

NEPA AND UNCERTAINTY IN LOW-RISK, HIGH-IMPACT SCENARIOS: NUCLEAR ENERGY AS A CASE STUDY

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“The ordinary citizen today assumes that science knows what makes the community clock tick; the scientist is equally sure that he does not. He knows that the biotic mechanism is so complex that its workings may never be fully understood.”

—Aldo Leopold¹

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¹ ALDO LEOPOLD, *A SAND COUNTY ALMANAC: AND SKETCHES HERE AND THERE* 205 (1949).

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INTRODUCTION

Human activities in the last few centuries have begun to erode the natural environment, disrupting Earth's ecological systems and destroying the natural resources on which we rely.² With growing concerns about ecological well-being, and increased appreciation for the environment,³ Congress enacted the National Environmental Policy Act

² See, e.g., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GRP. II, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY: SUMMARY FOR POLICYMAKERS 4–6 (Christopher B. Field et al. eds., 2014), https://ipcc-wg2.gov/AR5/images/uploads/WG2AR5_SPM_FINAL.pdf (discussing human interference with the carbon and climate systems, which affect precipitation, crop yields, incidence of flooding, and droughts); *Climate Change*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., <http://coralreef.noaa.gov/threats/climate/welcome.html> (last visited Mar. 16, 2016) (discussing human impacts on coral reef destruction); *Human Population Growth and Extinction*, CTR. FOR BIOLOGICAL DIVERSITY, http://www.biologicaldiversity.org/programs/population_and_sustainability/extinction/index.html (last visited Nov. 30, 2014) (discussing the human impact on biodiversity and the acceleration of the rate of species extinction).

³ See, e.g., RACHEL CARSON, *SILENT SPRING* (1962). *Silent Spring* brought environmental concerns to the American public and spurred a major environmental movement that led to the creation of the Environmental Protection Agency. Gary Kroll, *Rachel Carson—Silent Spring: A*

of 1969 (NEPA).⁴ NEPA's focus is disclosure of environmental risks, so that the governmental agencies undertaking various projects consider environmental factors in their decision-making and share such information with the public.⁵ NEPA, along with its corresponding regulations, created procedures and standards for the production, collection, and dissemination of data related to environmental impacts of government actions.⁶ However, striking the appropriate balance of what information to provide is difficult, especially where the risk of harm is low, or where data on environmental impacts are incomplete or uncertain.

The Council on Environmental Quality (CEQ)⁷ has had difficulty determining how uncertainties should be addressed in NEPA analyses. Initially, where information on environmental impacts was uncertain, CEQ regulations required that a "worst case analysis" be performed, analyzing the consequences of the worst possible environmental effects of a proposed action.⁸ In 1986, the CEQ replaced this regulation with a "rule of reason" test, which required discussion only of those potential environmental impacts that are reasonably foreseeable.⁹ While this amendment was intended to clarify the requirements and make the analysis more manageable,¹⁰ courts have continued to interpret NEPA's

Brief History of Ecology as a Subversive Subject, ONLINE ETHICS CTR. (July 6, 2006), <http://www.onlineethics.org/cms/9174.aspx> ("It was an essay of ecological radicalism that attempted to wake up a populace quiescent to the techno-scientific control of the world."). Carson was one of the first to bring the idea of accountability for environmental harms into the public sphere in the 1960s. *See id.*

⁴ Pub. L. No. 91-190, 83 Stat. 852 (1970) (codified as amended at 42 U.S.C. §§ 4321-4347 (2012)).

⁵ RICHARD L. REVESZ, ENVIRONMENTAL LAW AND POLICY 848-49 (2d ed. 2012).

⁶ *Id.*

⁷ NEPA created the Council on Environmental Quality to advise and monitor agencies preparing environmental impact statements (EISs). 42 U.S.C. §§ 4342, 4344. The CEQ is responsible for promulgating regulations interpreting NEPA's requirements. *See* Exec. Order No. 11,991, 3 C.F.R. § 123 (1977).

⁸ *See* Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,032 (Mar. 23, 1981) ("If there are gaps in relevant information or scientific uncertainty pertaining to an agency's evaluation of significant adverse impacts on the human environment, an agency must make clear that such information is lacking or that the uncertainty exists. An agency must include a worst case analysis of the potential impacts of the proposal . . .").

⁹ National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15,618-01, 15,625-26 (Apr. 25, 1986) (to be codified at 40 C.F.R. pt. 1502.22). According to the regulations, "reasonably foreseeable" impacts include those "which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." *Id.*

¹⁰ *Id.* at 15,620 ("CEQ is amending this regulation because it has concluded that the new requirements provide a wiser and more manageable approach to the evaluation of reasonably

requirements in areas of uncertainty in different ways.¹¹ This Note examines varying judicial interpretations of NEPA's requirements in areas of uncertainty, particularly in projects that involve low probability risks with potentially devastating consequences, and will examine nuclear energy as a case study. In these low-risk, high-impact scenarios, it is especially difficult to balance the public's right to information with the government's interest in preserving resources and avoiding an unmanageable analysis. NEPA and its corresponding regulations have not provided clear guidance for the sort of analysis that is required of agencies in such situations, and there is little uniformity among the courts. This Note will propose guidelines for more uniform NEPA requirements.

Part I provides a general background of NEPA, its goals and requirements, and of the old and new CEQ regulations that control the analysis of uncertainty.¹² Part II examines varying judicial interpretations of requirements in uncertain situations, using nuclear energy as a case study. In the context of licensing nuclear facilities, it discusses the different analyses that courts have required under NEPA for risks of radiation leaks, terrorism, long-term storage of nuclear waste, and nuclear meltdowns or accidents. Part III analyzes these varying interpretations, focusing on different levels of deference given to agencies in different contexts, and on the role of proximate relationships between government actions and uncertain outcomes. It provides guidelines for uniform requirements that courts should impose under NEPA in low-risk, high-impact areas of uncertainty in order to provide clarity in balancing the interests of the public and of the government. This Note encourages more detailed analyses of scientific conclusions, with thorough discussions of an agency's methods, as well as a discussion of other methods and points of view and an explanation for their rejection. It suggests that a lack of proximate causation between an agency's actions and certain impacts should not be dispositive, and an environmental impact statement (EIS)¹³ analysis may still be required. In addition, courts need not defer to an agency's political conclusions in the same manner that they defer to its scientific judgments. Lastly, this Note advocates adoption of forward-looking regulations requiring

foreseeable significant adverse impacts in the face of incomplete or unavailable information in an EIS.”).

¹¹ See Carla Mattix & Kathleen Becker, *Scientific Uncertainty Under the National Environmental Policy Act*, 54 ADMIN. L. REV. 1125, 1133, 1142 (2002) (explaining that some courts confusingly continued to hold that worst case analysis was required, believing that it was a development of common law as much as a regulatory requirement).

¹² The relevant regulation is codified at 40 C.F.R. § 1502.22 (2015).

¹³ See *infra* Section I.A for an explanation of EISs.

agencies to revisit and re-evaluate their predictions if more information becomes available and predictions become more certain.

I. BACKGROUND

A. *NEPA and Its Purposes*

Recognizing the importance of environmental protection to human welfare, Congress passed NEPA.¹⁴ In passing NEPA, Congress sought to cultivate harmony between people and the environment, prevent damage to the environment, and improve the public's understanding of the natural environment.¹⁵ NEPA requires "the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to" achieve those ends.¹⁶ Whereas most federal environmental statutes focus on particular environmental media,¹⁷ NEPA requires environmental review in all categories of major federal action.¹⁸ As such, NEPA has a tremendous impact on federal decision-making, and agencies prepare approximately 50,000 assessments per year pursuant to NEPA.¹⁹

Section 102 of NEPA is the most practically significant provision of the Act.²⁰ It requires that agencies prepare an environmental impact statement (EIS) for "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the

¹⁴ Pub. L. No. 91-190, 83 Stat. 852 (1970) (codified as amended at 42 U.S.C. §§ 4321-4347 (2012)).

¹⁵ 42 U.S.C. § 4321 (stating that NEPA declares "a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment . . . and stimulate the health and welfare of man"); Melanie E. Kleiss, Note, *NEPA and Scientific Uncertainty: Using the Precautionary Principle to Bridge the Gap*, 87 MINN. L. REV. 1215, 1219 (2003).

¹⁶ 42 U.S.C. § 4331(b).

¹⁷ See, e.g., Endangered Species Act, 16 U.S.C. § 1531 (2012); Clean Water Act, 33 U.S.C. § 1251 (2012); Clean Air Act, 42 U.S.C. § 7401 (2012).

¹⁸ See 42 U.S.C. § 4332(2)(c) (applying to all governmental agencies "in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment").

¹⁹ *Environmental Assessment*, NAT'L PRESERVATION INST., <http://www.npi.org/NEPA/assessment> (last visited Oct. 12, 2014).

²⁰ See Daniel A. Farber, *Confronting Uncertainty Under NEPA*, ISSUES LEGAL SCHOLARSHIP, July 13, 2009, at 1-2, http://ccrm.berkeley.edu/resin/pdfs_and_other_docs/Farber-managingtech-dangerousclimatechange.pdf.

quality of the human environment.”²¹ The discussion of environmental impacts in an EIS must address impacts that are direct and indirect, as well as beneficial and detrimental.²² Thus, NEPA serves as a full disclosure environmental law, aimed at providing information to the public regarding environmental costs of certain projects, and, to that end, an EIS cannot contain statements that are vague, general, or conclusory.²³ Copies of an EIS must be made available to relevant federal and state agencies, as well as to the public.²⁴

If an agency drafts an environmental assessment and determines that its actions do not qualify as “major” or do not “significantly” impact the environment, then the agency may prepare a “finding of no significant impact” (FONSI) instead of preparing an EIS.²⁵ To determine whether the impacts of an action qualify as significant, agencies must consider a wide range of global and local effects, including impacts on human health and safety, impacts on natural resources and animal species, precedential effects of the action, and degree of uncertainty with respect to an impact.²⁶

NEPA also established the Council on Environmental Quality (CEQ) within the Executive Office of the President.²⁷ The CEQ is

²¹ 42 U.S.C. § 4332(2)(c). An EIS requires agencies to prepare a statement evaluating:

(i) the environmental impact of the proposed action, (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented, (iii) alternatives to the proposed action, (iv) the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Id.

²² 40 C.F.R. § 1508.8 (2015).

²³ *Silva v. Lynn*, 482 F.2d 1282, 1284–85 (1st Cir. 1973) (stating that an EIS “permits the court to ascertain whether the agency has made a good faith effort to take into account the values NEPA seeks to safeguard,” and “serves as an environmental full disclosure law, providing information which Congress thought the public should have concerning the particular environmental costs involved in a project. To that end, it ‘must be written in language that is understandable to nontechnical minds and yet contain enough scientific reasoning to alert specialists to particular problems within the field of their expertise.’” (quoting *Envtl. Def. Fund, Inc. v. Corps of Eng’rs*, 348 F. Supp. 916, 933 (N.D. Miss. 1972))).

²⁴ See 42 U.S.C. § 4332(2)(c); 40 C.F.R. § 1503.1.

²⁵ 40 C.F.R. § 1501.4. If an agency determines that the undertaking will not significantly affect the environment, then its obligations under NEPA are complete. *National Environmental Policy Act Review Process*, ENVTL. PROTECTION AGENCY, <https://www.epa.gov/nepa/national-environmental-policy-act-review-process#ea> (last updated Nov. 2, 2015). Federal agencies issue approximately 50,000 FONSI’s each year, and only about 500 EIS’s per year. Bradley C. Karkkainen, *Toward a Smarter NEPA: Monitoring and Managing Government’s Environmental Performance*, 102 COLUM. L. REV. 903, 909–10 (2002). For an explanation of criteria that allow an agency to find no significant impact and forgo an EIS, see *Sierra Club v. U.S. Department of Transportation*, 753 F.2d 120, 127 (D.C. Cir. 1985).

²⁶ 40 C.F.R. § 1508.27.

²⁷ 42 U.S.C. § 4342.

responsible for promulgating regulations and ensuring that agencies meet their obligations under NEPA.²⁸ The CEQ also reports annually to the President on the state of the environment, and acts as a mediator when agencies disagree about implementation of NEPA requirements.²⁹

B. *Significant Impacts and Uncertainty Under NEPA:*
40 C.F.R. § 1502.22

In determining whether a project will have a significant impact on the environment, the CEQ guides agencies to consider “[t]he degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.”³⁰ Some degree of uncertainty is inherent in identifying any future environmental impacts.³¹ For example, if a habitat will become damaged, the extent to which organisms will suffer as opposed to adapt, cannot be predicted definitively.³² Furthermore, there are certain risks that may have potentially catastrophic impacts, yet the probability of their occurring is extremely low or unquantifiable. For instance, if a meteor falls from outer space and hits a certain location, the impacts will be severe, but the risk of such an event occurring is not considerable; moreover, it may be difficult to quantify such a risk, because the parameters of the potential situation are unknown.³³

In 1978, the CEQ issued regulations streamlining the procedural requirements of NEPA.³⁴ Under the 1978 regulations, where details of the potential impacts were unknown, section 1502.22 review was triggered,³⁵ requiring an analysis of a worst case scenario:

If (1) the information relevant to adverse impacts is essential to a reasoned choice among alternatives and is not known and the overall costs of obtaining it are exorbitant or (2) the information relevant to adverse impacts is important to the decision and the means to obtain it are not known (e.g., the means for obtaining it are beyond the state of the art) the agency shall weigh the need for the action against the risk and severity of possible adverse impacts were the action to

²⁸ See *The Council on Environmental Quality—About*, WHITE HOUSE, <http://www.whitehouse.gov/administration/eop/ceq/about> (last visited Oct. 12, 2014); see also Exec. Order No. 11,991, 3 C.F.R. § 123 (1977).

²⁹ *The Council on Environmental Quality—About*, *supra* note 28.

³⁰ 40 C.F.R. § 1508.27(b)(5).

³¹ See Kleiss, *supra* note 15, at 1221.

³² *Id.*

³³ See Farber, *supra* note 20, at 3–4.

³⁴ See National Environmental Policy Act—Regulations, 43 Fed. Reg. 55,978 (Nov. 29, 1978) (to be codified at 40 C.F.R. pts. 1500–1508).

³⁵ See 40 C.F.R. § 1502.22 (1985).

proceed in the face of uncertainty. If the agency proceeds, it shall include a worst case analysis and an indication of the probability or improbability of its occurrence.³⁶

Thus, where knowledge of impacts was incomplete or indeterminable, agencies were required to assume the worst possible outcomes in proceeding with their assessments.³⁷ In the explanatory information issued with the 1978 regulations, the CEQ explained that evaluation of incomplete or uncertain data is a key component that makes EISs useful to decision-makers and to the public.³⁸ However, the CEQ did not express the rationale for specifically selecting worst-case analysis over other forms of risk assessment.

The leading case applying the worst-case requirement involved "construction of a deepwater port and crude oil distribution system."³⁹ In *Sierra Club v. Sigler*, the EIS did not include a worst-case analysis of a spill resulting in total cargo loss, as the agency had determined that the possibility of such an occurrence was too remote to warrant discussion.⁴⁰ However, the Fifth Circuit held that the EIS was insufficient for failing to discuss the worst-case impact of a total cargo loss.⁴¹ The court stated that just because such a catastrophic event was a remote possibility, it did not excuse the requirement to address the worst-case analysis in an EIS.⁴² Agencies must address remote possibilities, including the worst-case scenario, and indicate the likelihood of their occurring.⁴³

In 1986, the CEQ amended section 1502.22⁴⁴ in response to considerable criticism.⁴⁵ The amendment was in response to a lack of clarity in interpreting the regulation, as well as a concern that the worst-

³⁶ National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15,618-01, 15,619 (Apr. 25, 1986) (to be codified at 40 C.F.R. pt. 1502.22) (quoting section 1502.22 as it existed prior to the 1986 amendments).

³⁷ See *id.*; see also *Or. Env'tl. Council v. Kunzman*, 817 F.2d 484, 494 (9th Cir. 1987) ("Clearly conveying [worst case scenario] information to decisionmakers and to the public is as important as the identification of known adverse environmental impacts.").

³⁸ See National Environmental Policy Act—Regulations, 43 Fed. Reg. at 55,980, 55,994.

³⁹ *Sierra Club v. Sigler*, 695 F.2d 957, 961 (5th Cir. 1983).

⁴⁰ *Id.* at 968, 973-75.

⁴¹ *Id.* at 972.

⁴² *Id.* at 974.

⁴³ *Id.* ("[R]emoteness . . . [must be] addressed by mandating the preparation of a worst case analysis *and* indicating to the decisionmaker 'the probability or improbability of its occurrence.'" (quoting 40 C.F.R. § 1502.22(b) (1982))).

⁴⁴ See National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15,618-01 (Apr. 25, 1986) (to be codified at 40 C.F.R. pt. 1502.22).

⁴⁵ See Charles F. Weiss, Note, *Federal Agency Treatment of Uncertainty in Environmental Impact Statements Under the CEQ's Amended NEPA Regulation § 1502.22: Worst Case Analysis or Risk Threshold?*, 86 MICH. L. REV. 777, 810 (1988).

case analysis requirement overemphasized speculative consequences.⁴⁶ The CEQ hoped the amendment would provide federal agencies with a more manageable approach for evaluating uncertain or incomplete data than the worst-case analysis approach, and avoid the infinite conjecture and speculation that a worst-case analysis may promote.⁴⁷ The revised regulation requires analysis in connection with “reasonably foreseeable significant adverse impacts,” not necessarily the worst-case scenario.⁴⁸ Where impacts are uncertain, the analysis required is

- (1) [a] statement that such information is incomplete or unavailable;
- (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and (4) the agency’s evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, “reasonably foreseeable” includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.⁴⁹

Now, when agencies are confronted with uncertainty, they need not analyze the worst case scenario; instead, they need only discuss “reasonably foreseeable significant adverse impacts,” and the discussion need not go beyond the mere provision of “credible scientific evidence” that relates to the impacts.⁵⁰ Thus, the worst-case analysis has been replaced with a threshold of reasonably foreseeable impacts based on credible scientific evidence.⁵¹

⁴⁶ *See id.*

⁴⁷ *See* National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. at 15,620 (“[T]he new requirements provide a wiser and more manageable approach . . . in the face of incomplete or unavailable information in an EIS. . . . It must again be emphasized that the Council concurs in the underlying goals of the original regulation—that is, disclosure of the fact of incomplete or unavailable information; acquisition of that information if reasonably possible; and evaluation of reasonably foreseeable significant adverse impacts even in the absence of all information. . . . Rather, the need for amendment is based upon the Council’s perception that the ‘worse case analysis’ requirement is an unproductive and ineffective method of achieving those goals; one which can breed endless hypothesis and speculation.”).

⁴⁸ *Id.*

⁴⁹ *Id.* at 15,625–26.

⁵⁰ 40 C.F.R. § 1502.22 (2015).

⁵¹ *See Weiss, supra* note 45, at 810.

II. JUDICIAL INTERPRETATION OF NEPA REQUIREMENTS IN AREAS OF UNCERTAINTY

The amendment to section 1502.22 dealing with uncertainty under NEPA has not actually provided clear guidance on how to approach situations where the parameters of a potential impact are unknown.⁵² In applying NEPA, circuits have required different environmental analyses, particularly in situations where risk is poorly understood but potentially severe.⁵³ There is no clear guidance for when potential risks are significant enough to be acknowledged, and to what degree they must be assessed.⁵⁴ A considerable amount of risk assessment-related litigation has surrounded nuclear power, and nuclear energy is a paradigm case study of the ambiguity surrounding uncertain impacts under NEPA. In particular, this Note identifies four areas of uncertainty in which courts have disagreed: (1) radiation leaks, (2) terrorist attacks, (3) long-term storage of spent nuclear fuel, and (4) nuclear meltdowns.

A. *Analysis: Nuclear Energy as a Case Study Demonstrates the Need for Greater Consistency of NEPA's Requirements Where Risks Are Uncertain*

About one-fifth of the electricity in the United States is generated by nuclear energy, and there are one hundred commercial nuclear reactors throughout the country.⁵⁵ Nuclear energy is virtually carbon-free and fairly inexpensive relative to other carbon-free methods of energy production, making it an attractive method of electricity production.⁵⁶ The Nuclear Regulatory Commission (NRC) is responsible for licensing and regulating nuclear power plants, and thus, for complying with NEPA regulations as they relate to nuclear facilities.⁵⁷ Given the public safety and environmental protection concerns associated with nuclear facilities, the issuance of a nuclear reactor license is considered a *per se* major federal action significantly impacting the environment, thus requiring an EIS.⁵⁸ Yet, there remains

⁵² See Farber, *supra* note 20, at 34.

⁵³ See, e.g., discussion *infra* Section II.A (discussing different courts' requirements of how EISs must analyze uncertain impacts in nuclear energy projects).

⁵⁴ See, e.g., discussion *infra* Section II.A.

⁵⁵ See *Frequently Asked Questions*, U.S. ENERGY INFO. ADMIN., <http://www.eia.gov/tools/faqs/faq.cfm?id=104&t=3> (last updated Dec. 3, 2015).

⁵⁶ See *Nuclear Energy*, CONSERVE ENERGY FUTURE, http://www.conserve-energy-future.com/Advantages_NuclearEnergy.php (last visited Jan. 12, 2015).

⁵⁷ See *About NRC*, U.S. NUCLEAR REG. COMMISSION, <http://www.nrc.gov/about-nrc.html> (last updated Mar. 17, 2016).

⁵⁸ See *New York v. U.S. Nuclear Regulatory Comm'n*, 589 F.3d 551, 553 (2d Cir. 2009).

a dispute about which risks the EIS must acknowledge and to what degree those risks must be assessed or quantified.⁵⁹

1. Radiation Leaks from Spent Nuclear Fuel

The nuclear energy industry generates over 2,000 tons of spent nuclear fuel (SNF)⁶⁰ each year, which is composed of highly radioactive byproducts.⁶¹ Currently, there is no permanent facility designated to store SNF, and most of the waste is stored at the reactor sites in concrete-lined pools.⁶² However, this on-site storage is only designed for temporary usage, whereas radioactive byproducts have half-lives in the thousands of years.⁶³ Frequently, there is slow leakage of radioactive material from temporary storage pools into the environment—into soils, aquifers, and rivers.⁶⁴ Safe storage of SNF is critical to human safety and environmental protection, but the degree to which NEPA calls for an analysis of the environmental impacts of SNF storage and leakage is unclear.

a. *Baltimore Gas*: Deference to Analysis of SNF Leakage

In 1979, the NRC issued a regulation adopting the “zero release assumption.”⁶⁵ Under the regulation, permitting authorities were to assume that radioactive waste from nuclear plants could be fully isolated from the environment and would not have any adverse effect.⁶⁶ Thus, potential harm from the release of radioactive waste was simply off the table when the agency considered whether to grant a permit to a new

NEPA requires that an EIS be prepared for any “major Federal actions significantly affecting the quality of the human environment,” and a FONSI where actions are not deemed major or significant. See 42 U.S.C. § 4332(2)(c) (2012); accord *supra* notes 21–25.

⁵⁹ See *infra* Sections II.A.1–4 for a discussion of varying judicial interpretations of NEPA’s requirements in uncertain situations. In the realm of nuclear energy, it is unclear whether NEPA requires government agencies to evaluate the risks associated with nuclear waste and meltdowns, and courts have not resolved the matter.

⁶⁰ SNF is nuclear reactor fuel that has been used and is no longer useful to sustain a nuclear reaction. *Spent Nuclear Fuel*, U.S. NUCLEAR REG. COMMISSION, <http://www.nrc.gov/reading-rm/basic-ref/glossary/spent-nuclear-fuel.html> (last updated Dec. 17, 2015).

⁶¹ BLUE RIBBON COMM’N ON AM.’S NUCLEAR FUTURE, REPORT TO THE SECRETARY OF ENERGY 14 (2012) [hereinafter BLUE RIBBON REPORT], http://energy.gov/sites/prod/files/2013/04/f0/brc_finalreport_jan2012.pdf.

⁶² *Id.*

⁶³ *Id.*

⁶⁴ NAT. RES. DEF. COUNCIL, NUCLEAR FACTS (2007), <http://www.nrdc.org/nuclear/plants/plants.pdf>.

⁶⁵ See Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management, 44 Fed. Reg. 45,362 (Aug. 2, 1979) (to be codified at 10 C.F.R. pt. 51).

⁶⁶ See *id.*

nuclear power plant.⁶⁷ The National Resource Defense Council petitioned for judicial review of zero release assumption, arguing that in its rulemaking analysis, the NRC had failed to assess uncertainties of whether SNF leakage could be fully prevented.⁶⁸ It argued that NEPA required the NRC to evaluate the potential environmental harms of leakage, which the NRC had deemed negligible and irrelevant under the zero release assumption.⁶⁹

The U.S. Supreme Court, reversing the D.C. Circuit, held that the NRC had complied with NEPA.⁷⁰ The Court stated that while the impacts of potential leakage had not been evaluated, the NRC had, in fact, considered the uncertainty surrounding leakage and it was permitted to view the possibility as equaling zero.⁷¹ The Court gave deference to the NRC's decision to issue a generic rule, and found it inappropriate to doubt an agency's decisions due to minor uncertainties surrounding SNF leakage.⁷² It stated that a court reviewing an action challenged under NEPA must be deferential to an agency's scientific determinations and sensitive to the fact that agencies are experts in their areas of decision-making.⁷³ Thus, the NRC was permitted to view the uncertain risk of radioactive leakage as equaling zero.

b. The Modern Approach: Scrutiny of SNF Leakage Assumptions in
New York v. Nuclear Regulatory Commission

Despite the Supreme Court's holding, in the over thirty years since *Baltimore Gas*, no court has taken such a deferential stance by permitting agencies to treat an uncertain risk as no risk at all.⁷⁴ Moreover, in a recent decision, *New York v. Nuclear Regulatory Commission*,⁷⁵ the D.C. Circuit did not defer at all to the NRC's analysis of SNF leakage from nuclear sites.⁷⁶ There, the court invalidated the NRC's findings and held that in order to conclude that the impacts of

⁶⁷ See *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 94 (1983).

⁶⁸ *Id.* at 87.

⁶⁹ *Id.* at 95 (“[The] rules were arbitrary and capricious and inconsistent with NEPA because the Commission had not factored the consideration of uncertainties surrounding the zero-release assumption into the licensing process in such a manner that the uncertainties could potentially affect the outcome of any decision to license a particular plant.”).

⁷⁰ See *id.* at 104–08.

⁷¹ See *id.* at 98.

⁷² *Id.* at 108 (“[I]t [is] totally inappropriate to cast doubt on licensing proceedings simply because of a minor ambiguity.”).

⁷³ *Id.* at 103 (“[A] reviewing court must remember that the Commission is making predictions, within its area of special expertise, at the frontiers of science. When examining this kind of scientific determination, as opposed to simple findings of fact, a reviewing court must generally be at its most deferential.”).

⁷⁴ See Farber, *supra* note 20, at 17.

⁷⁵ *New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471 (D.C. Cir. 2012).

⁷⁶ See *id.* at 481.

radioactive leaks were negligible, the NRC was required to assess the unknown dangers of such leaks with more specificity.⁷⁷

i. Background on the Waste Confidence Decision

Since the 1980s, the NRC has issued rules called Waste Confidence Decisions (WCD), which are general conclusions about the environmental safety of nuclear waste.⁷⁸ Like the zero waste assumption upheld in *Baltimore Gas*, WCD findings are applied in the licensing of all nuclear facilities and may not be challenged at that time; in this way, the WCD findings have a preclusive effect in all future licensing decisions.⁷⁹ The original WCD was published in 1984, and found that SNF could be safely stored at nuclear reactor sites without significant environmental impacts for at least thirty years.⁸⁰ The NRC amended its prediction in 2010, issuing an updated WCD which stated that SNF could be stored on site for a period of at least sixty years.⁸¹

ii. The Court's Opinion

In *New York v. Nuclear Regulatory Commission*, four states and numerous environmental groups challenged the finding that nuclear waste could be stored on-site for sixty years without adverse environmental impacts.⁸² The 2010 WCD analysis was conducted in a generic fashion, looking at risks across the board, rather than analyzing the risks associated with storage at each nuclear plant.⁸³ Furthermore, rather than analyze unknown impacts of future leaks, the WCD brushed away such uncertainty by looking to past leaks and labeling their impacts as negligible.⁸⁴ The D.C. Circuit invalidated the findings in the WCD, holding that if the NRC wanted to conclude that the impacts of past leaks had been negligible, it was required to examine past leaks with

⁷⁷ See *id.*

⁷⁸ See *Continued Storage of Spent Nuclear Fuel*, U.S. NUCLEAR REG. COMMISSION, <http://www.nrc.gov/waste/spent-fuel-storage/wcd.html> (last updated July 28, 2015). In August 2014, the NRC renamed the WCD rulemaking system, now calling it Continued Storage rulemaking. *Id.* The rule provides generic determinations that will be used in future NRC environmental reviews whenever constructing, permitting, or relicensing nuclear reactors. Sonal Patel, *Final NRC Rule to Replace Nuclear Waste Confidence Decision Is Coming Soon*, POWER (Aug. 6, 2014), <http://www.powermag.com/final-nrc-rule-to-replace-nuclear-waste-confidence-decision-is-coming-soon>.

⁷⁹ *Nuclear Regulatory Comm'n*, 681 F.3d at 476.

⁸⁰ See *id.* at 475.

⁸¹ See Waste Confidence Decision Update, 75 Fed. Reg. 81,037-01, 81,074 (Dec. 23, 2010) (to be codified at 10 C.F.R. pt. 51) (“The Commission finds reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 60 years beyond the licensed life for operation . . .”).

⁸² See *Nuclear Regulatory Comm'n*, 681 F.3d at 473.

⁸³ See *id.* at 479.

⁸⁴ *Id.* at 479–80.

more specificity in order to be certain that those leaks were not harmless due to “site-specific factors or even sheer luck.”⁸⁵ Moreover, the court required that the NRC examine potential effects of on-site storage over 60 years and not simply rely on past leaks as a method for determining the future risks of an additional thirty years of SNF storage.⁸⁶ In stating this conclusion, the court acknowledged *Baltimore Gas* and wrote that while the NRC’s application of its technical and scientific expertise demands deferential treatment by the courts, in this case, the Commission had failed to conduct a thorough enough analysis to merit the court’s deference.⁸⁷ Unlike in *Baltimore Gas*,⁸⁸ here the court required a more rigorous environmental review of the uncertain dangers of radioactive leaks. As such, the courts have been inconsistent as to whether the uncertainty surrounding radiation leaks must be considered, and if so, to what degree.

2. Terrorism

In a post-9/11 world, it is difficult to ignore the potential for terrorists to target nuclear facilities.⁸⁹ Nuclear equipment is susceptible to theft by terrorists, and storage pools of spent nuclear fuel are vulnerable to terrorist attacks that could disperse lethal levels of radioactivity.⁹⁰ Depending on the location, a terrorist attack on a nuclear facility could cause a release of radioactivity that may lead to thousands of near-term fatalities and even greater numbers of long-term deaths.⁹¹ However, it is difficult to assess the risk of a terrorist attack given the numerous unknown parameters of the situation, and it is not clear to what degree NEPA requires the NRC to analyze the probability and potential environmental impacts of a terrorist attack.

In a 2006 case involving the licensing of a temporary nuclear storage facility, the NRC conducted an environmental assessment (EA),

⁸⁵ *Id.* at 481.

⁸⁶ *Id.* (“A study of the impact of thirty additional years of SNF storage must actually concern itself with the extra years of storage.”).

⁸⁷ *See id.*

⁸⁸ *See* *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 98–108 (1983).

⁸⁹ *See* Harold A. Feiveson, *Security of U.S. Nuclear Power Plants*, in *THE FUTURE OF NUCLEAR POWER IN THE UNITED STATES* 73 (Charles D. Ferguson & Frank A. Settle eds., 2012).

⁹⁰ *See* NAT. RES. DEF. COUNCIL, *supra* note 64. If terrorist groups could sufficiently damage safety systems to cause a core meltdown at a nuclear power plant, or sufficiently damage SNF pools, such an attack could lead to widespread radioactive contamination with devastating consequences. *See* Feiveson, *supra* note 89, at 73. Despite the fact that SNF pools could also be the targets of a severe attack with devastating consequences, the pools are less well protected than reactor cores. *Id.*

⁹¹ *See* Feiveson, *supra* note 89, at 73.

which resulted in a FONSI.⁹² The EA did not consider the possibility of a terror attack, reasoning that the possibility of such an attack was too far removed from the natural consequences of the agency's actions, and that the risk from a terrorist attack cannot be determined, making any analysis that is done meaningless.⁹³ However, the Ninth Circuit concluded that it was unreasonable for the NRC to dismiss the possibility of a terrorist attack on the waste storage installation.⁹⁴ Despite the uncertainty surrounding the risk of terrorist attack, the NRC was still required to evaluate the vulnerabilities of a nuclear facility, the possible methods of attack, and the potential environmental impacts of such an attack, even if probabilities could not be numerically quantified to a certainty.⁹⁵ The court definitively stated that “[n]o provision of NEPA, or any other authority cited by the Commission, allows the NRC to eliminate a possible environmental consequence from analysis by labeling the risk as ‘unquantifiable.’”⁹⁶

While the Ninth Circuit seems logical and justified in holding that inability to fully quantify a risk does not justify completely ignoring that risk, the NRC continues to ignore harmful impacts from possible terrorist attacks, and other circuits have upheld that approach. For example, in 2009, the Third Circuit held that the NRC did not need to consider the impacts of a potential terrorist attack in an EIS for relicensing of a nuclear facility.⁹⁷ The court focused on causation, holding that the causal relationship between relicensing of the facility and the environmental effects of a hypothetical terrorist attack was “too attenuated to require NEPA review.”⁹⁸ Given that the criminal act of a third party, as well as the failure on the part of government agencies responsible for thwarting terrorist attacks, were both required for an attack to occur, there was no proximate causation.⁹⁹ The court went on to say that if NEPA required the NRC to analyze the potential consequences of an airborne terrorist attack, the Commission would spend its limited time and resources evaluating security risks over which

⁹² *San Luis Obispo Mothers for Peace v. Nuclear Regulatory Comm'n*, 449 F.3d 1016 (9th Cir. 2006).

⁹³ *See id.* at 1022.

⁹⁴ *Id.* at 1030.

⁹⁵ *Id.* at 1031 (“The numeric probability of a specific attack is not required in order to assess likely modes of attack, weapons, and vulnerabilities of a facility, and the possible impact of each of these on the physical environment, including the assessment of various release scenarios.”).

⁹⁶ *Id.* (quoting *Limerick Ecology Action, Inc. v. U.S. Nuclear Regulatory Comm'n*, 869 F.2d 719 (3d Cir. 1989)).

⁹⁷ *N.J. Dep't of Env'tl. Prot. v. U.S. Nuclear Regulatory Comm'n*, 561 F.3d 132 (3d Cir. 2009).

⁹⁸ *Id.* at 140.

⁹⁹ *Id.* at 140–41.

it has little control and which would not likely aid its essential function of assuring the safety and security of nuclear facilities.¹⁰⁰

While there is a circuit split surrounding the necessity of analyzing the environmental impacts of a hypothetical terrorist attack,¹⁰¹ it is likely that the public would desire the NRC to consider such impacts.¹⁰² In our post-September 11th world, the possibility of terrorist attacks is a realistic one. In fact, evidence indicates that al Qaeda ringleaders did contemplate attacking a nuclear power plant that they had identified during familiarization flights.¹⁰³ Thus, the probability of an attack on a nuclear facility, and the catastrophic consequences that would follow, is certainly not zero. Nonetheless, as discussed above, the courts have not provided consistent guidance as to how NEPA requires consideration of the uncertain parameters of a terrorist attack.

¹⁰⁰ *Id.* at 141. This argument, however, may be challenged, as the risk of a terrorist attack could in fact affect numerous details in the planning of a nuclear facility. See Ben Schiffman, Note, *The Limits of NEPA: Consideration of the Impacts of Terrorism in Environmental Impact Statements for Nuclear Facilities*, 35 COLUM. J. ENVTL. L. 373, 403–04 (2010).

¹⁰¹ See *supra* notes 92–100 and accompanying text.

¹⁰² While the majority of Americans do support the continued use of nuclear energy, see, e.g., ANN S. BISCONTI, PERSPECTIVE ON PUBLIC OPINION 1 (2013), http://www.nei.org/CorporateSite/media/filefolder/NEI-Perspective-On-Public-Opinion_April-2013.pdf?ext=.pdf (“68 percent [of Americans] now favor the use of nuclear energy as one of the ways to produce electricity . . .”), most are not in favor of increasing the country’s reliance on nuclear energy and do not necessarily consider nuclear energy safe. See John M. Broder & Marjorie Connelly, *Public Remains Split on Response to Warming*, N.Y. TIMES (Apr. 27, 2007), <http://www.nytimes.com/2007/04/27/washington/27poll.html?pagewanted=all> (“When asked whether they would accept a nuclear plan[t] in their community, [Americans] said no, 59 percent to 36 percent.”); *Opposition to Nuclear Power Rises amid Japanese Crisis*, PEW RES. CTR. (Mar. 21, 2011), <http://www.people-press.org/2011/03/21/opposition-to-nuclear-power-rises-amid-japanese-crisis> (finding that 52% of Americans in a 2011 survey were opposed to expanding the use of nuclear power).

¹⁰³ See NAT’L COMM’N ON TERRORIST ATTACKS UPON U.S., THE 9/11 COMMISSION REPORT 245 (2004), <http://www.9-11commission.gov/report/911Report.pdf> (explaining that al Qaeda terrorists had originally considered nuclear power plants as targets for the attack); *Al-Jazeera Offers Accounts of 9/11 Planning*, CNN (Sept. 12, 2002, 10:42 PM), <http://edition.cnn.com/2002/WORLD/meast/09/12/alqaeda.911.claim> (summarizing an interview with an al Qaeda terrorist who explained that nuclear facilities were one of the key options considered when studying various targets). Nuclear reactors have become targets of military attacks and have been repeatedly attacked in the last few decades: in 1980, Iran bombed the Al Tuwaitha nuclear complex in Iraq; in 1981, an Israeli air strike destroyed a nuclear research facility in Iraq; Iraq bombed a nuclear plant in Iran six times during the 1980s; in 1991 the United States bombed three nuclear reactors in Iraq; and in 2003 Israel bombed a reactor that was under construction in Syria. BENJAMIN K SOVACOO, CONTESTING THE FUTURE OF NUCLEAR POWER: A CRITICAL GLOBAL ASSESSMENT OF ATOMIC ENERGY 192 (2011).

3. Long-Term Storage of Spent Nuclear Fuel

As previously described, over 2,000 tons of highly radioactive SNF is generated each year, and stored at reactor sites in ways unintended for long-term storage.¹⁰⁴ Currently, there are approximately 65,000 tons of commercially generated SNF being stored in this manner,¹⁰⁵ and at present, there is no permanent facility designated to store SNF, which will continue to be radioactive for hundreds of thousands of years.¹⁰⁶ Safe permanent storage of SNF is critical, but courts have not been consistent with regard to what sort of planning for permanent storage is required under NEPA, or whether the NRC must assess the environmental impacts that could result from the government's failure to secure a permanent repository.¹⁰⁷ The NRC has insisted that it is possible to secure long-term storage, but has not demonstrated any ability to achieve that goal; in fact, legislative and regulatory attempts to date have only been met with failure to date.¹⁰⁸

The original WCD was published in 1984, and found that safe disposal of SNF in a mined geologic depository was feasible and would be available sometime between 2007 and 2009.¹⁰⁹ The NRC amended its prediction in 1990 and issued an updated WCD, which stated that a

¹⁰⁴ See BLUE RIBBON REPORT, *supra* note 61, at 14. Most SNF is stored in concrete pools, but some has been transferred to dry casks, which is considered safer, but is still temporary. *Id.*

¹⁰⁵ *Id.* This number includes spent fuel at sites where nuclear reactors have been shut down and are no longer operating. *Id.*

¹⁰⁶ See *Backgrounder on Radioactive Waste*, U.S. NUCLEAR REG. COMMISSION, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html> (last updated Apr. 3, 2015). Some SNF contains isotopes such as U-233, which has a half-life of about 160,000 years, meaning it takes 160,000 years for only half of the radioactivity that is present to decay. See *Uranium Isotope Data: 233u*, PERIODIC TABLE, <http://periodictable.com/Isotopes/092.233/index.p.full.html> (last visited Jan. 13, 2015).

¹⁰⁷ See discussion *infra* notes 112–20 and accompanying text.

¹⁰⁸ For example, Congress amended the Nuclear Waste Policy Act in 1987, directing the Department of Energy to study Yucca Mountain in Nevada as a potential site for geologic disposal of nuclear waste. See Act of Dec. 22, 1987, Pub. L. No. 100-203, sec. 5011, §§ 10133, 10172, 101 Stat. 1330 (codified as amended at 42 U.S.C. §§ 10133, 10172 (2012)). In 2002, President George W. Bush signed joint resolutions of Congress approving Yucca Mountain for development of a nuclear waste repository. See S.J. Res. 34, 107th Cong. (2002) (enacted); H.R.J. Res. 87, 107th Cong. (2002) (enacted). However, Congress's plan to turn Yucca Mountain into a geologic repository for nuclear waste failed, and ultimately, President Obama withdrew both the license application and all funding for the project in 2009. See Adam J. White, *Yucca Mountain: A Post-Mortem*, NEW ATLANTIS, Fall 2012, at 3, 11, http://www.thenewatlantis.com/docLib/20121116_TNA37White.pdf; see also U.S. Dep't of Energy, No. 63-001 (U.S. Nuclear Regulatory Comm'n Mar. 3, 2010) (motion to withdraw), http://energy.gov/sites/prod/files/edg/media/DOE_Motion_to_Withdraw.pdf.

¹⁰⁹ Waste Confidence Decision, 49 Fed. Reg. 34,658-01, 34,658 (Aug. 31, 1984) (to be codified at 10 C.F.R. pts. 50–51).

permanent repository would be available by 2025.¹¹⁰ In the NRC's 2010 updated WCD, the NRC abandoned all attempts to speculate when a permanent SNF repository would become available, and simply stated that a repository would be available "when necessary."¹¹¹

Before 2010, courts gave deference to the finding that a permanent repository would become available; it appears that no court challenged either the method by which the NRC made its determination or the accuracy of such determination.¹¹² However, this changed in the 2012 case of *New York v. Nuclear Regulatory Commission*, in which the D.C. Circuit held that the NRC's conclusive determination that a repository would be available when necessary was inadequate under NEPA.¹¹³ In its environmental assessment, the NRC neglected to even consider the possibility that a permanent repository would not be established, and did not address any environmental impact that would result in such a case.¹¹⁴ The NRC was required to either demonstrate that the probability that it would fail to establish a repository was so negligible that it did not warrant consideration, or to analyze the environmental impacts of such failure.¹¹⁵

There has also been litigation concerning the plausibility of a permanent repository effectively isolating SNF from the environment for hundreds of thousands of years. In *Nuclear Energy Institute v. EPA*, the D.C. Circuit held that the EPA's analysis of Yucca Mountain as a permanent repository for SNF did not evaluate and predict far enough

¹¹⁰ Waste Confidence Decision Review, 55 Fed. Reg. 38,474-01, 38,474 (Sept. 18, 1990) (to be codified at 10 C.F.R. pt. 51).

¹¹¹ Waste Confidence Decision Update, 75 Fed. Reg. 81,037-01, 81,038 (Dec. 23, 2010) (to be codified at 10 C.F.R. pt. 51).

¹¹² For example, in 1978, the Second Circuit upheld the NRC's licensing of nuclear facilities based on the NRC's "implied finding of reasonable assurance" that a permanent repository would be "available when needed." *Nat. Res. Def. Council, Inc., v. U.S. Nuclear Regulatory Comm'n*, 582 F.2d 166, 170 (2d Cir. 1978). (This challenge, however, was brought under the Atomic Energy Act, not NEPA). The court acknowledged opposition that existed to establishing a repository in many states, but determined that the legislature would be able to overcome such opposition, so the court need not get involved. *Id.* at 175.

¹¹³ See *New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471 (D.C. Cir. 2012).

¹¹⁴ *Id.* at 473, 477-78 ("[T]he Commission did not calculate the environmental effects of failing to secure permanent storage—a possibility that cannot be ignored [and] . . . the Commission's conclusion that a permanent repository will be available 'when necessary' fails to define the term 'necessary' in any meaningful way" (quoting Waste Confidence Decision Update, 75 Fed. Reg. at 81,038)). The NRC's EA did not result in an EIS, because it argued that the WCD did not constitute a major federal action. See *id.* at 476. The court disagreed, however, and concluded that the NRC must issue a FONSI or an EIS in which it assessed the probability of establishing a permanent repository and the environmental impacts of a failure to do so. See *id.* at 476-79.

¹¹⁵ *Id.* However, the court apparently did not believe that the NRC would be able to demonstrate that the risk was so negligible that it did not warrant consideration, given that the court stated that it was "a possibility that cannot be ignored." See *id.* at 473.

into the future.¹¹⁶ The EPA had analyzed the risks of radiation exposure from storage at Yucca Mountain for 10,000 years into the future,¹¹⁷ but the court held that predicting only 10,000 years into the future was inconsistent with public health, and that the EPA was required to analyze the long-term stability of Yucca Mountain on a time scale on the order of one million years.¹¹⁸ Furthermore, the EPA had resolved that since it was “impossible” to predict human behavior and economic imperatives in 10,000 years, it would assume in its analysis that “current conditions” would persist.¹¹⁹ The court questioned this reasoning and labeled it “odd,” though it did not formally rule on the appropriateness of employing such logic in areas of uncertainty, as the issue had not been raised in the case.¹²⁰ It is not entirely clear how a similar analysis of uncertain circumstances would fare if it were actually challenged, though the case suggests that a presumption of no change in human behavior over 10,000 years would not be permitted.

4. Nuclear Meltdowns and Accidents

Another area of ambiguity with regard to analyzing uncertain impacts is the possibility of a nuclear meltdown.¹²¹ A core melt accident occurs when the heat generated by a nuclear reactor exceeds the heat that the cooling system is removing, to the point where the nuclear fuel elements reach their melting points.¹²² This can lead to hydrogen explosions or fuel-coolant interactions that can destroy parts of the reactor’s containment vessel.¹²³ In a full meltdown, everything in the nuclear core, including the fuel and fuel rods, melts into a lava-like

¹¹⁶ *Nuclear Energy Inst., Inc. v. EPA*, 373 F.3d 1251 (D.C. Cir. 2004). Yucca Mountain in Nevada had been designated as a permanent geological repository for SNF, and Congress had directed the agency to study Yucca Mountain’s suitability as such. *See supra* note 108.

¹¹⁷ *Nuclear Energy Inst.*, 373 F.3d at 1266–67.

¹¹⁸ *Id.* at 1271–73. One million years was in accordance with National Academy of Science (NAS) recommendations, and the court held that the EPA had not demonstrated a sufficient reason for departing from NAS recommendations. *Id.* at 1273.

¹¹⁹ *Id.* at 1275 (“[W]e followed NAS’s recommendation to use current conditions to avoid highly speculative scenarios.” (alteration in original) (quoting Public Health and Environmental Radiation Protection Standards for Yucca Mountain, NV, 66 Fed. Reg. 32,074-01 (June 13, 2001) (to be codified at 40 C.F.R. pt. 197))).

¹²⁰ *Id.* at 1275.

¹²¹ The term nuclear meltdown is not officially defined, but generally refers to overheating of the core of a nuclear reactor. *See* Dan Nosowitz, *How Nuclear Reactors Work, and How They Fail*, POPULAR SCI. (Mar. 14, 2011), <http://www.popsci.com/science/article/2011-03/whats-happening-japans-nuclear-power-plants>.

¹²² John Matson, *What Happens During a Nuclear Meltdown?*, SCI. AM. (Mar. 15, 2011), <http://www.scientificamerican.com/article/nuclear-energy-primer>.

¹²³ *See* Nosowitz, *supra* note 121.

material that burns through the concrete containment vessel, and can even restart the chain reaction fission process at an uncontrollable rate.¹²⁴ Thus, radioactive material can breach all containment and escape into the environment, resulting in radioactive contamination and potential poisoning of the surrounding environment.¹²⁵ There is disagreement about whether NEPA requires an analysis of the unknown effects of a partial or full nuclear meltdown when nuclear reactors are constructed or licensed.

In *Carolina Environmental Study Group v. United States*, the D.C. Circuit ruled on whether an EIS related to a license to construct two nuclear reactors needed to consider the probability and effects of a nuclear meltdown.¹²⁶ Carolina Environmental Study Group argued that failure to consider the impacts of a breach of the reactor containment vessel violated NEPA,¹²⁷ while the Atomic Energy Commission (AEC)¹²⁸ had classified such an accident as Class 9, meaning that the hypothetical impacts were of “ultimate severity,” but the occurrence was “highly unlikely.”¹²⁹ The court held that the AEC’s recognition that the probability of a nuclear meltdown was minimal was sufficient for an EIS, and that it did not need to provide more detailed findings about the impacts of such an accident because it was so remote and unlikely.¹³⁰

Subsequent to *Carolina Environmental Study Group*, in 1979, a partial nuclear meltdown actually occurred at one of the Three Mile Island nuclear reactors in Dauphin County, Pennsylvania.¹³¹ It was the most serious accident to occur in United States commercial nuclear power plant operating history.¹³² The accident suggested that the likelihood of a meltdown was not as improbable as the *Carolina Environmental Study Group* court had judged. However, despite the

¹²⁴ *Id.*

¹²⁵ *Id.*

¹²⁶ See *Carolina Env'tl. Study Grp. v. United States*, 510 F.2d 796 (D.C. Cir. 1975).

¹²⁷ *Id.* at 798.

¹²⁸ The AEC was an agency established after World War II to control peacetime development of atomic technology. See Atomic Energy Act of 1946, ch. 724, sec. 2, 60 Stat. 755, 756 (1946), *repealed by* Energy Reorganization Act of 1974, Pub. L. No. 93-438, sec. 104(a), 88 Stat. 1237 (1974). The Energy Reorganization Act of 1974 transferred regulatory functions of the AEC to the new NRC. See 42 U.S.C. § 5801(c) (2012).

¹²⁹ *Carolina Env'tl. Study Grp.*, 510 F.2d at 798–99.

¹³⁰ *Id.* at 799 (“Because each statement on the environmental impact of a proposed action involves educated predictions rather than certainties, it is entirely proper, and necessary, to consider the probabilities as well as the consequences of certain occurrences in ascertaining their environmental impact. There is a point at which the probability of an occurrence may be so low as to render it almost totally unworthy of consideration.”).

¹³¹ *Backgrounder on the Three Mile Island Accident*, U.S. NUCLEAR REG. COMMISSION, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html> (last updated Dec. 12, 2014).

¹³² *Id.*

Three Mile Island accident, the D.C. Circuit continued to hold that the potential impacts of nuclear meltdowns did not require assessment. In *Deukmejian v. Nuclear Regulatory Commission*, the court held that consideration of the impacts of Class 9 nuclear accidents is not required under NEPA if the NRC reasonably believes that such accidents are highly unlikely to occur.¹³³ The court stated that the Three Mile Island accident did not establish that the probability of a nuclear meltdown is “anything but very small.”¹³⁴ Thus, despite the accident, the D.C. Circuit held that the risk of a nuclear meltdown was too remote and speculative to require consideration under NEPA.

While the D.C. Circuit has held that a low probability, but potentially catastrophic, nuclear meltdown does not require detailed assessment in an EIS, the Third Circuit disagreed. In *Limerick Ecology Action v. U.S. Nuclear Regulatory Commission*, the Limerick nuclear power plant was located twenty-five miles from Philadelphia and eight miles from the largest maximum-security prison in Pennsylvania.¹³⁵ In its EIS, the NRC excluded consideration of design alternatives that addressed the possibility of a severe accident without carefully examining the impacts of such an accident.¹³⁶ Petitioner argued that, after the Three Mile Island incident, it was irrational for the NRC to maintain that risks of severe accidents are too remote and speculative to require consideration.¹³⁷ The court agreed and concluded that after Three Mile Island and the issuance of the NRC’s Interim Policy,¹³⁸ severe accidents were not too remote or speculative and could no longer be ignored.¹³⁹ It declined to extend the D.C. Circuit’s decision, and held that NEPA requires careful consideration and public notification of the impacts of potentially severe accidents.¹⁴⁰ Thus, as demonstrated, the

¹³³ *Deukmejian v. Nuclear Regulatory Comm’n*, 751 F.2d 1287, 1301 (D.C. Cir. 1984).

¹³⁴ *Id.* (“[T]he fact that the accident occurred does not establish that accidents with significant environmental impacts will have significant probabilities of occurrence.”).

¹³⁵ *Limerick Ecology Action, Inc. v. U.S. Nuclear Regulatory Comm’n*, 869 F.2d 719, 722 (3d Cir. 1989).

¹³⁶ *Id.* at 722–23, 741.

¹³⁷ *Id.* at 741.

¹³⁸ In 1980, the NRC issued a Statement of Interim Policy, which stated that “[t]he March 28, 1979 accident at Unit 2 of the Three Mile island nuclear plant has emphasized the need for changes in NRC policies regarding the considerations to be given to serious accidents from an environmental as well as a safety point of view.” Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969, 45 Fed. Reg. 40101, 40101 (June 13, 1980) (to be codified at 10 C.F.R. pts. 50–51).

¹³⁹ *Limerick Ecology Action*, 869 F.2d at 740–41.

¹⁴⁰ *Id.* at 741 (“NEPA requires that the environmental impacts of agency action be given careful consideration and that the public be informed of them. Here, the NRC excluded consideration of design alternatives through a generic policy statement rather than through careful consideration. . . . Moreover, we are unwilling to conclude . . . that the underlying risks [of a severe accident] were remote and speculative.”).

uncertain risks of a potential nuclear meltdown have been treated inconsistently by courts reviewing NEPA challenges.

B. *Treatment of Uncertainty in Other Low-Risk, High-Impact Actions*

As discussed in the previous Section, there has been little clarity with respect to how agencies should handle uncertain, but potentially catastrophic, risks associated with nuclear energy. Nuclear energy is only one of several areas where severe environmental impacts are at stake, but the probability of their occurrence is low. Courts have required varying degrees of analysis under NEPA in other situations as well.¹⁴¹ Examples include dam collapses, nuclear weapons, and liquefied natural gas explosions.

Under Customary International Humanitarian Law, dams are considered “installations containing dangerous forces.”¹⁴² Dam failures are rare, but can cause immense damage to the civilian population and the environment. Several causes can result in dam failure, including design errors, flooding, and geologic instability.¹⁴³ There is ambiguity surrounding the degree to which potential impacts of dam failures must be assessed in an EIS.

In *Warm Springs Dam Task Force v. Gribble*, the Ninth Circuit held that the environmental impacts of a dam failure caused by a catastrophic earthquake did not require discussion in an Army Corps of Engineers’ EIS.¹⁴⁴ Plaintiffs sought a preliminary injunction to halt dam construction because the EIS did not address the environmental impacts of a complete dam failure in the wake of a catastrophic seismic event.¹⁴⁵ The court held that the risk of a dam failure was not substantial or concrete, and thus too remote and speculative to require a thorough assessment.¹⁴⁶ Moreover, the court stated that since “[e]veryone

¹⁴¹ The need for a uniform interpretation of what sort of analysis is required in projects that involve uncertain risks with potentially high impacts extends to numerous other projects that the federal government undertakes.

¹⁴² See 1 CUSTOMARY INTERNATIONAL HUMANITARIAN LAW: RULES 139 (Jean-Marie Henckaerts & Louise Doswald-Beck eds., 2005).

¹⁴³ *Why Dams Fail*, FED. EMERGENCY MGMT. AGENCY, <http://www.fema.gov/why-dams-fail> (last updated Oct. 21, 2015).

¹⁴⁴ See *Warm Springs Dam Task Force v. Gribble*, 621 F.2d 1017, 1026–27 (9th Cir. 1980) (per curiam).

¹⁴⁵ *Id.* at 1026.

¹⁴⁶ *Id.* (holding that, while an “impact statement must be particularly thorough when the environmental consequences of federal action are great,” consequences that are “remote and highly speculative” do not constitute substantial risks).

recognizes the catastrophic results of the failure of a dam[,] to detail these results would serve no useful purpose.”¹⁴⁷

In *Environmental Defense Fund v. Corps of Engineers*, a federal district court in Arkansas rejected an EIS that failed to include a discussion of all possible environmental impacts to the fullest extent possible.¹⁴⁸ The court stated that where there is scientific uncertainty related to potential risks, the EIS need not resolve the uncertainty, but it must at least lay out all of the varying contentions and opinions of experts, concerned organizations, and lay people.¹⁴⁹ Disclosure of incompleteness or uncertainty in an EIS would be sufficient.¹⁵⁰

Similarly, in *Save the Niobrara River Association v. Andrus*, a federal district court in Nebraska held that an EIS was inadequate for failing to discuss the severe impacts of geologic instability at the site.¹⁵¹ The EIS did not discuss potential impacts of earthquakes or foundation problems, stating that there was little seismic activity in the area.¹⁵² However, the plaintiffs provided evidence that there was, in fact, known seismic activity in the area and that geologic structures under the dam site could be faulty.¹⁵³ The court held that the EIS had to identify this scientific disagreement and analyze the geologic risks associated with the site, though it was not necessarily required to resolve the uncertainty.¹⁵⁴ Thus, there are different approaches as to uncertainty in connection with dam failure, and it has been suggested that the outcome will depend on the positions and convictions of each court.¹⁵⁵

¹⁴⁷ *Id.* at 1026–27.

¹⁴⁸ *Env'tl. Def. Fund, Inc. v. Corps of Eng'rs*, 325 F. Supp. 749, 759 (E.D. Ark. 1971).

¹⁴⁹ *Id.* (“[The] § 102 statement should set forth these contentions and opinions, even if the responsible agency finds no merit in them whatsoever. Of course, the § 102 statement can and should also contain the opinion of the responsible agency with respect to all such viewpoints. The record should be complete. Then, if the decisionmakers choose to ignore such factors, they will be doing so with their eyes wide open.”).

¹⁵⁰ *Id.* at 759–60. Two explanations for requiring mere acknowledgement of uncertainty are: (1) the unwillingness to constrain governmental actions in any case that involves scientific questions; and (2) the possibility that the controversial information may become available at a later stage of a multiphase project. *See Weiss, supra* note 45, at 790 n.60.

¹⁵¹ *Save the Niobrara River Ass'n v. Andrus*, 483 F. Supp. 844, 846 (D. Neb. 1977).

¹⁵² *Id.* at 851.

¹⁵³ *Id.*

¹⁵⁴ *Id.* at 851–52, 865 (“I do not hold that the uncertainty must be eliminated before construction can go forward. I hold only that the uncertainty its nature and basis and what is needed to remove it must be expressed in the FES so that a decisionmaker may weigh it on the scales.”).

¹⁵⁵ *See Farber, supra* note 20, at 7 (“Clearly, a good deal depends on the attitude of the reviewing court. There seems to be no clear guidance about when a potential risk becomes so significant that it must be acknowledged in the impact statement.”). Another area of low-risk, high-impact activity is liquefied natural gas. Liquefied natural gas is highly combustible, and in case of a leak, the gas vaporizes very quickly and can create fire and thermal radiation hazards. *See* MICHAEL J. MURPHY ET AL., U.S. DEP'T OF TRANSP., CLEAN AIR PROGRAM: SUMMARY OF ASSESSMENT OF THE SAFETY, HEALTH, ENVIRONMENTAL AND SYSTEM RISKS OF ALTERNATIVE

C. *Analysis: NEPA Requirements in Areas of Uncertainty Are Ambiguous, and Greater Consistency Is Desirable*

As discussed in the previous Section, there is disagreement about what NEPA requires when projects present unlikely or uncertain risks and impacts. Amendments to section 1502.22 have not led to the desired consistency in the area, and the courts have issued conflicting judgments when reviewing NEPA assessments of uncertain risks and impacts. In the area of nuclear energy specifically, it is unclear what analysis NEPA requires agencies to undertake related to the risks and impacts of radiation leaks, terrorist attacks, long-term storage of SNF, and nuclear meltdowns. With regard to radiation leaks, in 1983 the Supreme Court did not require the NRC to quantify the risk or impacts of leakage in *Baltimore Gas*,¹⁵⁶ while more recently, the D.C. Circuit did require such an assessment in *New York v. Nuclear Regulatory Commission*.¹⁵⁷ Similarly, there is a circuit split between the Ninth and Third Circuits as to whether NEPA requires an assessment of a potential terrorist attack on a nuclear facility.¹⁵⁸ While courts had previously allowed the NRC to rely upon the notion that a long-term storage facility would be available “when necessary,” most recently, the D.C. Circuit declined to do so.¹⁵⁹ Lastly, there is also inconsistency in whether the possibility of a nuclear meltdown must be analyzed, despite the advent of the Three Mile Island accident.¹⁶⁰

In these situations, it is unclear what NEPA requires of agencies such as the NRC. One might argue that the public would desire all of the aforementioned potential risks and impacts to be considered. Availability of information is desirable, especially when it comes to matters of public health and well-being related to nuclear safety and

FUELS 3–16 (1995), http://ntl.bts.gov/lib/000/400/422/20021101_alt_fuel.pdf. For example, the Cleveland East Ohio Gas Explosion of 1944, one of the largest gas explosions in this country, killed 130 people and destroyed an area of one square mile. See *East Ohio Gas Co. Explosion and Fire*, ENCYCLOPEDIA CLEVELAND HIST., <http://ech.cwru.edu/ech-cgi/article.pl?id=EOGCEAF> (last updated Mar. 27, 1998). While there is minimal case law regarding EIS consideration of liquefied natural gas explosions, one can analogize to the varying judicial views on meltdowns at nuclear power plants, and expect that courts would disagree. Given that liquefied natural gas explosions are rare and difficult to predict, some courts may decline to require an analysis of the impacts of such explosions, holding that they are too speculative. On the other hand, given the Cleveland East Ohio Gas Explosion, other courts may view the event as an indication that such consequences are foreseeable and must be considered.

¹⁵⁶ See *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87 (1983).

¹⁵⁷ See *New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471 (D.C. Cir. 2012); discussion *supra* Section II.A.1.

¹⁵⁸ See discussion *supra* Section II.A.2.

¹⁵⁹ See *Balt. Gas & Elec.*, 462 U.S. 87; *supra* discussion Section II.A.3.

¹⁶⁰ See discussion *supra* Section II.A.4.

radioactive waste. On the other hand, this must be balanced with an acknowledgment that NEPA is not intended to impose unmanageable burdens and paralyze government agencies. Section 1502.22 was intended to help strike this balance,¹⁶¹ but uniformity still has not been achieved in determining how—or even if—agencies must address uncertain environmental risks and impacts. It is important that agencies have a clear, consistent idea of their requirements under NEPA so that they may act efficiently and avoid litigation. For example, the immediate effect of *New York v. Nuclear Regulatory Commission* was to temporarily freeze the issuance of nuclear reactor licenses for two years until the NRC revised its WCD.¹⁶² Had there been clear and consistent guidelines for how the NRC must comply with NEPA in considering uncertain risks, the freeze may have been avoided. Policymakers should have a clear understanding of the proper scope of review that courts will use to review agency actions, and they should encourage the courts to adopt uniform standards.¹⁶³ Part III looks at the courts' varying interpretations and proposes such guidelines for uniform requirements that courts should impose under NEPA in low-risk, high-impact areas of uncertainty. In this way, clarity and predictability can be reached in balancing the interests of the public and the government under NEPA.

III. PROPOSAL: IMPROVING NEPA REQUIREMENTS FOR UNCERTAIN OR UNKNOWN RISKS AND IMPACTS

Where risk is poorly understood but potentially grave, NEPA regulations have not provided much guidance. The worst-case scenario and reasonably foreseeable impacts tests have not led to uniformity in the requirements of an EIS. Moreover, many courts consider the issue of uncertainty in NEPA analyses without referencing the CEQ regulations at all.¹⁶⁴ This Note suggests a number of ways that the CEQ and the judiciary can improve NEPA requirements where risks are poorly understood but potentially catastrophic, by proposing guidelines and factors that courts should use in evaluating the completeness of an EIS.

¹⁶¹ See *supra* notes 47–49 and accompanying text.

¹⁶² In September 2014, the NRC lifted the licensing moratorium and replaced the Waste Confidence Decision with its final rule on Continued Storage of Spent Nuclear Fuel, which relies on an assertion that storage of SNF in dry casks will continue to be safe into the indeterminate future. See Continued Storage of Spent Nuclear Fuel, 79 Fed. Reg. 56,238-01 (Sept. 19, 2014) (to be codified at 10 C.F.R. pt. 51). A challenge to the rule has been filed in federal court. See Supplemental Brief of Federal Respondents in Response to This Court's Order of February 1, 2016, *Beyond Nuclear, Inc. v. U.S. Nuclear Regulatory Comm'n*, No. 14-1216 (D.C. Cir. Feb. 1, 2016) (No. 14-1216), 2016 WL 589887.

¹⁶³ See Mattix & Becker, *supra* note 11, at 1156.

¹⁶⁴ See *id.* at 1143.

Courts must require agencies to evidence their expertise with more complete discussions of the relevant science. Additionally, a lack of proximate causation between an agency's actions and specific impacts should not be dispositive, and an EIS may still be required at times. This Note also recommends that courts not defer to political conclusions or predictions, as courts are well situated to evaluate the institutional feasibility of certain political occurrences. Lastly, forward-looking obligations should be placed on agencies to check their predictions and reassess their actions if more information has come to light and impacts become predictable with more certainty.

A. *Scientific Uncertainty*

While courts have not given agencies the amount of deference given by the *Baltimore Gas* Court,¹⁶⁵ courts do generally prefer to defer to the scientific findings of an agency. NEPA precedent makes clear that a deferential approach in judicial review is in order, as the Supreme Court has held for the government in all seventeen NEPA cases that it has heard.¹⁶⁶ There is a notion that courts should be particularly deferential when it comes to scientific findings.¹⁶⁷ This allows courts to avoid grappling with technical findings in a substantive way, as judges are not scientific experts; however, at the same time, it prevents agencies from being held accountable, and could even lead to propagation of fundamental scientific error.¹⁶⁸ Thus, in order to further fairness and ensure legitimacy of agency action, a more searching role for the courts is necessary.¹⁶⁹ When the likelihood of a hazard or the impact of a hazard is unclear, courts should require more explicit discussion of the nature of the risk and the different areas of uncertainties, exploring a number of scientific viewpoints.¹⁷⁰

¹⁶⁵ *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 89 (1983).

¹⁶⁶ See Hillary H. Harnett, Case Comment, *New York v. U.S. Nuclear Regulatory Commission*, 37 HARV. ENVTL. L. REV. 589, 597 (2013).

¹⁶⁷ *Id.* at 602 & n.105 (“[T]he Commission is making predictions, within its area of special expertise, at the frontiers of science. When examining this kind of scientific determination, as opposed to simple findings of fact, a reviewing court must generally be at its most deferential.” (alteration in original) (quoting *Balt. Gas & Elec.*, 462 U.S. at 103)).

¹⁶⁸ See Emily Hammond Meazell, *Super Deference, the Science Obsession, and Judicial Review as Translation of Agency Science*, 109 MICH. L. REV. 733, 734–35, 737–38 (2011) (“[S]uper deference [to agency science] also inhibits transparency; undermines deliberation; fails to accord with political accountability; and generally abdicates the courts’ role in the constitutional scheme by encouraging outcome-oriented review” (footnotes omitted)).

¹⁶⁹ *Id.* at 735. In this way, courts can reinforce administrative law values, such as participation, transparency, and deliberation. *Id.*

¹⁷⁰ See Farber, *supra* note 20, at 26.

While remaining deferential to agencies' scientific findings, courts should look at the adequacy of the analysis and require agencies to evidence their expertise with a more complete discussion of the relevant science. Agencies should avoid conclusory, finite predictions and indicate where inferences or judgments have come into play.¹⁷¹ One scholar advocates the inclusion of confidence intervals where statistical methods have been used to make predictions, as well as sensitivity analyses.¹⁷² Moreover, where there are other predictions based on different credible scientific methods, an agency should include a discussion of such methods and an explanation of why it chose to reject them.¹⁷³ This is exemplified in the court's analysis in *Environmental Defense Fund v. Corps of Engineers*, as previously discussed, where the court held that at the very least, an EIS must lay out all of the varying contentions and opinions of experts, even if it does not resolve the uncertainty of the situation at issue.¹⁷⁴ Lastly, in light of the D.C. Circuit's recent decision in *New York v. Nuclear Regulatory Commission*,¹⁷⁵ where an agency believes that the probability of a certain outcome is negligible, the agency should still include an analysis of its calculation and of how the agency arrived at its conclusion.¹⁷⁶ In this way, courts would be able to review whether the data match the conclusions.

One might argue that giving greater deference without requiring agencies to lay out all of their methods is still appropriate.¹⁷⁷ There is mixed precedent in the case law, and in light of the *Baltimore Gas* line of cases, some have argued that courts should defer to all scientific findings.¹⁷⁸ There, the Supreme Court's opinion, notable for its tone of deference, stated that the Court should be "at its most deferential" when

¹⁷¹ *Id.*

¹⁷² See *id.* at 28–29. Daniel Farber is the Sho Sato Professor of Law at the University of California, Berkeley School of Law, and is also the Co-Director of its Center for Law, Energy, and the Environment. *Faculty Profiles*, U.C. BERKELEY SCH. L., <https://www.law.berkeley.edu/php-programs/faculty/facultyProfile.php?facID=1141> (last visited Nov. 30, 2014).

¹⁷³ Farber, *supra* note 20, at 29.

¹⁷⁴ See *Env'tl. Def. Fund, Inc. v. Corps of Eng'rs*, 325 F. Supp. 749 (E.D. Ark. 1971); *supra* discussion Section II.B.1.

¹⁷⁵ 681 F.3d 471 (D.C. Cir. 2012).

¹⁷⁶ See discussion *supra* Section II.A.1.b.

¹⁷⁷ Increased scrutiny of the adequacy of an agency's scientific analysis may lead to increased time and expense in preparing an EIS, as well as the possibility of unnecessarily worrying the public with doomsday predictions that will not occur.

¹⁷⁸ See, e.g., Ryan G. Weldon & Michael E. Patterson, *Maintaining the Ninth Circuit's Clarified Arbitrary and Capricious Standard of Review for Agency Science After Lands Council v. McNair*, 31 PUB. LAND & RESOURCES L. REV. 55 (2010) ("To ensure the successful interaction between courts and agencies' use of science, courts must give deference to the agencies.").

it comes to reviewing scientific findings.¹⁷⁹ Subsequently, numerous courts have relied on *Baltimore Gas* and deferred to an agency's scientific findings,¹⁸⁰ though not to the same degree.¹⁸¹ However, while judges are not scientific experts situated to make scientific determinations, this level of deference is undesirable and renders government agencies unaccountable.¹⁸² Without overstepping beyond their areas of expertise, courts can—and should—still require more complete analyses of uncertain situations that provide discussions of all relevant science.

B. *Political Uncertainty*

While courts should not second-guess scientific conclusions that are based on credible science, they should not necessarily defer to an agency's political judgments. For example, in *New York v. Nuclear Regulatory Commission*, the NRC's statement that a long-term nuclear waste repository would become available "when necessary" was not only a scientific conclusion, but also a political one.¹⁸³ It involved a determination that geologic storage facility for SNF was scientifically feasible, as well as a political determination that the federal government would implement the project. In light of the Obama administration's 2009 decision to shut down Yucca Mountain, which had previously been designated by Congress and President George W. Bush for development as a nuclear waste repository,¹⁸⁴ the court was right to

¹⁷⁹ *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 103 (1983). In that case, the Court upheld the zero-release assumption. *See id.*

¹⁸⁰ *See, e.g., N.J. Dep't of Env'tl. Prot. v. U.S. Nuclear Regulatory Comm'n*, 561 F.3d 132, 143 (3d Cir. 2009) (deferring to the NRC's conclusion that a risk of a terrorist attack on a nuclear facility was too remote to warrant an assessment); *Sierra Club v. Marita*, 46 F.3d 606, 623 (7th Cir. 1995) (deferring to a dismissal of all theories of conservation biology without any accompanying assessment).

¹⁸¹ *See Farber, supra* note 20, at 17–18.

¹⁸² Where an agency's positions do not result from notice-and-comment rulemaking or formal adjudication, as was the case for the NRC's positions in its Waste Confidence Decisions, there is no check to ensure that the agency has not been influenced by certain interest groups in the industry; accordingly, in such scenarios, "reduced deference" is desirable, where agencies present all data, interpretations, manuals, and guidelines to the court, and the court gives this information a strong "power to persuade" weighting. Matt Kenna, *Chevron Deference to Agencies: a Two-Way Street*, 15 SE. ENVTL. L.J. 395, 400 (2007). Kenna also argues that where an agency does not administer the statute at issue, such as NEPA, under which the statute regulates the agency, the courts should not defer to an agency's interpretation of what the statute requires of it. *Id.* at 399–400; *see also Meazell, supra* note 168, at 737–38.

¹⁸³ *See New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471, 475 (D.C. Cir. 2012).

¹⁸⁴ In 2002, President George W. Bush signed joint resolutions of Congress approving Yucca Mountain for development of a nuclear waste repository. *See* S.J. Res. 34, 107th Cong. (2002) (enacted); H.R.J. Res. 87, 107th Cong. (2002) (enacted). In 2009, President Obama shut down

question the NRC's statement that a storage facility would become available when necessary. When it comes to judgments that implicate the political sphere, an agency should be expected to analyze institutional obstacles, and the court should not necessarily defer to political predictions.¹⁸⁵

One might argue that political predictions and questions of political feasibility are not the court's concern and that they are problems better suited to the political branches. In *New York v. Nuclear Regulatory Commission*, the NRC maintained that it was in a position to provide its own political analysis and make political predictions when it suggested that despite the debacle over Yucca Mountain, the existing legislative framework for a nuclear waste repository supported a finding that one would, in fact, be established.¹⁸⁶ Given that the Yucca Mountain project is still legally mandated to proceed, some have asserted that it is not the court's role to determine what the future holds and to make "better" or "more realistic" predictions.¹⁸⁷ Courts are frequently caught between a duty to enforce congressional enactments and a desire to acknowledge the practical realities of a situation, wondering whether they should wait for Congress to resolve a problem better suited to the legislature.¹⁸⁸ However, while Congress may be better suited to resolve such issues, agencies are not necessarily within their expertise or well situated to do so.¹⁸⁹ Forecasts about political affairs are beyond the scope of an agency's capacity, and courts should

the Yucca Mountain project and withdrew its license application. See Adam J. White, *Yucca Mountain: A Post-Mortem*, NEW ATLANTIS, Fall 2012, at 3, 11, http://www.thenewatlantis.com/docLib/20121116_TNA37White.pdf; U.S. Dep't of Energy, No. 63-001 (U.S. Nuclear Regulatory Comm'n Mar. 3, 2010) (motion to withdraw), http://energy.gov/sites/prod/files/edg/media/DOE_Motion_to_Withdraw.pdf.

¹⁸⁵ See Harnett, *supra* note 166, at 602-04.

¹⁸⁶ Brief for Respondents at 52-53, *Nuclear Regulatory Comm'n*, 681 F.3d 471 (No. 11-1045), 2011 WL 5553594.

¹⁸⁷ See Harnett, *supra* note 166, at 604 (noting the tension and potential for opposition in instances such as *New York v. Nuclear Regulatory Commission*, where the court asked the NRC to ignore the official law that was "on the books" in making its predictions).

¹⁸⁸ *Id.* at 603.

¹⁸⁹ Agencies have specialized technical expertise given the narrowed scope of their responsibilities, and it is generally agreed that courts should defer to such expertise involving difficult scientific questions. See, e.g., Andrew H. Baida, *Agency Deference and Expertise*, MD. B.J., Jan.-Feb. 2006, at 20, 23; Bradford C. Mank, *Protecting the Environment for Future Generations: A Proposal for a "Republican" Superagency*, 5 N.Y.U. ENVTL. L.J. 444, 467 (1996). However, this does not necessarily imply that agencies have special insight into political predictions; in fact, agencies "rarely staff a designated office with experts in politics, preferring instead to rely upon the political assessments of the politically appointed decisionmakers." Thomas O. McGarity, *The Internal Structure of EPA Rulemaking*, LAW & CONTEMP. PROBS., Autumn 1991, at 57, 64.

be skeptical of an agency's political predictions.¹⁹⁰ In particular, with regard to predictions that involve passing environmental legislation or significantly amending existing legislation, courts should not defer, as Congress has not enacted significant environmental legislation in over two decades.¹⁹¹ Thus, agencies should be required to fully analyze political and institutional obstacles, and it is appropriate for the courts to scrutinize those analyses.¹⁹²

C. Proximate Causation

Whether a particular outcome is proximately related to the agency's action should not weigh heavily in a court's review. In the circuit split over whether to consider the uncertain probability and impacts of a potential terrorist attack on a nuclear facility, the Third Circuit held that the environmental impacts of a terrorist attack, which requires a criminal act on the part of a third-party, are not proximately related to the licensing of a nuclear facility.¹⁹³ There, the court's NEPA analysis relied on tort law and looked to the Restatement (Second) of Torts for its discussion of causation.¹⁹⁴ Relying on Supreme Court NEPA analyses from earlier cases, one commentator argues that a proximate cause-based analysis is inappropriate and excludes too many impacts that should be—and historically have been—included in an

¹⁹⁰ Moreover, there is a concern that an agency's political predictions and decisions are based on their own self-interested agendas or the influence of interest groups in the affected industry, which may not be in line with the public's interests. See Mank, *supra* note 189, at 484. In fact, a survey from 2006 showed that 72.4% of Nevadans would have voted against establishing a nuclear repository at Yucca Mountain. See NEV. AGENCY FOR NUCLEAR PROJECTS, THE 2006 STATE OF NEVADA YUCCA MOUNTAIN SURVEY SUMMARY REPORT 3 (2006), <http://www.state.nv.us/nucwaste/news2006/pdf/nv2006summary.pdf>.

¹⁹¹ See Richard J. Lazarus, *Congressional Descent: The Demise of Deliberative Democracy in Environmental Law*, 94 GEO. L.J. 619, 629–30 (2006). Given this recent track record, it is inappropriate for an agency to assume that Congress will be more active in the coming years in making such reforms. As described by one Senator, “[t]o be able to move a major bill dealing with environmental law, or any adjustment to the law, is very difficult. Congress doesn’t want to focus on it, doesn’t want to put up with the heat.” *Id.* at 629 (quoting Charles Pope, *Environmental Bills Hitch a Ride Through the Legislative Gantlet*, 56 CONG. Q. WKLY. REP. 872, 873 (1998)).

¹⁹² Given that agencies may not have special political expertise, a “second opinion” from the court about the “substantive merits” of certain agency findings and predictions would be helpful in providing a more complete picture and ensuring that agencies are objective, realistic, and unmotivated by interest groups. See Mank, *supra* note 189, at 468–69. This is especially true where agencies are relying on industry data to make decisions. *Id.* at 484.

¹⁹³ See *N.J. Dep’t of Env’tl. Prot. v. U.S. Nuclear Regulatory Comm’n*, 561 F.3d 132, 143–44 (3d Cir. 2009).

¹⁹⁴ See *id.* at 140–41 (citing RESTATEMENT (SECOND) OF TORTS § 448 (AM. LAW. INST. 1965)).

EIS.¹⁹⁵ The Restatement (Second) of Torts is an entirely different area of law and does not lend itself to resolution of NEPA-related issues.¹⁹⁶ As such, certain impacts that are not proximately caused by an agency's actions may still be reasonably foreseeable and warrant assessment in an EIS. The impacts of a terrorist attack on a nuclear facility, while not proximately caused by the licensing of a nuclear facility, are foreseeable in light of events such as the September 11, 2001 attack on the World Trade Center, and should be included.¹⁹⁷

The Third Circuit in *New Jersey Department of Environmental Protection*¹⁹⁸ got its application of a proximate causation test wrong. The test excludes too many impacts that are properly included in EISs.¹⁹⁹ Additionally, NEPA's broad goal of promoting concern for the quality of the environment suggests that it is appropriate to draw lines in a way that includes more impacts for assessment, as opposed to fewer.²⁰⁰ Inquiring whether a particular outcome is proximately related to the agency's action leads to the exclusion of certain impacts, such as those from a terrorist attack, that are appropriately considered under NEPA. The purposes of NEPA are to ensure that the government carefully considers the impacts of its actions on the environment, and to guarantee that this information is made available to the public, who in turn will provide comments and feedback.²⁰¹ Without requiring a detailed discussion of the risks and impacts of a terrorist attack on a nuclear reactor, the NRC might not carefully consider such risks, or even be aware of certain impacts.²⁰² Furthermore, the public would be

¹⁹⁵ See Schifman, *supra* note 100, at 394–97.

¹⁹⁶ *Id.* at 397. Schifman explains that the requirement of an agency to act under NEPA is not analogous to a duty owed under tort law, and that the negligence standard of review in tort law has no place in NEPA review, which calls for an arbitrary and capricious standard. *Id.*

¹⁹⁷ See *San Luis Obispo Mothers for Peace v. Nuclear Regulatory Comm'n*, 449 F.3d 1016 (9th Cir. 2006) (requiring the NRC to evaluate the risks and possible impacts of a potential terrorist attack, despite an inability to numerically quantify such risks with certainty); Feiveson, *supra* note 89, at 73–77, 81–85 (noting that nuclear power plants were originally considered as targets for the September 11th attacks, and arguing that a future terrorist attack on a nuclear facility remains plausible and post-September 11 attempts by the NRC to increase nuclear reactor security may be insufficient).

¹⁹⁸ 561 F.3d 132 (3d Cir. 2009).

¹⁹⁹ For example, it would exclude consideration of new growth that results from certain government development projects such as highways, although such impacts require assessment under NEPA. See Schifman, *supra* note 100, at 396 n.152 (citing *City of Davis v. Coleman*, 521 F.2d 661 (9th Cir. 1975)).

²⁰⁰ See *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm'n*, 481 F.2d 1079, 1088 (D.C. Cir. 1973) (“The statutory phrase ‘actions significantly affecting the quality of the [human] environment’ is intentionally broad, reflecting [NEPA’s] attempt to promote an across-the-board adjustment in federal agency decision making so as to make the quality of the environment a concern of every federal agency.” (quoting 42 U.S.C. § 4332(2)(C) (2012))).

²⁰¹ See *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349–50 (1989).

²⁰² See Schifman, *supra* note 100, at 401–02.

deprived of an opportunity to comment on certain environmental impacts of a nuclear power plant and would have no assurance that the NRC is adequately addressing all of the environmental concerns.²⁰³ As such, excluding certain risks and impacts from consideration under NEPA simply because they are not proximately related to an agency's action conflicts with the purposes of NEPA and is inappropriate.

D. *Delay Caused by a Fuller Analysis and National Security*

Another factor that courts should consider in their review is whether there will be potentially deleterious consequences in requiring an agency to produce a more complete EIS. When an agency must amend its EIS to reconsider the feasibility of a long-term storage facility for nuclear waste and the impacts of a failure to procure such a facility, as in *New York v. Nuclear Regulatory Commission*, there will likely be a delay in the licensing of new power plants. Such a short-term delay in the licensing of new nuclear facilities may not have tremendous impacts on the government or the public. On the other hand, courts should follow the lead of the D.C. Circuit in *Committee for Nuclear Responsibility v. Seaborg* where the delay in the military's underground nuclear testing could have had serious national security and foreign policy implications.²⁰⁴ Accordingly, in a judicial review of an agency's NEPA analysis, courts should consider the relevant national security consequences of delaying the agency's project when weighing the appropriateness of a more searching analysis.

E. *Reevaluation of EIS Predictions*

Another guideline that should be considered in preparing a NEPA analysis of uncertain risks is a re-evaluation process. Agencies should never take the current state of knowledge as fixed,²⁰⁵ particularly where

²⁰³ *Id.* at 402.

²⁰⁴ *See* *Comm. for Nuclear Responsibility, Inc. v. Seaborg*, 463 F.2d 788 (D.C. Cir. 1971); 463 F.2d 796 (D.C. Cir. 1971). In this case, the D.C. Circuit found that the AEC's EIS related to an underground nuclear testing project was insufficient under NEPA, because the EIS did not consider the most severe potential environmental risks of the nuclear project. *See* 463 F.2d 783, 787-88; 463 F.2d 796, 797-98. However, the court declined to enjoin the AEC's nuclear testing until it came into compliance with NEPA because this delay in the nuclear program may have posed a threat to national security and foreign policy. *See* 463 F.2d 796, 797-99 ("Our failure to enjoin the test is not predicated on a conviction that the AEC has complied with NEPA in setting forth the dangers of environmental harm. The NEPA process—which is designed to minimize the likelihood of harm—has not run its course in the courts.")

²⁰⁵ *See* Farber, *supra* note 20, at 28.

knowledge is incomplete or there is disagreement. A risk once thought to be difficult to evaluate, may become more easily monitored; similarly, a risk once thought to have a probability of nearly zero, may later be shown to be more likely than previously thought.²⁰⁶ Furthermore, case studies indicate EIS predictions are more accurate in circumstances where there is continued monitoring of, and feedback from, project impacts, as opposed to one-time predictions that simply rely on more sophisticated predictive techniques.²⁰⁷ Currently, NEPA has no forward-looking requirements, and an evaluation of present conditions using current knowledge is all that is required. However, the CEQ should consider adding to the regulations an obligation for agencies to check their predictions and reassess their actions if circumstances are very different or more information has come to light.

CONCLUSION

Uncertain risks and impacts that are associated with potentially catastrophic effects present a challenge under NEPA. It is especially difficult to balance the public's right to information with the government's interest in preserving resources and avoiding unmanageable assessments. As demonstrated, the regulations have not provided much guidance and there is little uniformity among the courts. However, drawing from previous decisions where courts have gotten it right,²⁰⁸ this Note suggests a number of ways that the CEQ and the judiciary can improve NEPA requirements where risk is poorly understood but potentially grave. Courts should remain deferential to agencies' scientific conclusions, but require agencies to evidence their expertise with a more complete discussion of the relevant science. This includes a thorough discussion of the agency's scientific methods that support its conclusions, as well as competing methods and points of view and an explanation for their rejection. In addition, a lack of

²⁰⁶ For example, the risk of a nuclear meltdown was previously considered to be nearly non-existent, but post-Three Mile Island, has become a realistic event. See discussion *supra* Section II.A.4.

²⁰⁷ See Farber, *supra* note 20, at 25 (citing PREDICTION: SCIENCE, DECISION MAKING, AND THE FUTURE OF NATURE 369 (Daniel Sarewitz et al. eds., 2000)).

²⁰⁸ See, e.g., *New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471 (D.C. Cir. 2012) (requiring an agency to present its calculations and describe the methods that led to its conclusion that a certain potential outcome is negligible, and questioning the NRC's political predictions with regard to the future establishment of a nuclear waste repository); *Envtl. Def. Fund v. Corps of Eng'rs*, 325 F. Supp. 749, 759 (E.D. Ark. 1971) (holding that an EIS must lay out all varying contentions and opinions held by experts, even if it does not resolve the uncertainty); *Seaborg*, 463 F.2d 788 (factoring into its decision the national security implications of delaying an agency's project).

proximate causation between agency actions and certain impacts should not be dispositive, and an EIS analysis may still be implicated. Moreover, courts need not defer to political conclusions or predictions that are uncertain in the same way that they defer to scientific conclusions, as the court is in a position to assess the institutional feasibility of certain occurrences. Courts should consider the implications of a delay in agency action caused by producing more thorough EISs, such as any consequences to national security. Lastly, forward-looking regulations should be developed for areas of uncertainty, and agencies should be required to revisit their predictions where risks were not fully understood.