5719. The agency also noted that the "NIOSH 5040" method of analysis measures TC with "the accuracy, precision, and sensitivity necessary to use in compliance sampling for dpm." *Id.* at 5719-22 (noting that samples taken pursuant to the NIOSH 5040 method meet NIOSH's "accuracy criterion" because they "come within 25 percent of the true TC concentration at least 95 percent of the time"). Given that TC and DPM were tightly correlated, and that MSHA had a reliable method for determining the amount of TC in a sample, it was not per se unreasonable for MSHA to use TC as a surrogate for DPM.

However, as MSHA recognized in its 2001 Rules, TC is not always a perfect surrogate for DPM because TC measurements can be sensitive to interferences from other carbon-based sources, such as oil mist and tobacco smoke. *Id.* at 5726-30. Accordingly, in the 2005 Rules, MSHA converted one of the interim DPM exposure limits from total carbon to elemental carbon ("EC"), another surrogate for DPM that is less sensitive to interference. *See* 70 Fed. Reg. at 32,871 (noting that "using EC would impose fewer restrictions or caveats on sampling strategy (locations and durations), would produce a

measurement much less subject to questions, and inherently would be more precise”). MSHA reviewed the relevant evidence and concluded that EC was a reliable proxy for DPM because NIOSH research and MSHA’s laboratory tests “indicate that DPM, on average, is approximately 60 to 80% elemental carbon.” *Id.* Also, using the results of the 31-mine study, MSHA was able to establish a TC:EC conversion factor of 1.3. *See id.* at 32,889-99. MSHA obtained the 1.3 conversion factor by taking the median of the ratios observed during sampling. Moreover, in making these calculations, the agency only focused on valid samples – it omitted samples that were subject to interference. *Id.* at 32,944. Petitioners assert that the TC:EC conversion ratio used by MSHA is arbitrary and capricious because the correlation between TC and EC varies in a statistically significant manner. However, after analyzing over 1,000 samples from various mines, MSHA found that measuring TC directly or measuring EC and multiplying by the conversion factor of 1.3 made no difference to finding compliance with the 400 TC limit in 93.6% of the samples. *Id.* at 32,876. Obviously, the conversion factor is not perfect, and there is still some variability in the TC:EC ratio. However, MSHA’s decision to use the median ratio from valid samples in the 31-mine study as the conversion factor was well within the scope of the agency’s discretion. And MSHA’s sampling confirms that the 1.3 conversion factor – although not perfect – is a relatively accurate way of converting EC to TC. We cannot hold that it was arbitrary and capricious for the agency to use EC as a surrogate for DPM.

Finally, petitioners assert that the current interim limit of 350 TC and the final limit of 160 TC are arbitrary and capricious because MSHA did not convert these limits from TC to EC, even though the agency had acknowledged that TC can be an unreliable measure of DPM. We disagree. Although MSHA has recognized that TC is sensitive to interferences, the agency

has not entirely written off TC as a proxy for DPM. Indeed, MSHA has clearly stated in its rules that TC can still serve as a consistent and reliable surrogate for DPM as long as samples are taken in areas away from tobacco smoke and oil mist. See 2001 Rules, 66 Fed. Reg. at 5719 (noting that cigarette smoke is “under the control” of mine operators, and therefore it can be prohibited during sampling periods); *id.* at 5729 (noting that samples should be taken “upwind” of drilling that produces oil mist). Moreover, MSHA has stated that it will initiate a new rulemaking to convert the final limits from TC to EC.³ 2006 Rule, 71 Fed. Reg. at 28,983. In sum, MSHA has concluded that EC is a *better* proxy for DPM than TC, but this does not automatically render the use of TC to be arbitrary and capricious. Even though TC sampling is more difficult than EC sampling, MSHA has reasonably determined that TC can still be a reliable proxy for DPM as long as samples are taken in the proper manner. In any event, MSHA’s rulemaking suggests that it has no intention of using TC as a stand alone proxy.

Although total carbon and elemental carbon are not perfect surrogates for DPM, MSHA reasonably concluded based on evidence in the record that TC and EC are sufficiently well-correlated with DPM that they can serve as reliable proxies. These determinations are given “an extreme degree of deference” given that they involve complex judgments about sampling methodology and data analysis that are “within [the agency’s] technical expertise.” *Hüls Am.*, 83 F.3d at 452. Accordingly, we deny the petitions for review with respect to

³MSHA did not apply the 1.3 conversion factor to the final limit out of concern that the TC to EC ratio may be different at the lower level. It has, however, indicated that it will apply the 1.3 conversion factor as a check to samples measured for compliance with the 350 TC interim limit if the rulemaking has not been completed by that time.

the use of total carbon and elemental carbon as surrogates for diesel particulate matter.

IV.

Petitioners argue that the DPM exposure limits violate the Mine Act because they cannot feasibly be achieved by mine operators within the time period established by MSHA's rules. Petitioners also contend that MSHA was too optimistic about the efficacy of various DPM control technologies, and that the agency changed its feasibility determinations without a reasoned explanation. We find these arguments to be without merit.

Under the Mine Act, MSHA "shall set standards which most adequately assure on the basis of the best available evidence that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standard for the period of his working life." 30 U.S.C. § 811(a)(6)(A). Moreover, the Act states:

In addition to the attainment of the highest degree of health and safety protection for the miner, other considerations shall be the latest available scientific data in the field, the feasibility of the standards, and experience gained under this and other health and safety laws.

Id. This Court has not yet analyzed the precise role of feasibility in a Mine Act rulemaking. However, many other environmental and worker protection statutes contain feasibility requirements, and we can look to cases interpreting those statutes to inform our analysis. *See, e.g.*, 29 U.S.C. § 655(b)(5) ("Occupational Safety and Health Act") (stating that the Secretary of Labor shall "set the standard which most adequately assures, to the extent feasible, on the basis of the best available evidence, that no

employee will suffer material impairment of health”).

The Supreme Court has interpreted “feasible” in the OSH Act as meaning “capable of being done, executed, or effected,” both technologically and economically. *Am. Textile Mfrs. Inst. v. Donovan*, 452 U.S. 490, 508-09 (1981). In order for its rules to be deemed feasible, an agency must establish “a reasonable possibility that the typical firm will be able to develop and install engineering and work practice controls that can meet the [permissible exposure limit] in most of its operations.” *Am. Iron & Steel Inst. v. OSHA*, 939 F.2d 975, 980 (D.C. Cir. 1991) (“*AISI*”) (citation omitted). Given that feasibility determinations involve complex judgments about science and technology, our standard of review is deferential: the agency is “not obliged to provide detailed solutions to every engineering problem,” but only to “give plausible reasons for its belief that the industry will be able to solve those problems in the time remaining.” *Nat’l Petrochemical & Refiners Ass’n v. EPA*, 287 F.3d 1130, 1136 (D.C. Cir. 2002). The fact that “a few isolated operations within an industry” will not be able to comply with the standard does not undermine a showing that the standard is generally feasible. *AISI*, 939 F.2d at 980. Moreover, MSHA has emphasized that its DPM rules are intended to be “technology forcing,” and the industry petitioners have conceded in their brief that MSHA has authority to promulgate technology-forcing rules. See 2005 Proposed Rules, 70 Fed. Reg. at 53,283 (“When we established the 2001 final limit, we were expecting some mine operators to encounter difficulties implementing control technology because the rule was technology forcing.”); Reply Br. of Petitioners at 33. When a statute is technology-forcing, the agency “can impose a standard which only the most technologically advanced plants in an industry have been able to achieve – even if only in some of their operations some of the time.” *United Steelworks of Am. v. Marshall*, 647 F.2d 1189, 1264 (D.C. Cir. 1980) (quoting *AISI v. OSHA*, 577 F.2d 825,

832-35 (3d Cir. 1978)).

Petitioners assert that the implementation timetable established by the 2006 Rules is not feasible, and that many mine operators will be unable to meet the final exposure limits. To the contrary, MSHA provided more than enough evidence to justify its conclusion that the timetable is feasible. *See* 2006 Rules, 71 Fed. Reg. at 28,933-75 (summarizing evidence in support of feasibility determinations). In the 2006 Rules, MSHA determined that several types of DPM control technologies were more widely available than the agency had previously thought. For example, the agency noted that by 2005, several mines were using biodiesel fuel, which reduces DPM emissions from diesel engines. *Id.* at 28,936. Similarly, MSHA acknowledged that mine operators had problems using filters in the past, but the agency emphasized that filters are a highly effective tool for controlling DPM if they are properly selected, installed, and maintained. *Id.* at 28,944-46. MSHA extensively discussed the pros and cons of all currently-available filtering technologies, and it determined that several newer models of filters “are not subject to many of the difficult implementation issues that have slowed the adoption of some DPM controls.” *Id.* at 28,944. Moreover, MSHA stated that it will continue to provide “extensive information” to mine operators about the proper procedures for selecting, installing, and maintaining their filtration systems. *Id.* at 28,946. In sum, the agency concluded that “the mining industry as a whole can reduce DPM levels to the 2001 final limit of 160 TC $\mu\text{g}/\text{m}^3$ by May 20, 2008.” *Id.* at 28,978. MSHA offered an abundance of evidence in support of its feasibility determinations, and we cannot hold that the agency’s conclusions were arbitrary and capricious.

Petitioners also challenge MSHA’s findings about several specific types of control technologies, especially “environmental

cabs” and improved mine ventilation. They argue that these control technologies should not have been considered in MSHA’s feasibility analysis because they have important limitations or are only useful in certain types of mines. These arguments misinterpret the meaning of “feasibility.” For its rules to be upheld, MSHA does not need to show that *every* technology can be used in *every* mine. The agency must only demonstrate a “reasonable possibility” that a “typical firm” can meet the permissible exposure limits in “most of its operations.” *AISI*, 939 F.2d at 980. In the 2006 Rules, MSHA explained that:

As we have maintained throughout this rulemaking, mine operators should determine the control or combination of controls that will be best suited to their mine-specific circumstances and conditions, and that controls need to be evaluated, selected, and implemented on a case-by-case and application-by-application basis.

71 Fed. Reg. at 28,942. Thus, the fact that some of the specific control technologies identified by MSHA cannot be used in every mine does not undermine the overall reasonableness of the agency’s feasibility determinations. This also undercuts petitioners’ argument that MSHA should have engaged in a feasibility analysis for each specific type of mine. MSHA has never suggested that there is a one-size-fits-all approach for every mine to meet the DPM exposure limits. Rather, the agency has reasonably concluded that many different technologies can be effective in reducing DPM exposure, and it is up to each individual mine operator to choose the best mix of controls for that particular mine. Nothing in the Mine Act or the APA requires an agency to describe in detail how every single regulated party will be able to comply with the agency’s rules. *See, e.g., Nat’l Petrochemical & Refiners Ass’n*, 287 F.3d at 1136 (noting that an agency must “identify the major steps for improvement” but need not provide “detailed solutions to every

engineering problem”) (citation omitted).

MSHA’s feasibility determinations are buttressed by the agency’s statistical findings that many mines are already in compliance with the DPM exposure limits. In the 2006 Rules, MSHA provided data from its prior enforcement sampling, which revealed that 82% of samples were in compliance with the 308 EC interim limit, 78% of samples were in compliance with the 350 TC interim limit, and 46% of samples were in compliance with the 160 TC final limit. 71 Fed. Reg. at 28,961. Furthermore, the data indicated that of the mines sampled, 54% were in compliance with the 308 EC interim limit, 45% were in compliance with the 350 TC interim limit, and 18% were in compliance with the 160 TC final limit. *Id.* Moreover, this sampling focused on mines that were likely to have the highest DPM exposure levels; thus, the actual industry-wide compliance rates are likely to be higher than the compliance rates for these samples. *Id.* Focusing upon the percentage of sampled mines in compliance, petitioners contend the data demonstrates that the imposed limits are infeasible. On the contrary, we agree with MSHA that the data supports the agency’s conclusion that the limits are feasible. It is not arbitrary or capricious to consider feasible an interim limit with which half of all sampled mines are already in compliance. And given that – in the 2006 Rules – MSHA extended the effective date for the final limit until May 2008, mines that are not yet in compliance will still have almost a year and a half to achieve compliance with the final limits.

Additionally, this Court has held that “[a]ny risk that the standard may prove to be infeasible in practice is counterbalanced by flexibility in the standard’s enforcement.” *AISI*, 939 F.2d at 980. Here, MSHA’s rules allow mine operators to seek an extension of the compliance deadline if they are having difficulty achieving the DPM exposure limits. A mine that “requires additional time to come into compliance”

because of “technological or economic constraints” may seek a renewable one-year extension of the deadline. 30 C.F.R. § 57.5060(c). *See also* 2005 Rules, 70 Fed. Reg. at 32,951-53. We also noted in *AISI* that an agency’s burden of proving feasibility is “greatly ease[d]” if employers are permitted to require employees to use respirators if the exposure limits cannot be met by other means. 939 F.2d at 980. MSHA’s 2005 Rules contain precisely that requirement – if a mine operator is unable to comply with the DPM exposure limits, it must provide “respiratory protection” to miners. *See* 30 C.F.R. § 57.5060(d). *See also* 2006 Rules, 71 Fed. Reg. at 28,986-91; 2005 Rules, 70 Fed. Reg. at 32,953-58. Thus, if any mine operators experience difficulty complying with the DPM exposure limits, they will be able to apply for an extension of the deadline and require their employees to wear respirators. This “flexibility in the standard’s enforcement” only reinforces our conclusion that MSHA’s feasibility determinations were reasonable. *See AISI*, 939 F.2d at 980.

Finally, petitioners contend that MSHA’s feasibility determinations are arbitrary and capricious because the agency reversed itself several times without reasoned explanation. Contrary to petitioners’ assertions, however, MSHA did not change its feasibility determinations between the 2005 rulemaking and the 2006 rulemaking. After promulgating the 2005 Rules, MSHA issued a set of proposed rules that would have changed the effective date for the DPM final limit. *See* 2005 Proposed Rules, 70 Fed. Reg. at 53,280-93. In the proposed rules, MSHA noted that some of its feasibility determinations were being “questioned” and that some of its assumptions “may not” have been valid; the agency sought comments from the public about these issues. *Id.* at 53,283. However, none of these statements can be deemed a “reversal” of the agency’s feasibility determinations. Indeed, in the same set of proposed rules, MSHA also stated that the final limit of

160 TC might still be feasible because of mine operators' "wider use of alternative fuels and filter technology." *Id.* Thus, the 2005 Proposed Rules sought new comments from the public about certain feasibility issues, but did not actually change any of the agency's feasibility determinations. It cannot be said that the agency changed its position on these matters without reasoned explanation.

In sum, we deny the petitions for review with respect to MSHA's feasibility determinations. The agency identified several types of control technologies that are effective at reducing DPM exposure, and it offered evidence that a substantial number of mines are already in compliance with the DPM limits. We see no reason to second-guess MSHA's conclusion that its DPM exposure limits are feasible.

V.

Petitioners also challenge MSHA's inclusion in the DPM rules of medical evaluation and transfer rights for workers who are required to wear respirators. *See* 2006 Rules, 71 Fed. Reg. at 28,986-91. First, petitioners assert that MSHA included these provisions in its final rules without giving adequate notice to the regulated parties. This argument is flatly contradicted by the 2005 Proposed Rules, in which MSHA stated:

We are interested in comments from the mining community on whether we should include in the final rule, pursuant to Section 101(a)(7) of the Mine Act, a provision requiring a medical evaluation to determine a miner's ability to use a respirator before the miner is fit tested or required to work in an area of the mine where respiratory protection must be used under the final limits. In addition, we are seeking comments on whether the final rule should contain a requirement for transfer of a miner to an area of the mine

where respiratory protection is not required if a medical professional has determined in the medical evaluation that the miner is unable to wear a respirator for medical reasons.

70 Fed. Reg. at 53,289. MSHA also included the full text of the proposed rules regarding medical evaluation and transfer rights. *Id.* Thus, the petitioners' contention that MSHA pulled a "surprise switcheroo" by including these provisions in the 2006 Rules is groundless.

Petitioners also contend that MSHA lacked statutory authority to adopt the medical evaluation and transfer requirements. The Mine Act expressly permits MSHA to require medical evaluations and transfers "where appropriate." 30 U.S.C. § 811(a)(7). In the 2006 Rules, MSHA reasonably concluded that such provisions were "appropriate." With respect to medical evaluations, MSHA relied upon an OSHA study that found that "use of a respirator may place a physiological burden on a worker while wearing such a device." 71 Fed. Reg. at 28,986. Given that respirators could potentially cause "illness, injury, and in some instances, even death," MSHA reasonably concluded that miners should be provided with medical examinations before they are required to wear respirators. *Id.* at 28,986-87. Similarly, MSHA determined that it was "appropriate" to require transfers with pay protection for workers who are physically unable to wear respirators (but only to an "existing" job, not a new position). *Id.* at 28,987-91. If the rules did not provide transfer rights, miners might attempt to wear respirators – despite the risks of doing so – in order to protect their jobs. *Id.* at 28,990. MSHA reasonably concluded that the transfer rights would "remove the fear of reprisals" for such workers. *Id.* Petitioners argue that MSHA was required to do a full cost-benefit analysis before it could grant medical evaluation and transfer rights. However, the Mine Act contains no such requirement – it only requires that these provisions be

“appropriate.” MSHA easily met its burden of showing the appropriateness of these provisions.

* * *

Finally, petitioners argue that in the 2006 Rules MSHA impermissibly reduced the length of the phase-in period for the final exposure limits from what was proposed in 2005. We find this contention to be without merit because MSHA’s final implementation timetable was a “logical outgrowth” of the proposed rules. At the time the proposed rules were issued in 2005, the final DPM limit of 160 TC was scheduled to go into effect in January 2006. In the proposed rules, MSHA sought comments about whether the agency should “stagger the effective dates for implementation of the final DPM limit, phased-in over a five year period” between 2006 and 2011. 70 Fed. Reg. at 53,288. The proposed rules also stated:

We request comments on whether five years is the correct timeframe for reducing miners’ exposures to the 160 micrograms of TC as originally established in the 2001 standard and to have been effective in January 2006.

Id. In the 2006 Rules, MSHA ultimately chose an effective date of May 2008 for the final limit. 71 Fed. Reg. at 28,978. This choice essentially splits the difference between the original effective date (January 2006) and the proposed effective date (January 2011). This Court has found the “logical outgrowth” test to be satisfied in similar circumstances. In *Husqvarna v. EPA*, 254 F.3d 195, 203 (D.C. Cir. 2001), we held that a four-year phase-in period for certain EPA rules was “a logical outgrowth of the proposed five-year implementation schedule.” Just so here. We hold that the final two-year phase in period for the 160 TC final limit was a logical outgrowth of the proposed five-year phase in period.

VI.

For the aforementioned reasons, we deny the petitions for review in their entirety. MSHA's risk assessment was based upon evidence in the record that workers who are exposed to high levels of DPM face increased risks of lung cancer and other adverse health effects. The agency's selection of total carbon and elemental carbon as surrogates for DPM was based upon evidence that TC and EC are closely correlated with DPM and that there are reliable conversion ratios between DPM, TC, and EC. And MSHA offered more than enough evidence in support of its conclusion that mine operators can feasibly comply with the DPM exposure limits. Our standard of review is deferential, and we can find nothing in the administrative record that would justify second-guessing the agency's conclusions. The petitions for review are therefore

Denied.