

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued March 16, 2012

Decided June 8, 2012

No. 11-1045

STATE OF NEW YORK, ET AL.,
PETITIONERS

v.

NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF
AMERICA,
RESPONDENTS

STATE OF NEW JERSEY, ET AL.,
INTERVENORS

Consolidated with 11-1051, 11-1056, 11-1057

On Petitions for Review of Orders
of the Nuclear Regulatory Commission

Monica Wagner, Deputy Bureau Chief, Office of the Attorney General for the State of New York, argued the cause for petitioners States and Prairie Island Indian Community Petitioners. With her on the briefs were *Eric T. Schneiderman*, Attorney General, Office of the Attorney General for the State of New York, *John J. Sipos* and *Janice A. Dean*, Assistant Attorneys General, *Barbara D. Underwood*, Solicitor General, *Brian A. Sutherland*, Assistant Solicitor General of Counsel,

Jeffrey S. Chiesa, Attorney General, Office of the Attorney General for the State of New Jersey, *Kevin P. Auerbacher*, Assistant Attorney General, *Ruth E. Musetto*, Deputy Attorney General, *William H. Sorrell*, Attorney General, Office of the Attorney General for the State of Vermont, *Thea Schwartz*, Assistant Attorney General, *George Jepsen*, Attorney General, Office of the Attorney General for the State of Connecticut, *Robert Snook*, Assistant Attorney General, and *Joseph F. Halloran*.

Geoffrey H. Fettus argued the cause for petitioners the Environmental Groups. With him on the briefs were *Andres J. Restrepo* and *Diane Curran*.

Robert M. Rader, Senior Attorney, U.S. Nuclear Regulatory Commission, argued the cause for respondents. With him on the brief were *John E. Arbab*, Attorney, U.S. Department of Justice, *Stephen G. Burns*, General Counsel, U.S. Nuclear Regulatory Commission, and *John F. Cordes Jr.*, Solicitor.

David A. Repka argued the cause for intervenors Nuclear Energy Institute, et al., in support of respondents. With him on the brief were *Brad Fagg* and *Jerry Bonanno*. *Anne W. Cottingham* entered an appearance.

Before: SENTELLE, *Chief Judge*, TATEL and GRIFFITH, *Circuit Judges*.

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

SENTELLE, *Chief Judge*: Four states, an Indian community, and a number of environmental groups petition this Court for review of a Nuclear Regulatory Commission (“NRC” or “Commission”) rulemaking regarding temporary storage and permanent disposal of nuclear waste. We hold that the

rulemaking at issue here constitutes a major federal action necessitating either an environmental impact statement or a finding of no significant environmental impact. We further hold that the Commission's evaluation of the risks of spent nuclear fuel is deficient in two ways: First, in concluding that permanent storage will be available "when necessary," the Commission did not calculate the environmental effects of failing to secure permanent storage—a possibility that cannot be ignored. Second, in determining that spent fuel can safely be stored on site at nuclear plants for sixty years after the expiration of a plant's license, the Commission failed to properly examine future dangers and key consequences. For these reasons, we grant the petitions for review, vacate the Commission's orders, and remand for further proceedings.

I. Background

This is another in the growing line of cases involving the federal government's failure to establish a permanent repository for civilian nuclear waste. *See, e.g., In re Aiken County*, 645 F.3d 428, 430–31 (D.C. Cir. 2011) (recounting prior cases). We address the Commission's recent rulemaking regarding the prospects for permanent disposal of nuclear waste and the environmental effects of temporarily storing such material on site at nuclear plants until a permanent disposal facility is available.

After four to six years of use in a reactor, nuclear fuel rods can no longer efficiently produce energy and are considered "spent nuclear fuel" ("SNF"). Blue Ribbon Commission on America's Nuclear Future, *Report to the Secretary of Energy* 10–11 (2012). Fuel rods are thermally hot when removed from reactors and emit great amounts of radiation—enough to be fatal in minutes to someone in the immediate vicinity. *Id.* Therefore, the rods are transferred to racks within deep, water-filled pools

for cooling and to protect workers from radiation. After the fuel has cooled, it may be transferred to dry storage, which consists of large concrete and steel “casks.” Most SNF, however, will remain in spent-fuel pools until a permanent disposal solution is available. *Id.* at 11.

Even though it is no longer useful for nuclear power, SNF poses a dangerous, long-term health and environmental risk. It will remain dangerous “for time spans seemingly beyond human comprehension.” *Nuclear Energy Inst., Inc. v. Env'tl. Prot. Agency*, 373 F.3d 1251, 1258 (D.C. Cir. 2004) (per curiam). Determining how to dispose of the growing volume of SNF, which may reach 150,000 metric tons by the year 2050, is a serious problem. *See* Blue Ribbon Commission, *supra*, at 14. Yet despite years of “blue ribbon” commissions, congressional hearings, agency reports, and site investigations, the United States has not yet developed a permanent solution. That failure, declared the most recent “blue ribbon” panel, is the “central flaw of the U.S. nuclear waste management program to date.” *Id.* at 27. Experts agree that the ultimate solution will be a “geologic repository,” in which SNF is stored deep within the earth, protected by a combination of natural and engineered barriers. *Id.* at ix, 29. Twenty years of work on establishing such a repository at Yucca Mountain was recently abandoned when the Department of Energy decided to withdraw its license application for the facility. *Id.* at 3. At this time, there is not even a prospective site for a repository, let alone progress toward the actual construction of one.

Due to the government’s failure to establish a final resting place for spent fuel, SNF is currently stored on site at nuclear plants. This type of storage, optimistically labeled “temporary storage,” has been used for decades longer than originally anticipated. The delay has required plants to expand storage pools and to pack SNF more densely within them. The lack of

progress on a permanent repository has caused considerable uncertainty regarding the environmental effects of temporary SNF storage and the reasonableness of continuing to license and relicense nuclear reactors.

In this case, petitioners challenge a 2010 update to the NRC's Waste Confidence Decision ("WCD"). The original WCD came as the result of a 1979 decision by this court remanding the Commission's decision to allow the expansion of spent-fuel pools at two nuclear plants. *Minnesota v. NRC*, 602 F.2d 412 (D.C. Cir. 1979). In *Minnesota*, we directed the Commission to consider "whether there is reasonable assurance that an off-site storage solution [for spent fuel] will be available by . . . the expiration of the plants' operating licenses, and if not, whether there is reasonable assurance that the fuel can be stored safely at the sites beyond those dates." *Id.* at 418. The WCD is the Commission's determination of those risks and assurances.

The original WCD was published in 1984 and included five "Waste Confidence Findings." Briefly, those findings declared that: 1) safe disposal in a mined geologic repository is technically feasible, 2) such a repository will be available by 2007–2009, 3) waste will be managed safely until the repository is available, 4) SNF can be stored safely at nuclear plants for at least thirty years beyond the licensed life of each plant, and 5) safe, independent storage will be made available if needed. Waste Confidence Decision, 49 Fed. Reg. 34,658, 34,659–60 (Aug. 31, 1984). The Commission updated the WCD in 1990 to reflect new understandings about waste disposal and to predict the availability of a repository by 2025. *See* Waste Confidence Decision Review, 55 Fed. Reg. 38,474, 38,505 (Sept. 18, 1990). The Commission reviewed the WCD again in 1999 without altering it. *See* Waste Confidence Decision Review: Status, 64 Fed. Reg. 68,005, 68,006–07 (Dec. 6, 1999).

In 2008, the Commission proposed revisions to the Waste Confidence Findings, and, after considering public comments, made revisions in 2010. Waste Confidence Decision Update, 75 Fed. Reg. 81,037 (Dec. 23, 2010). That decision, under review in this case, reaffirmed three of the Waste Confidence Findings and updated two. First, the Commission revised Finding 2, which, as of 1990, expected that a permanent geologic repository would be available in the first quarter of the twenty-first century. As amended, Finding 2 now states that a suitable repository will be available “when necessary,” rather than by a date certain. *Id.* at 81,038. In reaching that conclusion, the Commission examined the political and technical obstacles to permanent storage and determined that a permanent repository will be ready by the time the safety of temporary on-site storage can no longer be assured. *Id.*

Finding 4 originally held that SNF could be safely stored at nuclear reactor sites without significant environmental effects for at least thirty years beyond each plant’s licensed life, including the license-renewal period. *Id.* at 81,039. In revising that finding, the Commission examined the potential environmental effects from temporary storage, such as leakages from the spent-fuel pools and fires caused by the SNF becoming exposed to the air. Concluding that previous leaks had only a negligible near-term health effect and that recent regulatory enhancements will further reduce the risk of leaks, the Commission determined that leaks do not pose the threat of a significant environmental impact. *Id.* at 81,069–71. The Commission also found that pool fires are sufficiently unlikely as to pose no significant environmental threat. *Id.* at 81,070–71. As amended, Finding 4 now holds that SNF can be safely stored at plants for at least sixty years beyond the licensed life of a plant, instead of thirty. *Id.* at 81,074. In addition, the Commission noted in its final rule that it will be developing a plan for longer-term storage and will conduct a full assessment

of the environmental impact of storage beyond the sixty-year post-license period. *Id.* at 81,040. Based on the revised WCD, the Commission released a new Temporary Storage Rule (“TSR”) enacting its conclusions and updating its regulations accordingly. *See* Consideration of Environmental Impacts of Temporary Storage of Spent Fuel after Cessation of Reactor Operation, 75 Fed. Reg. 81,032 (Dec. 23, 2010); 10 C.F.R. § 51.23(a). Petitioners challenge the amended 10 C.F.R. § 51.23(a) based on both Finding 2 and Finding 4.

II. The Commission’s Obligations Under NEPA

The National Environmental Policy Act of 1969 (“NEPA”), 42 U.S.C. § 4321 *et seq.*, requires federal agencies such as the Commission to examine and report on the environmental consequences of their actions. NEPA is an “essentially procedural” statute intended to ensure “fully informed and well-considered” decisionmaking, but not necessarily the best decision. *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 558 (1978). Under NEPA, each federal agency must prepare an Environmental Impact Statement (“EIS”) before taking a “major Federal action[] significantly affecting the quality of the human environment.” 42 U.S.C. § 4332(2)(C). An agency can avoid preparing an EIS, however, if it conducts an Environmental Assessment (“EA”) and makes a Finding of No Significant Impact (“FONSI”). *See Sierra Club v. Dep’t of Transp.*, 753 F.2d 120, 127 (D.C. Cir. 1985); *see also Theodore Roosevelt Conservation P’ship v. Salazar*, 616 F.3d 497, 503–04 (D.C. Cir. 2010) (explaining NEPA procedures in detail). The issuance or reissuance of a reactor license is a major federal action affecting the quality of the human environment. *See New York v. Nuclear Regulatory Comm’n*, 589 F.3d 551, 553 (2d Cir. 2009).

The parties here dispute whether the WCD itself constitutes a major federal action. To petitioners, the WCD is a major federal action because it is a predicate to every decision to license or relicense a nuclear plant, and the findings made in the WCD are not challengeable at the time a plant seeks licensure. The Commission contends that because the WCD does not authorize the licensing of any nuclear reactor or storage facility, and because a site-specific EIS will be conducted for each facility at the time it seeks licensure, the WCD is not a major federal action. To the Commission, the WCD is simply an answer to this court's mandate in *Minnesota* to ensure that plants are only licensed while the NRC has reasonable assurance that permanent disposal of the resulting waste will be available. The Commission also contends that the WCD constitutes an EA supporting the revision of 10 C.F.R. § 51.23(a), and because the EA found no significant environmental impact, an EIS is not required.

We agree with petitioners that the WCD rulemaking is a major federal action requiring either a FONSI or an EIS. The Commission's contrary argument treating the WCD as separate from the individual licensing decisions it enables fails under controlling precedent.

We have long held that NEPA requires that "environmental issues be considered at every important stage in the decision making process concerning a particular action." *Calvert Cliffs' Coordinating Comm., Inc. v. Atomic Energy Comm'n*, 449 F.2d 1109, 1118 (D.C. Cir. 1971). The WCD makes generic findings that have a preclusive effect in all future licensing decisions—it is a pre-determined "stage" of each licensing decision. NEPA established the Council on Environmental Quality ("CEQ") "with authority to issue regulations interpreting it." *Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 757 (2004). The CEQ has defined major federal actions to include actions with

“[i]ndirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.” 40 C.F.R. §§ 1508.8, 1508.18; *Public Citizen*, 541 U.S. at 763; *see also Andrus v. Sierra Club*, 442 U.S. 347, 358 (1979) (holding that the CEQ’s NEPA interpretations are entitled to substantial deference); *accord CTIA-Wireless Ass’n v. FCC*, 466 F.3d 105, 115 (D.C. Cir. 2006). It is not only reasonably foreseeable but eminently clear that the WCD will be used to enable licensing decisions based on its findings. The Commission and the intervenors contend that the site-specific factors that differ from plant to plant can be challenged at the time of a specific plant’s licensing, but the WCD nonetheless renders uncontestable general conclusions about the environmental effects of plant licensure that will apply in every licensing decision. *See* 10 C.F.R. § 51.23(b).

Petitioners’ argument continues by suggesting that the WCD lacks an EIS and must be reversed on that basis. Not necessarily. No EIS is required if the agency conducts an EA and issues a FONSI sufficiently explaining why the proposed action will not have a significant environmental impact. *Public Citizen*, 541 U.S. at 757–58. Though we give considerable deference to an agency’s decision regarding whether to prepare an EIS, the agency must 1) “accurately identif[y] the relevant environmental concern,” 2) take a “hard look at the problem in preparing its EA,” 3) make a “convincing case for its finding of no significant impact,” and 4) show that even if a significant impact will occur, “changes or safeguards in the project sufficiently reduce the impact to a minimum.” *Taxpayers of Michigan Against Casinos v. Norton*, 433 F.3d 852, 861 (D.C. Cir. 2006) (internal quotation omitted). An agency’s decision not to prepare an EIS must be set aside if it is “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” *Public Citizen*, 541 U.S. at 763 (quoting 5 U.S.C. § 706(2)(A)).

III. Availability of a Permanent Repository

With these NEPA obligations in mind, we turn to the Commission's conclusion that a permanent repository for SNF will be available "when necessary." In so concluding, the Commission examined the historical difficulty—now measured in decades rather than years—in establishing a permanent facility. *See, e.g.*, Waste Confidence Decision Update, 75 Fed. Reg. at 81,049. Though a number of commenters suggested that the social and political barriers to building a geologic repository are too great to conclude that a facility could be built in any reasonable timeframe, the Commission believes that the lessons learned from the Yucca Mountain program and the Blue Ribbon Commission on America's Nuclear Future will ensure that, through "open and transparent" decisionmaking, a consensus would be reached. *Id.* Further, the Commission noted that the Nuclear Waste Policy Act mandates a repository program, demonstrating the continued commitment and obligation of the federal government to pursue one. The scientific and experiential knowledge of the past decades, the Commission explained, would enable the government to create a suitable repository by the time one is needed. *Id.*

A.

Petitioners argue that the Commission's conclusion regarding permanent storage violates NEPA in two ways: First, it fails to fully account for the significant societal and political barriers that may delay or prevent the opening of a repository. Second, the Commission's conclusion that a permanent repository will be available "when necessary" fails to define the term "necessary" in any meaningful way and does not address the effects of a failure to establish a repository in time. Petitioners further contest the Commission's claim that the WCD constitutes an EA for permanent disposal, let alone the

EIS they contend is required here.

The Commission responds by contending that it “candidly acknowledged” the societal and political challenges, and crafted the WCD to account for those risks. Overcoming political obstacles is not the responsibility of the Commission, it contends, and the NRC’s conclusion that institutional obstacles will not prevent a repository from being built is entitled to substantial deference. The Commission contends that the selection of a precise date for Finding 2 is not required by NEPA or any other laws governing the NRC, and the Commission used the “when necessary” formulation as far back as 1977. *See NRDC v. Nuclear Regulatory Comm’n*, 582 F.2d 166, 170, 175 (2d Cir. 1978).

As for examining the environmental effects of failing to establish a repository, the Commission contends that the WCD is an EA supporting the revision of 10 C.F.R. § 51.23(a). No EIS is necessary regarding permanent disposal because, the Commission argues, the WCD is not a major federal action, and conducting an EIS for this issue would be the sort of “abstract exercise” the Supreme Court declined to require in *Baltimore Gas and Electric Company v. NRDC*, 462 U.S. 87, 100 (1983). Further, the Commission’s existing “Table S-3” already considers the environmental effects of the nuclear fuel cycle generally and found no significant impacts. Therefore, the Commission believes, no EIS is required.

B.

The Commission’s “when necessary” finding is already imperiled by our conclusion that the WCD is a major federal action. We hold that the WCD must be vacated as to its revision to Finding 2 because the WCD fails to properly analyze the environmental effects of its permanent disposal conclusion.

While we share petitioners' considerable skepticism as to whether a permanent facility can be built given the societal and political barriers to selecting a site, we need not resolve whether the Commission adequately considered those barriers. Likewise, we need not decide whether, as the Commission contends, an agency's interpretation of the political landscape surrounding its field of expertise merits deference. Instead, we hold the WCD is defective on far simpler grounds: As we have determined, the WCD is a major federal action because it is used to allow the licensing of nuclear plants. *See supra* Part II. Therefore, the WCD requires an EIS or, alternatively, an EA that concludes with a finding of no significant impact. The Commission did not supply a suitable FONSI here because it did not examine the environmental effects of failing to establish a repository.

Even taking the Commission's word that the WCD constitutes an EA for the permanent storage conclusion, *see* Waste Confidence Decision Update, 75 Fed. Reg. at 81,042, the EA is insufficient because a finding that "reasonable assurance exists that sufficient mined geologic repository capacity will be available when necessary," *id.* at 81,041, does not describe a probability of failure so low as to dismiss the potential consequences of such a failure. Under NEPA, an agency must look at both the probabilities of potentially harmful events and the consequences if those events come to pass. *See, e.g., Carolina Envtl. Study Grp. v. U.S.*, 510 F.2d 796, 799 (D.C. Cir. 1975). An agency may find no significant impact if the probability is so low as to be "remote and speculative," or if the combination of probability and harm is sufficiently minimal. *See, e.g., City of New York v. Dep't of Transp.*, 715 F.2d 732, 738 (2d Cir. 1983) ("The concept of overall risk incorporates the significance of possible adverse consequences discounted by the improbability of their occurrence."). Here, a "reasonable assurance" that permanent storage will be available is a far cry

from finding the likelihood of nonavailability to be “remote and speculative.” The Commission failed to examine the environmental consequences of failing to establish a repository when one is needed.

The Commission argues that its “Table S-3” already accounts for the environmental effects of the nuclear fuel cycle and finds no significant impact. Not so. Table S-3, like the Commission itself, presumes the existence of a geologic repository. Therefore, it cannot explain the environmental effects of a failure to secure a permanent facility. The Commission also complains that conducting a full analysis regarding permanent storage would be an “abstract exercise.” Perhaps the Commission thinks so because it perceives the required analysis to be of the effects of the permanent repository itself. But we are focused on the effects of a *failure* to secure permanent storage. The Commission apparently has no long-term plan other than hoping for a geologic repository. If the government continues to fail in its quest to establish one, then SNF will seemingly be stored on site at nuclear plants on a permanent basis. The Commission can and must assess the potential environmental effects of such a failure.

IV. Temporary On-Site Storage of SNF

In concluding that SNF can safely be stored in on-site storage pools for a period of sixty years after the end of a plant’s life, instead of thirty, the Commission conducted what it purports to be an EA, which found that extending the time for storage would have no significant environmental impact. *See* Waste Confidence Decision Update, 75 Fed. Reg. at 81,074. This analysis was conducted in generic fashion by looking to environmental risks across the board at nuclear plants, rather than by conducting a site-by-site analysis of each specific nuclear plant. Two key risks the Commission examined in its

EA were the risk of environmental harm due to pool leakage and the risk of a fire resulting from the fuel rods becoming exposed to air. *See id.* at 81,069–71. We conclude that the Commission’s EA and resulting FONSI are not supported by substantial evidence on the record because the Commission failed to properly examine the risk of leaks in a forward-looking fashion and failed to examine the potential consequences of pool fires.

A.

Petitioners challenge the finding of no significant impact on two bases: First, petitioners argue that a generic analysis is simply inappropriate and that the Commission was required to look at each plant individually. A site-by-site analysis is necessary, petitioners argue, because the risks of leaks and fires are affected by site-specific factors such as pool configuration, leak detection systems, the nature of SNF stored in the pool, and the location of the pool within the plant. Overall, petitioners argue that NEPA requires the Commission to fully analyze the environmental effects of on-site storage, and a generic analysis cannot fulfill that statutory mandate.

Second, petitioners argue that even if generic analysis is appropriate, the Commission’s generic EA in this case was insufficient. They maintain that the Commission did not adequately account for leaks from on-site pools because the Commission only looked at past leaks to see if they caused environmental damage, rather than examining the risks of future leaks. Also, as petitioners point out, the Commission’s own studies have shown that previous leaks “did, or potentially could, impact ground-water resources relative to established EPA drinking water standards.” NRC, *Liquid Radioactive Release Lessons Learned Task Force Final Report* 13 (2006). Petitioners also argue that the Commission’s analysis of the

effects of pool fires was deficient because the Commission declined to examine the consequences of pool fires due to the low probability of such an occurrence. In petitioners' view, the Commission could only avoid examining the consequences of pool fires in a full EIS if it found the risk so low as to be "remote and speculative"—a finding the Commission did not make. Finally, Petitioners contend that the Commission completely failed to look at non-health environmental factors such as effects on the Prairie Island Indian Community's homeland, which is located near one of the plants governed by the rule.

The Commission responds by stating that its examination of past leaks properly demonstrated that the potential for environmental harm from leakage is negligible. The Commission argues that the effects of past leaks have been shown to be quite minimal, and the Commission's leakage task force has recommended twenty-six specific measures to minimize the risk even further. Also, the NRC exercises oversight over the pools and will ensure that they do not become unsafe over the sixty-year period. With regard to fires, the Commission contends that it engaged in an "exhaustive consideration" of the risk and found that such an event is extremely unlikely. In the Commission's view, a site-by-site analysis of pool-fire risk is unnecessary because the Commission relied on studies which accounted for all of the variations cited by petitioners and essentially looked at the most dangerous combinations of site-specific factors. Even looking to a worst-case scenario, the Commission says, the risk of fires was still extremely low.

Responding to petitioners' argument that the Commission failed to determine that the risk of fires was "remote and speculative," the Commission suggests that it did not dismiss the risk out of hand as "remote and speculative" but rather examined

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it thoroughly and found it to be so low that the consequences could not possibly overcome the low probability. Therefore, the Commission did not need to conduct a full EIS for pool fires. Finally, the Commission argues that petitioners did not raise the issue of non-health impacts during the rulemaking, and thus they cannot raise that issue on petition now.

B.

Both the Supreme Court and this court have endorsed the Commission's longstanding practice of considering environmental issues through general rulemaking in appropriate circumstances. *See, e.g., Baltimore Gas*, 462 U.S. at 100 ("The generic method chosen by the agency is clearly an appropriate method of conducting the hard look required by NEPA."); *see also Minnesota*, 602 F.2d at 416–17. Though *Baltimore Gas* dealt with the nuclear fuel cycle itself, which is generally focused on things that occur outside of individual plants, we see no reason that a comprehensive general analysis would be insufficient to examine on-site risks that are essentially common to all plants. This is particularly true given the Commission's use of conservative bounding assumptions and the opportunity for concerned parties to raise site-specific differences at the time of a specific site's licensing. Nonetheless, whether the analysis is generic or site-by-site, it must be thorough and comprehensive. Even though the Commission's application of its technical expertise demands the "most deferential" treatment by the courts, *Baltimore Gas*, 462 U.S. at 103, we conclude that the Commission has failed to conduct a thorough enough analysis here to merit our deference.

1.

The Commission admits in the WCD Update that there have been "several incidents of groundwater contamination

originating from leaking reactor spent fuel pools and associated structures.” 75 Fed. Reg. at 81,070. The Commission brushes away that concern by stating that the past leaks had only a negligible near-term health impact. *Id.* at 81,071. Even setting aside the fact that near-term health effects are not the only type of environmental impacts, the harm from past leaks—without more—tells us very little about the potential for future leaks or the harm such leaks might portend. The WCD Update seeks to extend the period of time for which pools are considered safe for storage; therefore, a proper analysis of the risks would necessarily look *forward* to examine the effects of the additional time in storage, as well as examining past leaks in a manner that would allow the Commission to rule out the possibility that those leaks were only harmless because of site-specific factors or even sheer luck. The WCD Update has no analysis of those possibilities other than to say that past leaks had “negligible” near-term health effects. *Id.* A study of the impact of thirty additional years of SNF storage must actually concern itself with the extra years of storage.

The Commission also notes that a taskforce has made recommendations for improvements to spent-fuel pools, which the NRC “has addressed, or is in the process of addressing.” *Id.* But those improvements are thus far untested, and we have no way of deferring to the Commission’s conclusion that they will ensure the absence of environmental harm. Finally, the Commission refers to its monitoring and regulatory compliance program as a buffer against pool degradation. *Id.* That argument is even less availing because it amounts to a conclusion that leaks will not occur because the NRC is “on duty.” With full credit to the Commission’s considerable enforcement and inspection efforts, merely pointing to the compliance program is in no way sufficient to support a scientific finding that spent-fuel pools will not cause a significant environment impact during the extended storage

period. This is particularly true when the period of time covered by the Commission's predictions may extend to nearly a century for some facilities.

Despite giving our "most deferential" treatment to the Commission's application of its technical and scientific expertise, we cannot reconcile a finding that past leaks have been harmless with a conclusion that future leaks at all sites will be harmless as well. The Commission's task here was to determine whether the pools could be considered safe for an additional thirty years in the future. That past leaks have not been harmful with respect to groundwater does not speak to whether and how future leaks might occur, and what the effects of those leaks might be. The Commission's analysis of leaks, therefore, was insufficient.

2.

Even though the Commission engaged in a more substantial analysis of fires than it did of leaks, that analysis is plagued by a failure to examine the consequences of pool fires in addition to the probabilities. Petitioners, citing *Limerick Ecology Action, Inc. v. Nuclear Regulatory Commission*, 869 F.2d 719, 739 (3d Cir. 1989), argue that the Commission could only avoid conducting an EIS if it found the risk of fires to be "remote and speculative." The Commission, citing *Carolina Environmental Study Group v. United States*, 510 F.2d at 799, argues that it did not need to examine the consequences of fires because it found the risk of fires to be very low.

We disagree with both parties. As should be clear by this point in our opinion, an agency conducting an EA generally must examine both the probability of a given harm occurring *and* the consequences of that harm if it does occur. Only if the harm in question is so "remote and speculative" as to reduce the

effective probability of its occurrence to zero may the agency dispense with the consequences portion of the analysis. *See Limerick Ecology Action, Inc.*, 869 F.2d at 739. But, contra petitioners, the finding that the probability of a given harm is nonzero does not, by itself, mandate an EIS: after the agency examines the consequences of the harm in proportion to the likelihood of its occurrence, the overall expected harm could still be insignificant and thus could support a FONSI. *See Carolina Env'tl. Study Grp.*, 510 F.2d at 799 (“Recognition of the minimal probability of such an event is not equatable with nonrecognition of its consequences.”). Here, however, the Commission did not undertake to examine the consequences of pool fires at all. Depending on the weighing of the probability and the consequences, an EIS may or may not be required, and such a determination would merit considerable deference. *C.f.*, *City of New York*, 715 F.2d at 751–52 (deferring to an agency’s weighing of a “catastrophic” harm against an “infinitesimal probability”). But unless the risk is “remote and speculative,” the Commission must put the weights on both sides of the scale before it can make a determination.

3.

As for petitioners’ remaining argument that the Commission did not consider non-health environmental effects, we agree with the Commission that petitioners did not properly raise those issues in the rulemaking. Petitioners essentially present two non-health impacts: decrease in property values and risk of harm to the Prairie Island Indian Community’s homeland. The Tribe did mention its small size and close proximity to the Prairie Island Nuclear Generating Plant, but it did not assert specifically how it might be harmed by either the rulemaking itself or the licensing the rulemaking enables. With regard to property values, petitioners point to a study considering the economic impact of the Indian Point plant. But that study actually

assumes a diminution in values caused by current plant operation and simply extends it mathematically—it in no way asserts whether or how any harm to property values might occur nor how that harm is related to a change in the physical environment. Petitioners’ failure to raise these objections to the agency waives them. *See Public Citizen*, 541 U.S. at 764. We note, as did the Supreme Court in *Public Citizen*, that primary responsibility for compliance with NEPA lies with the Commission, not petitioners; nonetheless, the non-health effects alluded to here are not “so obvious that there is no need for a commentator to point them out.” *Id.* Given, however, that we are invalidating the Commission’s conclusions as a whole, petitioners will have the opportunity to properly raise and clarify these concerns on remand.

* * *

Overall, we cannot defer to the Commission’s conclusions regarding temporary storage because the Commission did not conduct a sufficient analysis of the environmental risks. In so holding, we do not require, as petitioners would prefer, that the Commission examine each site individually. However, a generic analysis must be forward looking and have enough breadth to support the Commission’s conclusions. Furthermore, as NEPA requires, the Commission must conduct a true EA regarding the extension of temporary storage. Such an analysis must, unless it finds the probability of a given risk to be effectively zero, account for the consequences of each risk. On remand, the Commission will have the opportunity to conduct exactly such an analysis.

V. Conclusion

We recognize that the Commission is in a difficult position given the political problems concerning the storage of spent

nuclear fuel. Nonetheless, the Commission's obligations under NEPA require a more thorough analysis than provided for in the WCD Update. We note that the Commission is currently conducting an EIS regarding the environmental impacts of SNF storage beyond the sixty-year post-license period at issue in this case, and some or all of the problems here may be addressed in such a rulemaking. In any event, we grant the petitions for review, vacate the WCD Update and TSR, and remand for further proceedings consistent with this opinion.

So ordered.