United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued January 26, 1998 Decided April 3, 1998

No. 96-1234

Columbia Falls Aluminum Company, et al.,

Petitioners

v.

Environmental Protection Agency and

Carol M. Browner, Administrator,

Respondents

Reynolds Metals Company, et al.,

Intervenors

Consolidated with

Nos. 97-1044, 97-1558, 97-1724

On Petitions for Review of Orders of the

Environmental Protection Agency

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Lester Sotsky argued the cause for petitioners. With him on the briefs was Jonathan S. Martel. Andrew S. Ratzkin entered an appearance.

Steven E. Silverman, Attorney, Environmental Protection Agency, argued the cause for respondents. With him on the brief were Lois J. Schiffer, Assistant Attorney General, U.S. Department of Justice, and Daniel R. Dertke, Attorney.

Michael W. Steinberg argued the cause for intervenors Reynolds Metals Company, et al. With him on the brief were Joshua D. Sarnoff, Loren R. Dunn and David R. Case. Lowell F. Martin and Michael A. McCord entered appearances.

Before: Ginsburg, Henderson, and Randolph, Circuit Judges.

Opinion for the Court filed by Circuit Judge Randolph.

Randolph, Circuit Judge: These consolidated petitions, brought by small manufacturers of aluminum, challenge three rules of the Environmental Protection Agency, promulgated pursuant to s 3004 of the Resource Conservation and Recovery Act of 1976 ("RCRA"), Pub. L. No. 94-580, 90 Stat. 2795. The rules establish a treatment standard for "spent potliner"--a byproduct of primary aluminum reduction--and prohibit its land disposal if it is untreated. Because EPA's test for determining compliance with its spent potliner treatment standard is arbitrary and capricious, we vacate and remand. In all other respects, we deny the petitions for review.

I. BACKGROUND

A. Statute and Regulations

Subtitle C of RCRA establishes a comprehensive regulatory scheme governing the treatment, storage, and disposal of hazardous wastes. Wastes are considered hazardous if they possess one of four characteristics (ignitability, corrosivity, reactivity, and toxicity) or if EPA lists them as hazardous following a rulemaking. See 42 U.S.C. s 6921(a); 40 C.F.R. pt. 261. Once a waste is listed or identified as hazardous,

every aspect of its existence is regulated under Subtitle C. See Chemical Waste Management, Inc. v. EPA, 976 F.2d 2, 8 (D.C. Cir. 1992).

In 1984 Congress adopted the Hazardous and Solid Waste Amendments ("Amendments"), Pub. L. No. 98-616, 98 Stat. 3221, shifting "the focus of hazardous waste management away from land disposal to treatment alternatives." American Petroleum Inst. v. EPA, 906 F.2d 729, 733 (D.C. Cir. 1990). The Amendments prohibit land disposal of hazardous wastes unless one of two conditions is satisfied: either the waste is treated to comply with standards promulgated under RCRA s 3004(m), or EPA determines that hazardous constituents will not "migrate" from the disposal unit. RCRA s 3004(g)(5), 42 U.S.C. s 6924(g)(5). Section 3004(m) provides that EPA must specify "those levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized." 42 U.S.C. s 6924(m)(1).1 If hazardous wastes are treated to the level or by the method specified under s 3004(m), they are not subject to the land disposal prohibitions. 42 U.S.C. s 6924(m)(2).

The 1984 Amendments did not ban all land disposal outright. With the exception of two categories of hazardous wastes for which Congress imposed earlier restrictions,2 EPA had to implement the land disposal prohibition in three phases for all wastes identified or listed as hazardous as of the time of the 1984 Amendments. See generally Hazardous

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1 In its first rulemaking to implement the Amendments, EPA considered both risk-based and technology-based treatment standards. Ultimately, EPA selected standards based on the performance of the best demonstrated available technology ("BDAT"). See Hazardous Waste Treatment Council v. EPA, 886 F.2d 355 (D.C. Cir. 1989) (upholding BDAT as a reasonable interpretation of s 3004(m) but remanding for fuller explanation).

2 These two categories are solvents and dioxins, see s 6924(e), and the so-called California List wastes, see s 6924(d).

Waste Treatment Council v. EPA, 886 F.2d 355, 357 & n.1 (D.C. Cir. 1989). To guarantee promptness, a statutory "hard hammer" fell on May 8, 1990. 42 U.S.C. s 6924(g)(6)(C). Hazardous wastes for which EPA failed to issue regulations by that date were subject to an absolute ban on land disposal. For newly identified or listed hazardous wastes, the statute required EPA to promulgate prohibitions and treatment standards within six months of the date of listing or identification. RCRA s 3004(g)(4), 42 U.S.C. s 6924(g)(4). EPA may delay the effective date of the land disposal prohibition until the earliest date that "adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment" is available, but in any event no longer than two years. RCRA s 3004(h)(2), 42 U.S.C. s 6924(h)(2). This is known as a "national capacity variance." Applicants may request an extension of the effective date for up to one year, renewable once for no more than one additional year. RCRA s 3004(h)(3), 42 U.S.C. s 6924(h)(3).

B. Spent Potliner

All aluminum in the United States is produced by dissolving alumina (aluminum oxide) in a molten cryolite bath and then introducing a direct electric current to reduce the alumina to aluminum metal. The reduction takes place in electrolytic cells, called pots, consisting of a steel shell lined with brick with an inner lining of carbon. The carbon lining is up to 15 inches thick and serves as the cathode for the electrolysis process. During a service life of four to seven years, the carbon lining absorbs the cryolite solution and degrades. Once a liner cracks, the pot is emptied and cooled. The steel shell is stripped away, leaving a large solid block of carbon--a "spent potliner." 3 An estimated 100,000 to 125,000 metric tons are produced each year. See 62 Fed. Reg. 1991, 1993 (1997).

The listing of spent potliner--assigned hazardous waste code K088--has a tangled history. EPA originally listed K088 in 1980 because it contained high concentrations of

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3 A more detailed description is found in 56 Fed. Reg. 32,993, 33,002 (1991).

cyanide. See 45 Fed. Reg. 47,832 (1980). Before the regulations took effect, Congress enacted the Solid Waste Disposal Act of 1980, Pub. L. No. 96-482, 94 Stat. 2334, which included a provision named after its sponsor, Congressman Tom Bevill of Alabama. The Bevill Amendment excluded mining wastes from Subtitle C regulation until EPA had conducted a study of the "adverse effects" of such wastes. See RCRA s 8002(p), 42 U.S.C. s 6982(p). EPA interpreted the Bevill Amendment to include "solid wastes generated during the smelting and refining of ores and minerals" and suspended its listing of spent potliner. See 46 Fed. Reg. 4614, 4615 (1981). When litigation ensued, EPA announced a proposed reinterpretation narrowing the scope of the Bevill exclusion. See 50 Fed. Reg. 40,292 (1985). EPA then changed its mind, withdrew its proposed reinterpretation, and was sued again. In Environmental Defense Fund v. EPA, this court ordered the Agency to relist spent potliner by August 31, 1988. 852 F.2d 1316, 1331 (D.C. Cir. 1988). The Agency complied, see 53 Fed. Reg. 35,412 (1988), but missed the six-month statutory deadline for promulgating land disposal restrictions and treatment standards. As the result of another suit filed by EDF, EPA signed a consent decree requiring it to promulgate a final rule establishing land disposal restrictions for spent potliner by June 30, 1996. See EDF v. Reilly, No. 89-0598 (D.D.C.).

In April 1996, EPA promulgated the first of three rules challenged here. The Rule prohibited land disposal of spent potliner unless the waste satisfied the s 3004(m) treatment standard established in the same rulemaking. See 61 Fed. Reg. 15,566 (Apr. 8, 1996). The April 1996 Rule also granted a nine-month national capacity variance pursuant to s 3004(h)(2) "to allow facilities generating K088 adequate time to work out logistics." 61 Fed. Reg. at 15,589.

At the time of the April 1996 rulemaking, only Reynolds Metals Company was engaged in full-scale treatment of spent potliner. Reynolds, an intervenor in this case, had begun treating spent potliner at its facility in Gum Springs, Arkansas several years before any rule was proposed. See Brief for Intervenors at 4. The Reynolds treatment process involves

crushing spent potliner to particle size and adding roughly equal parts limestone and brown sand.4 According to Reynolds, the brown sand prevents the mixture from clogging in the kiln and the limestone reacts with the fluoride in spent potliner to transform it into relatively insoluble calcium fluoride. See 56 Fed. Reg. 32,993, 33,003 (1991); see also 56 Fed. Reg. 55,160, 55,180 (1991) (discussing potential for slagging or clogging in thermal treatment of spent potliner). The mixture is fed into a thermal rotary kiln that is 250 feet in length and 9.5 feet in diameter. Natural gas heats the kiln to 1200 degrees Fahrenheit. When the material exits the kiln, it is cooled and then deposited in an on-site monofill.

Under its "derived from" rule, EPA listed the kiln residue as hazardous because it was generated from the treatment of a hazardous waste. See 40 C.F.R. s 261.3(c)(2)(i). In August 1989, Reynolds petitioned EPA to "delist" its kiln residue--exempt it from the list of hazardous wastes--maintaining that the treated residue was no longer hazardous. EPA granted Reynolds' delisting petition pursuant to RCRA s 3001(f), 42 U.S.C. s 6921(f). See 56 Fed. Reg. 67,197 (1991). The delisting allowed Reynolds to dispose of treated spent potliner in non-Subtitle C units. EPA recognized that although it was not specifying a particular technology, as a practical matter Reynolds would wind up treating most spent potliner because Reynolds provided "virtually all existing treatment capacity." 62 Fed. Reg. at 1993.

The April 1996 Rule for spent potliner established a treatment standard expressed as numerical concentration limits for various constituents in the waste. The constituents included cyanide, toxic metals, a group of organic compounds called polycyclic aromatic hydrocarbons (PAHs), and fluor-

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4 Brown sand is an alkaline mud generated in the process of extracting alumina from bauxite. Reynolds had previously operated a bauxite mine and had stockpiled large quantities of brown sand. See 56 Fed. Reg. at 33,003.

ide.5 EPA explained that most of these limits were equivalent to universal treatment standards, which it developed "by evaluating all existing Agency data from various technologies." 6 April 1996 Rule, 61 Fed. Reg. at 15,585; see also 40 C.F.R. s 268.48 ("Universal Treatment Standards" Table). The exception was fluoride, for which the concentration limit was based on data submitted in Reynolds' delisting petition. The standards for cyanide and the organic constituents were based on a "total composition concentration analysis." 61 Fed. Reg. at 15,584. For fluoride and the metals, including arsenic, treatment standards were expressed in terms of the Toxicity Characteristic Leaching Procedure or TCLP. Id.

Because EPA's use of the TCLP is pivotal to the case, it will be helpful to examine the test in some depth. EPA developed the TCLP in response to a congressional directive in the 1984 Amendments to improve its then-existing toxicity characteristic test by making changes "necessary to insure that it accurately predicts the leaching potential of wastes which pose a threat to human health and the environment

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5 Key treatment standards for non-wastewater forms of K088 were established as follows:

arsenic	5.0 mg/l TCLP
cyanide (total)	590 mg/kg
cyanide (amenable)	30 mg/kg
fluoride	48 mg/l TCLP

See 40 C.F.R. s 268.40, "Treatment Standards for Hazardous Wastes" Table. Fluoride itself is not a hazardous constituent, but EPA decided to regulate it because it "is capable of causing substantial harm in the form of groundwater degradation, adverse ecological effects and potential adverse human health effects. The Agency's view thus is that, unless fluoride in this waste is treated, the legal standard in section 3004(m) would not be satisfied." 61 Fed. Reg. 15,566, 15,585 (1996).

6 "A universal standard is a single concentration limit established for a specific constituent regardless of the waste matrix in which it is present, i.e., the same treatment standard applies to a particular constituent in each waste code in which it is regulated." Proposed Best Demonstrated Available Technology (BDAT) Background Document for Spent Potliners From Primary Aluminum Reduction--K088 (Jan. 13, 1995).

when mismanaged." 42 U.S.C. s 6921(g). See generally Edison Electric Inst. v. EPA, 2 F.3d 438, 442 (D.C. Cir. 1993) (discussing EPA's promulgation of revised toxicity characteristic test). The TCLP is designed to simulate the mobility or leachability of toxic constituents into groundwater following disposal of a hazardous waste in a municipal solid waste landfill.7 In 1990 EPA adopted the TCLP as the required test for measuring the mobility of toxic metals in all solid wastes. See 55 Fed. Reg. 11,798 (1990).

For solid wastes, the TCLP involves reducing a sample of the waste to particle size and mixing it with an extraction fluid. One of two extraction fluids is used depending on the alkalinity of the waste being tested. See 51 Fed. Reg. 21,648, 21,655-56 (1986). Any solid is then discarded and the remaining liquid, called the TCLP extract, is analyzed for toxic contaminants. A solid waste exhibits the characteristic of toxicity if it contains any one of a number of contaminants specified by EPA at a concentration equal to or greater than the regulatory level. See 40 C.F.R. s 261.24 & Table 1 (Maximum Concentration of Contaminants for the Toxicity Characteristic). For example, the regulatory level for arsenic is 5.0 mg/l. A waste would be considered toxic--and thus hazardous--if, when measured by the TCLP, it revealed a concentration of arsenic equal to or greater than 5.0 mg/l. Use of the TCLP is widespread in EPA's regulations implementing land disposal restrictions. For all wastes covered by waste extract standards, the TCLP is used to measure compliance. See 40 C.F.R. s 268.40(b).

Without any formal notice and comment, EPA promulgated the second spent potliner rule in January 1997, just as the first national capacity variance was due to expire. See 62

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7 Leaching is the process whereby constituents in the waste become suspended or dissolved in liquids, such as rainwater, that percolate through the waste. Leachate is a fluid containing these components drawn from the original waste. In some cases, solubility--the degree to which a chemical dissolves in water--depends on the pH of the medium. Some compounds are more soluble in highly alkaline conditions and others are more soluble in highly acidic conditions.

Fed. Reg. 1992 (Jan. 14, 1997) ("January Rule"). Entitled "Emergency Extension of the K088 Capacity Variance," the January Rule stated that "unanticipated performance problems" were causing the Agency to postpone implementing the land disposal prohibition for an additional six months. EPA explained that "notwithstanding that the wastes as tested by the TCLP would have complied with the land disposal restriction treatment standards for the non-wastewater forms of K088, actual sampling data shows potentially high concentrations of hazardous constituents in the leachate" from Reynolds' landfill. 62 Fed. Reg. at 1993.8 The length of the extension was based on EPA's estimate of the time it would take to "modify, evaluate, and correct the current deficiencies in treatment performance." Id. at 1992. EPA admitted that it "was not aware of these data until recently, and in particular was not aware of these data during the rulemaking which established the K088 treatment standard." Id. at 1993 n.6.

In July 1997, EPA announced that "Reynolds' treatment (albeit imperfect) does reduce the overall toxicity associated with the waste" and consequently was an improvement over the disposal of untreated spent potliner. 62 Fed. Reg. at 37,696. Because Reynolds agreed to give up its delisting and manage the treated waste in a landfill subject to Subtitle C safeguards, the Agency decided that "protective disposal capacity exists." Id. at 37,697. It authorized a three-month extension of the national capacity variance to give generators time to make arrangements with Reynolds. Id. On October 8, 1997, the extension ended and the prohibition on land disposal of untreated spent potliner took effect.

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8 EPA reported the following levels in actual leachate as measured in September 1996:

total cyanide	46.5 mg/l
arsenic	6.55 mg/l
fluoride	45 mg/l

Id.

II. JURISDICTIONAL AND PROCEDURAL ISSUES

Before we get to the merits two issues must be resolved. The first is whether requests petitioners filed with EPA for reconsideration deprive this court of jurisdiction. The second is whether petitioners' challenges to the treatment standard are confined to the record before EPA at the time of the April 1996 rulemaking.

A. The Effect of Pending Requests

Timely petitions for judicial review of the April 1996, January 1997, and July 1997 Rules were respectively filed on July 6, 1996, January 21, 1997, and September 15, 1997. See 42 U.S.C. s 6976(a)(1) (establishing 90-day filing window). While these petitions for judicial review were pending, petitioners submitted to EPA a "Petition for Amendment of Land Disposal Restrictions Phase III--Spent Potliner" on July 9, 1996, and a "Petition for Amendment of RCRA Rule Regarding Spent Potliner" on April 11, 1997.

A party's pending request for agency reconsideration renders "the underlying action nonfinal, regardless of the order of filing" with respect to that party. Wade v. FCC, 986 F.2d 1433, 1434 (D.C. Cir. 1993); see also TeleSTAR, Inc. v. FCC, 888 F.2d 132 (D.C. Cir. 1989); United Transp. Union v. ICC, 871 F.2d 1114 (D.C. Cir. 1989). Thus, if petitioners' filings at EPA sought agency reconsideration, they would operate to deprive this court of jurisdiction over the July 6, 1996, and January 21, 1997, petitions for judicial review. They would not affect the September 15, 1997, petition for judicial review, which challenged EPA's July Rule, because the filings dealt solely with the rules promulgated earlier.

A request for a new rulemaking, however, would not pose any problem for our subject matter jurisdiction. See American Mining Congress v. EPA, 907 F.2d 1179, 1185 (D.C. Cir. 1990). Once a rule is final, an agency can amend it only through a new rulemaking. See American Petroleum, 906 F.2d at 739-40. In this case, EPA promulgated both a treatment standard, which it treated as a final rule, and a national capacity variance, which it extended twice. Since

petitioners' filings with the Agency not only attacked the treatment standard but also requested an extension of the existing national capacity variance, it is hard to characterize them as solely requests for reconsideration, or for a new rulemaking. RCRA's provision governing agency petitions does not distinguish among requests for "promulgation, amendment, or repeal." 42 U.S.C. s 6974(a). We shall therefore assume, arguendo, that petitioners sought agency reconsideration.

After the submission of briefs in this case but before oral argument, petitioners informed EPA that they were "hereby withdraw[ing] any and all such" requests then pending.9 Attachment to Petition for Review (Dec. 17, 1997). They immediately filed a new petition for judicial review and a motion to consolidate it with the earlier petitions, which we granted. Petitioners' actions, although late in the day, have cured the jurisdictional defect. See United Transp. Union, 871 F.2d at 1118; TeleSTAR, 888 F.2d at 134. Their new petition, filed on December 17, 1997, is timely with respect to the April 1996 and January 1997 Rules because the 90-day statute of limitations was tolled by the pending administrative requests for reconsideration. See Stone v. INS, 514 U.S. 386, 392 (1995); ICC v. Brotherhood of Locomotive Eng'rs, 482 U.S. 270, 284-85 (1987). Although neither Stone nor Locomotive Engineers addressed the situation of a party withdrawing a request for reconsideration, rather than the agency taking final action on it, this court recently held that withdrawal had the same effect on the time within which to appeal. "We see no reason why the principles of the general tolling rule should not be applied when an optional administrative petition to reconsider is withdrawn rather than being acted upon by the agency." Los Angeles SMSA Ltd. Partnership v. FCC, 70 F.3d 1358, 1359 (D.C. Cir. 1995).

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9 EPA conceded at oral argument that any jurisdictional defect was cured by the withdrawal of the pending petitions. It is, of course, this court's duty to satisfy itself of jurisdiction independently. See Bender v. Williamsport Area Sch. Dist., 475 U.S. 534, 541 (1986).

B. Record Under Review

The second preliminary issue relates to the record. EPA objects that petitioners' claims are based on information not available to it at the time the first spent potliner rule was issued in April 1996. See Brief for Respondents at 23-28. The Agency contends that petitioners waived their objections to the treatment standard because they failed to raise them during the original rulemaking, and that review is limited to the administrative record compiled at that time. According to EPA, it never reopened the issue of the treatment standard in the January or July 1997 rulemakings, and thus review of evidence discovered after the April 1996 rule is foreclosed. Id. at 27.

Undoubtedly, new information calling into question the efficacy of the treatment standard and the Reynolds process prompted many of petitioners' current challenges. Petitioners cannot be deemed to have waived these claims by failing to present them in April 1996. While judicial review should be based on the full administrative record before an agency at the time of its decision, see Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402 (1971); Walter O. Boswell Memorial Hosp. v. Heckler, 749 F.2d 788, 792 (D.C. Cir. 1984), there are at least two ways in which the record developed after the April 1996 Rule is properly before us. Although we are concerned not with the timeliness of the petitions--each petition for judicial review was timely with respect to the rule it challenged--but with the content of the decisionmaking record, our analysis draws on the law regarding the time limits for seeking review.

First we look to the doctrine of reopening. When "an agency's actions show that it has not merely republished an existing rule ... but has reconsidered the rule and decided to keep it in effect, challenges to the rule are in order." Public Citizen v. Nuclear Regulatory Comm'n, 901 F.2d 147, 150 (D.C. Cir. 1990). Reopening may be explicit, or it may be implicit. See Kennecott Utah Copper Corp. v. United States Dep't of Interior, 88 F.3d 1191 (D.C. Cir. 1996); State of Ohio v. EPA, 838 F.2d 1325 (D.C. Cir. 1988).

Statements made in the January 1997 Rule, which the July 1997 Rule referred to as a "notice," 62 Fed. Reg. at 37,695, indicate that EPA was considering whether environmental performance was so dismal that the treatment standard should be re-written. Given the new information about the actual results at the Reynolds facility, it would have been surprising if EPA had no second thoughts. "In almost all cases," EPA stated in January 1997, "simply meeting the treatment standards" suffices for s 3004(m), but "where treatment is not operating so as to reduce environmental availability of key hazardous constituents appreciably ... the Agency must question the adequacy of the treatment." 62 Fed. Reg. at 1994. EPA cautioned that its action should not be read "to vitiate a treatment standard whenever treatment performance turns out in practice to be less than predicted by analytic protocols such as the TCLP," id., thus implying that in this particular case poor performance had undermined EPA's confidence in its treatment standard.

EPA's reopening of its fluoride concentration limit, which had been based on the data in the Reynolds' delisting petition, was more explicit. In the January Rule, EPA noted that it "may have to ultimately revise the treatment standard for fluoride.... EPA will be seeking more information to more fully characterize the treatment process for fluoride during the extended national capacity variance period." 62 Fed. Reg. at 1995 n.13.

That EPA reopened the entire spent potliner treatment standard becomes all the more apparent when one considers that the question whether to extend the national capacity variance under s 3004(h)--which EPA insists was the sole focus of its January and July 1997 rulemakings--is inextricably linked with the question whether the s 3004(m) treatment standard worked. EPA now denies this, saying that the "protective" standard of s 3004(h) alone controls the determination whether there is adequate disposal capacity. Brief for Respondents at 38. But the Agency said something quite different when these matters were before it. In its July Rule, EPA described the issue confronting it not as one of "adequate volume of treatment capacity," but as "environ-

mental adequacy, specifically whether treatment satisfies the requirements of section 3004(m) which says that treatment is to be sufficient to minimize threats to human health and the environment posed by land disposal of the waste, and section 3004(h)(2) which says that to be adequate treatment and disposal capacity must be protective of human health and the environment." 62 Fed. Reg. at 37,695. EPA itself announced that its "January notice" was "premised on two factors: 1) treatment performance that was less than predicted through the use of models in the delisting proceeding and (for constituents whose treatment is measured by the TCLP protocol) the [land disposal restriction] treatment standard; and 2) unsafe disposal.... The two rationales are linked and influence one another." Responses to Major Comments for Waste K088 (July 7, 1997).

Once an agency reopens an issue, whether by soliciting comments or indicating a willingness to reconsider, "a new review period is triggered." Kennecott, 88 F.3d at 1213. By the same token, once an agency reopens, the record before the agency at the time of reopening may be reviewed by the court. Because EPA reopened the treatment standard, the record developed at the time of the January and July rulemakings is the record for the purpose of judicial review.

The same result may be reached by a different route. RCRA provides that a petition for review may be filed after the ninetieth day if "based solely on grounds arising after such" date. 42 U.S.C. s 6976(a)(1). See Natural Resources Defense Council, Inc. v. EPA, 907 F.2d 1146, 1165 (D.C. Cir. 1990). With respect to a similar provision in the Clean Air Act, we said that the provision was designed to "assure that standards were revised whenever necessary" on the basis of new information. Oljato Chapter of Navajo Tribe v. Train, 515 F.2d 654, 660 (D.C. Cir. 1975). Oljato laid out, as a precondition, "presentation to the Administrator of any new information thought to justify revision of a standard of performance." Id. at 666.

What occurred here satisfied the Oljato standard. After issuing its April 1996 Rule, new data came to EPA's attention by the fall of 1996. EPA published the data in its January 1997 Rule. 62 Fed. Reg. at 1993. Petitioners also submitted to EPA numerous comments and petitions, now withdrawn, discussing the implications of these developments. Although EPA did not formally act on petitioners' submissions, it did respond to comments, saying it was "considering these questions ... but not in the context of the present proceeding." In Group Against Smog & Pollution, Inc. v. EPA, we held that evidence "submitted in the form of comments ... rather than in a formal petition" satisfied the procedural requirements because the agency "appear[ed] here to have taken heed of petitioners' comments." 665 F.2d 1284, 1290 (D.C. Cir. 1981). For the purpose of our inquiry, it is important only that the information was presented to EPA at the time it decided against altering the treatment standard. Whether EPA's decision to stand pat represented a decision not to reconsider the standard is, in light of the information known to EPA at that time, a distinction having no bearing on our review of the record.

III. MERITS

With one exception, petitioners' objections are not well-taken. They charge EPA with having improperly adopted Reynolds as the "best demonstrated available technology" ("BDAT") instead of superior vitrification technology. See Brief for Petitioners at 19. Our review of the proposed spent potliner rule and the background documents does not bear this out. For everything other than fluoride, EPA did not base its concentration limits on Reynolds' numbers. It used universal treatment standards and made explicit its understanding that "any treatment technology (other than impermissible dilution) can be used to achieve those levels." April 1996 Rule, 61 Fed. Reg. at 15,585. EPA is correct that petitioners have confused the treatment standard with the

performance of the Reynolds treatment process. See Brief for Respondents at 28. We also find that comments submitted to EPA in 1992 in response to its Advanced Notice of Proposed Rulemaking did not sufficiently alert the Agency to potential problems with the use of the TCLP for alkaline wastes such as spent potliner. See Comalco On-Site Engineering Report.

This brings us to petitioners' serious and substantial criticism of the TCLP, a criticism based on evidence that came to light after the April 1996 rulemaking. It was, petitioners believe, arbitrary and capricious for EPA to continue using the TCLP to measure compliance with the treatment standard once it knew that the test was not an accurate predictor of the mobility of toxic constituents in the actual leachate.

As discussed above, the concentration limits for fluoride and the toxic metals in spent potliner are expressed in terms of the TCLP. See 40 C.F.R. s 268.40. Thus the TCLP cannot be divorced from the standard itself. Because these constituents cannot be destroyed, the goal of treatment is to minimize their mobility. The treatment standard is in fact a model intended to predict the degree to which these constituents will leach following disposal. The problem, as EPA has admitted, is that the model does not work. The leachate "generated from actual disposal of the treatment residues is more hazardous than initially anticipated." 62 Fed. Reg. at 37,695. When tested by the TCLP, the treated spent potliner exhibited numbers that were lower than the regulatory levels for toxic constituents, but tests of the actual leachate revealed numbers above the concentration limits. Arsenic, which has a treatment standard of 5.0 mg/l TCLP, was present in the leachate at 6.55 mg/l. Fluoride has a concentration limit of 48 mg/l TCLP, but a leachate concentration of 2228 mg/l. In its proposal to revoke the delisting of Reynolds' treated spent potliner, EPA described the "residue leachate concentrations" as "orders of magnitude higher than the average predicted

TCLP leachate values." 62 Fed. Reg. 41,005, 41,008-09 (1997).

EPA attributes the failure of the TCLP to several factors. It acknowledged in the January Rule that the "extreme alkaline pH conditions that exist in the Gum Springs monofill were not anticipated by the Agency and are not analogous to" conditions simulated by the TCLP. 62 Fed. Reg. at 1994. The TCLP is premised on a "generic mismanagement scenario" in which hazardous waste is deposited in a municipal solid waste landfill, where other wastes would act as buffer agents. See 51 Fed. Reg. at 21,654-55; see also Edison Electric, 2 F.3d at 445 (describing mismanagement scenario for the TCLP). Reynolds disposes of treated spent potliner in a monofill--a landfill receiving only spent potliner--where the high pH level remains undiluted. In the July 1997 Rule, EPA stated:

> In hindsight, it is now apparent that spent potliners are themselves highly alkaline and contain cyanide, arsenic, and fluoride--constituents which are most soluble under alkaline pH.... EPA had failed to take into account the effect of alkaline disposal conditions on potliners and potliner treatment residues when promulgating ... the treatment standard for K088 wastes....

62 Fed. Reg. at 37,695. Despite these flaws, the Agency concluded: "Although it is now apparent that the TCLP is not a good model for disposal conditions to which K088 would be subject, the treatment standard still requires use of the TCLP and any results so obtained that do not exceed the treatment standard are in compliance." 62 Fed. Reg. at 37,696 n.12.

We cannot make sense of EPA's conclusion. Why should the treatment standard for spent potliner be maintained when that standard has no correlation to the actual fate of toxic constituents upon disposal? Petitioners ask this question; EPA gives no good answer. An agency's use of a model is

arbitrary if that model "bears no rational relationship to the reality it purports to represent." American Iron & Steel Inst. v. EPA, 115 F.3d 979, 1005 (D.C. Cir. 1997) (quotations and citations omitted). Models need not fit every application perfectly, nor need an agency "justify the model on an ad hoc basis for every chemical to which the model is applied." Chemical Mfrs. Ass'n v. EPA, 28 F.3d 1259, 1265 (D.C. Cir. 1994). If, however, "the model is challenged, the agency must provide a full analytical defense." Eagle-Picher Indus., Inc. v. EPA, 759 F.2d 905, 921 (D.C. Cir. 1985); see also Natural Resources Defense Council, Inc. v. Herrington, 768 F.2d 1355, 1385 (D.C. Cir. 1985). Furthermore, EPA "retains a duty to examine key assumptions as part of its affirmative burden of promulgating and explaining a non-arbitrary, non-capricious rule." Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 534 (D.C. Cir. 1983). Here EPA knows that "key assumptions" underlying the TCLP are wrong and yet has offered no defense of its continued reliance on it.

In Edison Electric Institute v. EPA, petitioners challenged the application of the TCLP to mineral wastes. We held that the TCLP "must bear some rational relationship to mineral wastes in order for the Agency to justify the application of the toxicity test to those wastes." 2 F.3d at 446. Finding no evidence "that mineral wastes were exposed to conditions similar to those simulated by the TCLP," we ordered a remand "to allow the Agency to provide a fuller and more reasoned explanation for its decision." Id. at 447. Similarly, in Chemical Manufacturers Ass'n, we vacated a rule premised on a "generic air dispersion model" when applied to a chemical which evidence indicated was a solid, not a gas, at the relevant temperature. 28 F.3d at 1264. "For want of a rational relationship between the model and the molecule, we hold that the rule ... is arbitrary and capricious." Id. at 1266.

In this case, there is not only no evidence that treated spent potliner is exposed to the disposal conditions that the

TCLP simulates, but all available evidence indicates that the treated residue is disposed of in quite different circumstances. It is impossible to say at this point whether the TCLP would be an inaccurate predictor for spent potliner's leachability following all forms of treatment. Certain aspects of the Reynolds treatment process--disposal in a dedicated monofill and the additives it uses--increase alkalinity. The TCLP may or may not work well for other spent potliner treatment technologies.

EPA argues that it could have made a "per se finding that because Reynolds' process met the treatment standard it automatically provided protective capacity." Brief for Respondents at 37. Instead it "examined the actual performance ... and the actual disposal" and concluded that the Reynolds process provides "substantial treatment" because it destroys most of the cyanide and all of the PAHs. Id. at 37, 40. This does not amount to a justification of the use of the TCLP. For a treatment standard to work, it must be reasonably accurate. It would be inefficient and unwise for EPA to assume the burden of investigating environmental data, testing actual leachate, and making ad hoc safety determinations for each facility that treats spent potliner.

We therefore conclude that EPA's use of the TCLP is arbitrary and capricious. As a result, we must vacate the treatment standard itself because the concentration limits for fluoride and the metals, including arsenic, are expressed only in terms of the TCLP. Our decision today does not affect the viability of the concentration limits established for other constituents. Vacating the treatment standard for spent potliner also requires us to vacate the prohibition on land disposal.10 Contrary to EPA's arguments on appeal, see Brief for Respondents at 50-51, we believe Congress intended treatment standards and land disposal restrictions to operate in tandem. The statutory language indicates as much.

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10 Due to EPA's interpretation of the Bevill Amendment, spent potliner was not listed until 1988. It thus escapes the statutory

RCRA s 3004(m) requires that "simultaneously" with the promulgation of prohibitions on land disposal, the Administrator of the EPA shall "promulgate regulations specifying" treatment standards. 42 U.S.C. s 6924(m)(1). These regulations are to "become effective on the same date" as any land disposal prohibition. Id. s 6924(m)(2).

Pragmatic considerations also strongly suggest that the treatment standard and land disposal restriction are intended to work together. Banning land disposal is a relatively simple task, one that could be accomplished by administrative fiat, but promulgating treatment standards is more complicated. To ensure that EPA would act promptly, Congress enacted an absolute deadline of May 8, 1990--the so-called "hard hammer"--for all hazardous wastes listed or identified as of the time of the 1984 Amendments. This was a powerful incentive for regulatory action because a ban on land disposal without a means of treatment would threaten the closure of entire industries. Under RCRA s 3004(j), generators of a waste prohibited from land disposal are also barred from storing it. See Steel Mfrs. Ass'n v. EPA, 27 F.3d 642, 647 (D.C. Cir. 1994) (holding that interim treatment standards were justified where operation of hard hammer "effectively would have halted the country's steel production"). If we were to vacate the treatment standard for spent potliner without vacating the prohibition on land disposal, aluminum manufacturers might be forced to cease production.

EPA is of course aware of such consequences. It listed spent potliner in 1988 but failed to meet the six-month statutory deadline for promulgating a land disposal prohibition. The inference is that the Agency delayed banning land disposal until it could develop a treatment standard.

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hard hammer. EPA has stated that it "believes that these previously excluded wastes are 'newly identified' for the purpose of determining applicability of the land disposal prohibitions." 55 Fed. Reg. 22,520, 22,667 (1990).

IV. CONCLUSION

EPA's continued reliance on the TCLP as a means of determining compliance with the treatment standard is arbitrary and capricious. Because the Agency provided no justification for requiring a test it knew to be inaccurate, the petitions for review are granted in this respect. The spent potliner treatment standard and the prohibition on land disposal are vacated and remanded.

Our decision leaves EPA without a regulation governing spent potliner. If EPA wishes to promulgate an interim treatment standard, the Agency may file a motion in this court to delay issuance of this mandate in order to allow it a reasonable time to develop such a standard.

•••••••So ordered.