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Necessarily Unpredictable - Oil Spill Risks beyond the Horizon

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NECESSARILY UNPREDICTABLE? OIL SPILL RISKS BEYOND THE HORIZON

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> The occurrence of oil spills is fundamentally a matter of probability. There is no certainty regarding the amount of oil that would be produced, or the size or likelihood of a spill that would occur, during the estimated life of a given lease sale. . . . A probabilistic event such as an oil-spill occurrence or oil-spill contact to an environmentally sensitive area cannot be predicted, only an estimate of its likelihood (its probability) can be quantified.[1]

Oil spills are and will remain a fact of life, probably until the oil is gone. The principal "environmental" statute constraining our Department of Interior's oversight of "deepwater" oil development in the Gulf of Mexico (and the rest of our "outer continental shelf") has been the National Environmental Policy Act (NEPA).[2] In retrospect, of course, that oversight left a lot to be desired, arguably implying that NEPA leaves a lot to be desired. And indeed, it does. But the lessons from the BP oil spill are rather less intuitive than some have argued.[3] This Article will sketch NEPA's now shop-worn structural flaws, three of the major pivots in NEPA practice today, and a focused look at the actual NEPA process that led to the Deepwater Horizon tragedy last summer. It will also consider briefly our culture's understanding of so-called "low-probability" risks on the way to proposing several needed changes in how our federal agencies assess and take environmental risks consistent with our "foundation of environmental policymaking in the United States," NEPA.[4]

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1. MINERALS MGMT. SERV., OIL-SPILL RISK ANALYSIS: GULF OF MEXICO OUTER CONT'L SHELF (OCS) LEASE SALES, CENT. PLANNING AREA & W. PLANNING AREA, 2007–2012, & GULFWIDE OCS PROGRAM, 2007–046, http://www.boemre.gov/itd/pubs/2007/2007-040.pdf [hereinafter OCS REP. MMS 2007–040].

2. National Environmental Policy Act, 42 U.S.C. §§ 4321-4370f (2006). NEPA's purposes preamble explicitly invoked "the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth" and "resource exploitation," forces that had to be checked if the "conditions under which man and nature can exist in productive harmony" were to be achieved. *Id.* § 4331(a).

3. *See, e.g.*, ALYSON FLOURNOY ET AL., CTR. FOR PROGRESSIVE REFORM, REGULATORY BLOWOUT: HOW REGULATORY FAILURES MADE THE BP DISASTER POSSIBLE, & HOW THE SYS. CAN BE FIXED TO AVOID A RECURRENCE 35–42 (2010) (arguing that MMS, among other things, should have been required to complete a "worst case scenario" analysis, required to avoid "tiering" its NEPA documents, and not permitted to use "categorical exclusions" in specific NEPA determinations).

4. MINERALS MGMT. SERV., OUTER CONT'L SHELF OIL & GAS LEASING PROGRAM: 2007–2012, FINAL ENVTL. IMPACT STATEMENT App. D, D-1 (MMS 2007–03), http://www.boemre.gov/5-year/2007-2012FEIS/AppendixDLaws.pdf [hereinafter PROGRAMMATIC EIS].

NEPA's genius was its generality and simplicity. The statute commands no particular environmental outcomes. It is not limited in scope to classes of industry or measurable degradations of air or water or soil quality, to losses of species, or creations of new toxins; it governs irrespective of motive, purpose, or point. NEPA requires that "all agencies of the Federal Government shall . . . include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official" stating the environmental impact of the proposed action, any unavoidable adverse environmental impacts should the action be taken, alternatives to the proposed action, and other information useful in deciding whether the reasons for the proposal outweigh or otherwise defeat the reasons against it.[5] NEPA § 102 *also* directs the same agencies to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment."[6] This "stop and think" mandate,[7] when combined with the "study and integration" mandate, might seem to imply a kind of über-deliberation duty. But it would be a misleading implication—one that obscures several latent complications in our concept of law and, thus, our understandings of NEPA as law.

First of all, the Supreme Court has made clear that suits to affect administrative agencies' allocative choices face a heavy presumption against judicial relief.[8] As the United States Supreme Court has made increasingly clear, to be brought into court along the usual routes, an agency's action "must be one by which rights or obligations have been determined, or from which legal consequences will flow."[9] Many have criticized this norm at the Court,[10] but the critiques seem to have had little effect. For a variety of reasons grounded in our separation of powers, the judiciary has resisted becoming the tip of the sword in projects such as NEPA § 102(2)'s study and integration requirement.[11] By contrast, NEPA § 102(2)'s "stop and

5. 42 U.S.C. § 4332(2)(C).

6. *Id.* § 4332(2)(A). Separately, § 102(2)(B) requires all agencies to "identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations." *Id.* § 4332(2)(B). Combined, these are NEPA's "study and integration" mandates.

7. "If NEPA mandates anything, it mandates this: a federal agency cannot ram through a project before first weighing the pros and cons of the alternatives." Simmons v. U.S. Army Corps of Engineers, 120 F.3d 664, 670 (7th Cir. 1997).

8. "Allocative" decisions in this sense include decisions to take or not to take enforcement action of various kinds, *see, e.g.*, Heckler v. Chaney, 470 U.S. 821, 837–38 (1985), decisions as to the expenditure of lump-sum appropriations, *see, e.g.*, Lincoln v. Vigil, 508 U.S. 182, 190–92 (1993), and decisions to take or not to take so-called "programmatic" actions. *See, e.g.*, Norton v. S. Utah Wilderness Alliance, 542 U.S. 55, 66–67 (2004).

9. Bennett v. Spear, 520 U.S. 154, 177–78 (1997) (internal quotation marks and citations omitted).

10. *See, e.g.*, Eric Biber, *The Importance of Resource Allocation in Administrative Law*, 60 ADMIN. L. REV. 1 (2008).

11. Some courts have even gone so far as to hold that the statute's "detailed statements" called forth in § 102(2)(C) can fully satisfy an agency's duty under § 102(2)(A). *See, e.g.*, Save our Sycamore

think" mandate—its "detailed statement" requirement—has become a staple of federal court practice for most of our last four decades.[12] Indeed, some aspect of this requirement has come before the Supreme Court no fewer than sixteen times.[13] This vein of NEPA's has arguably even influenced our administrative law's "reasoned decision making" jurisprudence more generally.[14] As part III will show, though, too much of NEPA's stop and think mandate today takes the form of *guidance* to federal agencies and is not, in any simple sense, law. Thus, understanding its status in our legal system has become part of NEPA's increasingly ambivalent legacy.

One net result of the above is that NEPA law tends to focus us on discrete, identifiable instances of agency choice while the broader picture of agency rationality recedes from view. The broader picture—a picture that might include, for example, an agency's decision to forego directed study of certain nettlesome variables in issues it routinely encounters—is virtually invisible to NEPA. Thus, systemic failures go unremedied. Indeed, they often go unrecognized. An agency that repeatedly and insistently failed to study a risk arising routinely in its practice and that promised to continue to arise in the future might be called *irrational* in every sense—and still survive almost any challenge alleging a failure of NEPA compliance. NEPA § 102(2)'s study and integration mandates are, in short, potentially powerful but essentially left out of NEPA practice today.

A second problem is how its administrator has been responding to NEPA's shortcomings: through a turgid flow of guidance, memoranda, circulars, and the like, none of which authoritatively resolve any of NEPA's shortcomings.[15] These tools have their place, but they are poorly chosen if and to the extent that their user expects they will change agency conduct that has powerful reasons behind it. The Council on Environmental Quality (CEQ), NEPA's administrator, must rethink its belief that it can update NEPA without updating its NEPA rules. To be sure, this problem is more deeply and broadly rooted, but it will have to be confronted if federal regulators are to better manage risks like catastrophic oil spills.

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v. Metro. Atlanta Rapid Transit Auth., 576 F.2d 573 (5th Cir. 1978); Save Our Invaluable Land (SOIL), Inc. v. Needham, 542 F.2d 539 (10th Cir. 1976); Pa. Protect Our Water & Envtl. Res., Inc. v. Appalachian Reg'l Comm'n, 574 F. Supp. 1203 (M.D. Pa. 1982).

12. *See, e.g.*, DANIEL R. MANDELKER, NEPA LAW & LITIG.: THE NATI'L ENVTL. POLICY ACT 2–10 (2d ed. 1996).

13. *See* Richard J. Lazarus, *When a Loss is Almost a Victory*, 26 ENVTL. F. 14 (Mar./Apr. 2009), *available at* http://www.law.georgetown.edu/faculty/lazarus/docs/columns/LAZARUS.FORUMMarch AprilFinalColumn.pdf.

14. *See, e.g.*, Jason J. Czarnezki, *Revisiting the Tense Relationship Between the U.S. Supreme Court, Administrative Procedure and the National Environmental Policy Act*, 25 STAN. ENVTL. L.J. 3 (2006).

15. *See infra* note 147 and accompanying text.

I. NEPA IN PRACTICE TODAY: DOCUMENTS, DECISIONS, AND DEFERENCE

If there is one sure thing NEPA has revealed about us in its four decades, it is this: we do not know the value of information. This is not to complain that our priorities are askew (although they may be). It is to observe that we are not very good at valuing information accurately, especially information about environmental risk. NEPA is written and structured as if this information is easily gathered, easily sorted, and easily absorbed by those who make decisions for the public. Quite to the contrary, "information about the environmental consequences of our actions is not free, abundant, and unerringly accurate, but is more typically scarce, costly to assemble, highly uncertain, and variable in quality."[16] Getting us to think probabilistically about environmental risk—and to expertly manage the "plan uncertainty" that inevitably arises within any such calculus[17]—has been a constant negotiation between NEPA as it was legislated, NEPA as it actually works in our legal system, and NEPA as it might be reformed in the future.

NEPA's "Council on Environmental Quality" (CEQ) established rules in 1978 that divide all agency actions into three categories: those that normally do,[18] those that normally do not,[19] and those that may or may not[20] require one of NEPA's "detailed statements" on environmental impacts and alternatives to the proposed action.[21] Into at least one of these three categories the sum total of all NEPA-governed actions across our sprawling federal agencies must fit.[22] Only about 500 or so actions a year draw a full EIS today.[23] Best estimates are that some 50,000 or more assessments are done annually to determine whether a full impact statement is necessary.[24]

16. Bradley C. Karkkainen, *Toward a Smarter NEPA: Monitoring and Managing Government's Environmental Performance*, 102 COLUM. L. REV. 903, 926 (2002) [hereinafter Karkkainen, *Toward a Smarter NEPA*].

17. *See* Dave Owen, *Probabilities, Planning Failures, and Environmental Law*, 84 TUL. L. REV. 265 (2009) (describing the general phenomenon of "plan uncertainty" and environmental law's failure to account for plan uncertainty when requiring particular environmental outcomes).

18. 40 C.F.R. § 1501.4(a)(1) (2010).

19. *Id.* § 1501.4(a)(2).

20. *Id.* § 1501.4(b).

21. In making the foregoing determinations, the action agency may proceed "under its procedures" for NEPA compliance. *See id.* § 1501.4(a). Thus, departmental manuals, circulars, and guidance fill the void between these three kinds of NEPA actions and agency operations more generally. At the Department of the Interior, for example, the *DOI Manual* specifies to personnel which departmental actions normally necessitate one of these NEPA decisions. U.S. DEP'T OF THE INTERIOR, DEPARTMENTAL MANUAL pt. 516 (1978), http://elips.doi.gov/app_dm/index.cfm (last visited June 27, 2011).

22. The pigeonhole that has attracted the most attention from courts, commentators, and action agencies has been the "may or may not require a detailed statement," depending on the context. *See* Karkkainen, *Toward a Smarter NEPA*, *supra* note 16, at 920 –24. "[O]ver the longer run of cases, no clear standard of 'significance' has emerged," leaving agency managers a lot of discretion in deciding whether their agencies actions should trigger NEPA's threshold for an environmental impact statement. Karkkainen, *Toward a Smarter NEPA*, *supra* note 16, at 920.

23. *See* Ted Boling, *Making the Connection: NEPA Processes for National Environmental Policy*, 32 WASH. U. J.L. & POL'Y 313, 320–21 (2010).

24. *See* Karkkainen, *Toward a Smarter NEPA*, *supra* note 16, at 920.

And no one knows how many "categorical exclusions" materialize in a given year.[25]

CEQ has long insisted that NEPA's goal is better decisions, not better documents. A convergence of many causes, however, has led to a lopsided focus on the latter and our acute and continuing frustrations as to the former. A Presidential Task Force in 2003 noted NEPA's own congenital defect and its role in this failure of implementation:

> In the 1997 [twenty-five-year] study, CEQ recognized that the environmental protection afforded by the traditional environmental management model, "predict, mitigate and implement," depends on the accuracy of the predicted impacts and expected results of any mitigation. The study concluded that a "major difficulty with the traditional environmental impact analysis process is that it is a one-time event; i.e., results from intensive research, modeling, and other computations or expert opinions are analyzed, the analysis of potential environmental impacts is prepared, mitigation measures are identified, and a document is released for public review." Unfortunately, this process does not account for unanticipated changes in environmental conditions, inaccurate predictions, or subsequent information that might affect the original environmental protections.[26]

In short, whether it is a "categorical exclusion" (CE), a full-dress "environmental impact statement" (EIS), or an "environmental assessment" and a "finding of no significant impact" (EA/FONSI), every NEPA process requires a responsible official to assess some given risk, to predict, and to pursue a course of action in light of the exercise. If we were more serious about improving our probabilistic thinking about risk, though, these NEPA documents would become valuable assets upon completion: with them, we should be able to ground-truth past efforts in prediction, past characterizations of cause and effect, and to reach some generalizations about NEPA methods in order to improve our planning and risk-taking.

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25. Some data exist, of course. As of March 31, 2010, for example, 157,500 of the approximately 165,600 reported projects and activities carried out pursuant to the American Recovery and Reinvestment Act were finalized on the basis of Categorical Exclusion. *See* COUNCIL ON ENVTL. QUALITY, THE FIFTH REP. ON THE NAT'L ENVTL. POLICY ACT STATUS & PROGRESS FOR AM. RECOVERY & REINVESTMENT ACT OF 2009 ACTIVITIES & PROJECTS 4 (2010), http://ceq.hss.doe.gov/nepa/attachments/may2010/CEQ_ARRA_NEPA_Report_May_03_2010.pdf. Even beyond the special case of the ARRA, agencies are supposedly under a duty to document any application of a categorical exclusion, *see, e.g.*, California v. Norton, 311 F.3d 1162 (9th Cir. 2002), although compliance with such a norm is obviously difficult to verify.

26. THE NEPA TASK FORCE REP. TO THE COUNCIL ON ENVTL. QUALITY: MODERNIZING NEPA IMPLEMENTATION 44 (2003), http://ceq.hss.doe.gov/ntf/report/finalreport.pdf (quoting COUNCIL ON ENVTL. QUALITY, THE NAT'L ENVTL. POLICY ACT: A STUDY OF ITS EFFECTIVENESS AFTER TWENTY-FIVE YEARS 32 (1997), *available at* http://ceq.eh.doe.gov/nepa/nepa25fn.pdf) [hereinafter NEPA TASK FORCE REP.].

Finally, ever since CEQ's rules have been in place, agencies have been encouraged to "tier" their NEPA documents in order to "eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review."[27] This notion of tiering supposedly allows an agency to treat broad-scale environmental risks in a full-dress environmental impact statement (EIS) for a whole "program" and then to bracket those broader questions in subsequent stages of implementation where, presumably, progressively narrower impacts and alternatives can be highlighted.[28] "When the geographical scope expands, cumulative effects become more complex, solutions to problems affect multiple agencies, and information sharing becomes essential,"[29] though, and agencies have encountered great difficulties generating NEPA analyses that organize such risks in a coherent way. "Little formal guidance exists to distinguish the content requirements of a programmatic analysis and that of a site-specific analysis."[30] Still, court challenges to the use of "tiering" rarely end in remands back to the agency for reconsideration of its decision-making compartments.[31] Agencies benefit from a healthy measure of judicial deference in judgments of this kind.[32] Tiering makes good sense in the abstract: environmental risk is abundant and often exists at multiple levels of consciousness. A formalistic insistence that all imaginable risks be rehashed at any juncture in which they might factor into a decision would ignore the perils for practical decision making that such formalism entails.[33] In practice, nevertheless, tiering has been a source of confusion and conflict—serving as one of the most frequent subjects of CEQ's "guidance" and other interpretive work[34]—in large measure because of the difficulties

27. 40 C.F.R. § 1502.20 (2010).

28. *See* NEPA TASK FORCE REP., *supra* note 26, at 35–40.

29. *Id.* at 39.

30. *Id.* at 40.

31. *See, e.g.*, Fund for Animals v. Kempthorne, 538 F.3d 124, 137–39 (2d Cir. 2008) (upholding programmatic impact statement on wildlife extermination plan against challenge that site-specific exterminations were not going to be assessed individually); N. Alaska Envtl. Ctr. v. Kempthorne, 457 F.3d 969 (9th Cir. 2006) (upholding programmatic impact statement for whole oil and gas leasing program over challenges that agency's commitment to analyze site-specific actions in the future left risks understudied); Minn. Pub. Interest Research Group v. Butz, 498 F.2d 1314 (8th Cir. 1974) (confirming the general propriety of tiering prior to CEQ's NEPA rules). Rarely is not "never," of course. *See, e.g.*, Blue Mountains Biodiversity Project v. Blackwood, 161 F.3d 1208 (9th Cir. 1998) (rejecting agency judgment that programmatic EIS adequately considered risks of several more specific actions).

32. *See* MANDELKER, *supra* note 12, at §§ 9:16–9:17.

33. Tiering can mean both that certain risks will be deferred to some future NEPA analysis and/or that certain risks have been left to some prior consideration that was presumably broader in scope. *See, e.g.*, Kleppe v. Sierra Club, 427 U.S. 390 (1976) (affirming Department of Interior's deferral of "regional" and site-specific assessments in programmatic EIS for nationwide coal development program because no regional or site-specific "proposal" had yet emerged); Manatee County v. Gorsuch, 554 F. Supp. 778 (M.D. Fla. 1982) (upholding EPA decision to forego site-specific NEPA document on grounds the scenario analyzed in programmatic EIS was precisely like the site-specific proposal for action under review).

34. *See, e.g.*, Jan G. Laitos, *Paralysis by Analysis in the Forest Service Oil and Gas Leasing Program*, 26 LAND & WATER L. REV. 105 (1991); William G. Malley & Angela M. Dusenbury, *Tiered Environmental Studies in the National Environmental Policy Act Process for Highway Projects*, 1792 TRANSP. RES. REC. 101 (2002); J.B. Ruhl & Robert L. Fischman, *Adaptive Management in the Courts*, 95 MINN. L. REV. 424, 456–61 (2010).

we all have in disentangling narrow, action-specific risks from the risks entailed in broader courses of conduct.

Besides NEPA's misunderstanding of its own production costs, though, NEPA also undervalues information that has been gathered, recorded, and processed. Once the costs of an adequately "detailed" statement of environmental risks have been born, we should expect the finished product to be quite valuable. In point of fact, virtually no care is taken to make these NEPA products widely available, searchable, or otherwise accessible to prospective users. And EISs are valued more frequently than any other NEPA documents![35] The countless agency reviews that end with a CE—which are not necessarily "NEPA documents" under the rules[36]—are rarely even recorded, let alone archived, indexed, or tracked over time. The thousands of EA/FONSIs that accumulate annually mostly disappear without a trace. Unfortunately, NEPA itself makes no provision for the spreading or sharing of its informational benefits. Most completed NEPA documents, so far as the law is concerned, can recede immediately from consciousness[37]—with the possible exception of the agency officials for whom broad-scale NEPA analyses offer a way of expediting yet-to-be completed NEPA processes. These shortcomings added up to a tragically insufficient analysis of environmental risk by the Department of Interior as it moved oil and gas development into deeper and deeper waters. Part II examines that breakdown.

II. NEPA AT INTERIOR: LEARNING TO LEAN ON THE "UNPREDICTABLE"

If NEPA as it has evolved is being defined by its structural flaws and our own uneven understanding of the value of information, some agencies have been able to adapt it to their habits more deftly than others. This part explores one agency's particularly deft and, in retrospect, tragically negligent risk planning as structured by NEPA. It identifies three key pivots that arise in NEPA practice routinely: (1) the so-called low-probability/high-impact risk; (2) the use of tiering to organize risk analysis at broader and smaller scales; and (3) the incremental nature of information and the necessity of updating if we are to use our information rationally.

Since September 11, 2001, decision-making theorists—and no small slice of the public—have been obsessed with optimizing for so-called "low-probability/high-impact" risks.[38] Then-Vice President Cheney even announced a "1% rule," a rule that truly catastrophic risks should be treated

35. Every EIS must be filed for "review" with the U.S. Environmental Protection Agency (EPA), a step that was added by Section 309 of the Clean Air Act months after NEPA was enacted. *See* 42 U.S.C. § 7609 (2006); LYNTON KEITH CALDWELL, THE NAT'L ENVTL. POLICY ACT: AN AGENDA FOR THE FUTURE 70–71 (1998). And every completed EIS must be filed with EPA for permanent archivization. 40 C.F.R. § 1506.9 (2010). No other NEPA documents are archived by EPA.

36. 40 C.F.R. § 1508.10 (2010).

37. *See* Michael B. Gerrard & Michael Herz, *Harnessing Information Technology to Improve the Environmental Impact Review Process*, 12 N.Y.U. ENVTL. L.J. 18 (2003).

38. *See, e.g.*, CASS R. SUNSTEIN, WORST-CASE SCENARIOS (2008).

"like a certainty."[39] Cheney's heuristic has a certain sensibility to it depending on one's definition(s) of "catastrophe." Given the former Minerals Management Service's NEPA analyses of the risks of catastrophic oil spills in the deep waters of the Gulf of Mexico, though, this "Cheney doctrine" was obviously gerrymandered, to say the least. Who defines the truly catastrophic such that no expense will be spared in assessing and managing its risks?[40] In our combustion economy, anything necessary to the extraction, delivery, or use of oil, coal, or natural gas has seemed like a risk worth taking. Nowhere has this been more evident than at the Department of the Interior (DOI).

The Outer Continental Shelf Lands Act (OCSLA)[41] and other, related statutes delegate to DOI the authority to permit exploration for and development of oil and gas resources in the coastal areas of the United States from three to 200 miles offshore.[42] OCSLA structures DOI's leasing programs loosely, but NEPA supplies the principal analytical duties that attach to the many decisions OCSLA requires of DOI.[43] As OCSLA development pressures have intensified and more offshore areas have been opened to exploration and development, the risks in such activities have become a commonplace in DOI NEPA processes. And if DOI and its component bureaus were not the "first movers" on the NEPA technique known as tiering, they were at least fast followers. Since 1986, when DOI established and delegated its OCLSA responsibilities to the Minerals Management Service (MMS), MMS categorically excluded from NEPA review (1) applications for permits to drill (APD); exploration plans (EP); and development and production plans (DPP).[44] Beyond these CEs, though, MMS also routinely used "programmatic" EISs to discharge NEPA duties over broad areas of operation.[45] By 2000, MMS had charted a path of using the NEPA rules to highlight multiple sources of uncertainty and their resultant unpredictabilities, to advantage its "preferred alternatives" by its interpretation of OCSLA and carefully selected "purpose and need" statements,[46] and

39. SUNSTEIN, *supra* note 38, at 1.

40. *Id.* at 6.

41. 43 U.S.C. §§ 1331–1356 (2006).

42. *Id.* § 1334.

43. *See* Robert B. Wiygul, *The Structure of Environmental Regulation on the Outer Continental Shelf: Sources, Problems, and the Opportunity for Change*, 12 J. ENERGY NAT. RES. & ENVTL. L. 75, 104–22, 134–36 (1992).

44. *See* NAT'L COMM'N ON THE BP DEEPWATER HORIZON OIL SPILL & OFFSHORE DRILLING, THE NAT'L ENVTL. POLICY ACT & OUTER CONT'L SHELF OIL & GAS ACTIVITIES 18 (2011) (Staff Working Paper No. 12), http://www.oilspillcommission.gov/sites/default/files/documents/The%20National%20Environmental%20Policy%20Act%20and%20Outer%20Continental%20Shelf%20Oil%20and%20Gas%20Activities.pdf.

45. The practice had even divided elements of DOI against each other. *See, e.g.*, Pennaco Energy, Inc. v. Dep't of Interior, 377 F.3d 1147 (10th Cir. 2004) (upholding Interior Board of Land Appeals' reversal of BLM's issuance of oil and gas leases for failure to prepare sufficiently specific NEPA analyses by relying on tiering from programmatic EISs).

46. The 1973 CEQ Guidelines provided that "[a] description of the proposed action" and "a statement of its purposes" should be included in any EIS. *See* Council on Environmental Quality, Preparation of Environmental Impact Statements: Guidelines, 38 Fed. Reg. 20550, 20553 (1973) (codified at 40 C.F.R. § 1500.3(a)(1)). In the 1978 rules, CEQ extracted this concept and clarified it. *See*

the production of truly daunting NEPA documents—physically imposing in their sheer volume—likely to defend against any challenges arising from its NEPA processes. In short, MMS navigated "ultra deepwater" (greater than or equal to 5000 feet) drilling in the Gulf of Mexico through NEPA very skillfully.

In 2000, MMS prepared an Environmental Assessment and FONSI for "deepwater operations and activities" in the Gulf, anticipating that the risks of spills and other environmental consequences were increasing.[47] It concluded that, although "[d]eepwater operations have the potential to result in oil spills on the [outer continental shelf] that are greatly larger than those previously analyzed," the occurrence of such a spill "is a very low-probability event" and "the extensive mitigation measures for oil-spill prevention and response currently required are considered adequate to minimize the risk of spills and potential impacts."[48] Accounting for all sources, MMS found in its 2000 FONSI, the frequency was seven blowouts per 1000 well bores—what it called "relatively rare."[49] Unfortunately, that subtle introduction of the relativity of risk foreshadowed the analytical work—and analytical failings—to come.

In April 2007, the agency finalized a "programmatic" EIS for "Outer Continental Shelf" (OCS) drilling operations, stating that the "purpose and need" behind its five-year plan was (1) to "comply" with its enabling legislation, and (2) to "fulfill a need to increase domestic sources of energy."[50] At the same time MMS was finalizing another EIS for eleven proposed

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Council on Environmental Quality, National Environmental Policy Act: Regulations, 43 Fed. Reg. 55978 (1978). The rules stated that "[t]he statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." *Id.* at 55996 (codified at 40 C.F.R. § 1502.13). This "purpose and need" rule has since proven a powerful mechanism for agencies to define the baseline expectations against which their proposed actions—and, thus, the reasonable alternatives—are to be judged. *See, e.g.*, Colo. Wild, Inc. v. U.S. Forest Serv., 523 F. Supp. 2d 1213 (D. Colo. 2007); City of Alexandria v. Slater, 198 F.3d 862 (D.C. Cir. 1999).

Thus, while an agency cannot "define its objectives in unreasonably narrow terms," *City of Carmel-by-the-Sea v. U.S. Dept. of Transportation*, 123 F.3d 1142, 1155 (9th Cir. 1997), the vast majority of precedents limit the alternatives that must be considered in an EIS to those that are consistent with the purpose and need of the project *as articulated by the agency*. MANDELKER, *supra* note 12, at § 9-64-65 & n.8.

47. *See* MINERALS MGMT. SERV., GULF OF MEXICO DEEPWATER OPERATIONS & ACTIVITIES (2000) (MMS 2000-001), http://s3.documentcloud.org/documents/7050/gulf-of-mexico-deepwater-operations-and-activities.pdf [hereinafter DEEPWATER FONSI].

48. DEEPWATER FONSI, *supra* note 47, at *iv-v*.

49. *Id.* at II-16.

50. *Id.* at I-1. The Programmatic EIS was done in connection with a plan to sell twenty leases in seven of the agency's twenty-six outer continental shelf "planning areas." *See id.* at *i*. The Interior Department's enabling legislation, the Outer Continental Shelf Lands Act of 1953 (OCSLA), 43 U.S.C. §§ 1331–1356 (2006), requires that leasing progress according to an orderly plan (but says nothing about durations). *See* § 1344(a) ("The Secretary . . . shall prepare and periodically revise, and maintain an oil and gas leasing program to implement the policies of [OCSLA]."). OCSLA *also* says the Secretary "shall select the timing and location of leasing, to the maximum extent practicable, so as to obtain a proper balance between the potential for environmental damage, the potential for discovery of oil and gas, and the potential for adverse impact on the coastal zone." § 1344(a)(3). The Secretary, thus, clearly has discretion to stay ultra-deepwater drilling in the Gulf if the environmental costs are deemed too high.

lease sales in the Gulf of Mexico,[51] as well as a stand-alone "Oil-Spill Risk Analysis."[52] Now, we might view the concurrent EISs—one for OCS drilling generally and one for scheduled sales in the Gulf—as proof the agency's mind was made up about deep water oil development. But it could also have reflected the agency's awareness of the multi-dimensionality of the trade-offs being considered and the fact that particular sales of rights to drill in the Gulf presented specific and material risks of "significant" environmental impacts wholly apart from the risks being weighed in the programmatic EIS. Unfortunately, neither of the EISs weighed the risks of uncontrollable blowouts—which is rather peculiar given the occurrence of such blowouts historically.[53] For that sort of estimate, the Oil-Spill Risk Analysis was the only document MMS generated that came even remotely close and it limited its large spill arithmetic to events of "[greater than or equal to]10,000 [barrels]." The Oil-Spill Risk Analysis's large spill estimate of 10,000 barrels was used to derive spill probabilities "per billion barrels of production" based on spill-to-production data from 1985 to 1999. Its finalized predictions suggested 0.05 spills from platforms, 0.34 spills from pipelines, and 0.25 spills from tankers.[54] Using those numbers and MMS's estimates of expected production in the Gulf, both for the five-year period 2007 to 2012, and for the life of the leases being sold (2007 to 2046), the conclusions were stark:

Western Planning Area (2007-12):	9-15% probability
Western Planning Area (2007-46):	92-99.5% probability
Central Planning Area (2007-12):	26-40% probability
Central Planning Area (2007-46):	96-99.5% probability[55]

The "wealth of historical data and information derived from over fifty years of oil and gas exploration, development, and production activities were used extensively by MMS,"[56] but according to MMS the data were too coarse to permit any finer-grained analysis of likely spill *severity*. In short, the agency found that spill volumes are unpredictable and stopped short even from hypothesizing some plausible upper bound limit on a catastrophic spill.

51. *See* MINERALS MGMT. SERV., GULF OF MEXICO OCS REGION, GULF OF MEXICO OCS LEASE SALES: 2007-2012, FINAL ENVTL. IMPACT STATEMENT (MMS 2007-18), http://www.gomr.boemre.gov/PDFs/2007/2007-018-Vol1.pdf [hereinafter GULF SALES EIS].

52. *See* MINERALS MGMT. SERV., OIL-SPILL RISK ANALYSIS: GULF OF MEXICO OUTER CONT'L SHELF (OCS) LEASE SALES, CENT. PLANNING AREA & W. PLANNING AREA, 2007-2012, & GULFWIDE OCS PROGRAM, 2007-2046 at 1 (OCS Report MMS 2007-040), http://www.boemre.gov/ITD/pubs/2007/2007-040.pdf [hereinafter OIL-SPILL RISK ANALYSIS].

53. The best data available—gathered by a Norwegian firm that specializes in oil and gas development risk assessment—counted some 573 blowouts worldwide since 1955. *See* Arne Jernelöv, *How to Defend Against Future Oil Spills*, 466 NATURE 182, 183 (2010) (describing SINTEF database). That yields an average occurrence of about one per month. Note, though, that this data set—by far the most salient information in MMS's risk assessments regarding deepwater exploration and development—was (and is) *privately owned* and, therefore, of limited accessibility.

54. *See* OIL-SPILL RISK ANALYSIS, *supra* note 52, at 11.

55. *See id.* at 52 (Table 1b).

56. *See id.* at 4.

Of course, the then-worst well blowout by volume ever recorded was the IXTOC-1 in 1979—a well operated by Pemex in the Gulf of Mexico. What was MMS's analysis of that spill and its likelihood of repeating given the conditions so obviously specific to deepwater development in the Gulf of Mexico? It was never even mentioned. Yet, in its Sales EIS, MMS purported to construct a massive tradeoff between a certain inevitability/unpredictability of oil spills and the expected *prosperity* oil development would bring. The tradeoff was built on critical assumptions derived from past loss occurrences *in U.S. waters* and other select information. MMS's estimates were for between 155 to 221 development wells in the "western" and between 330 to 468 development wells in its "central" Gulf planning areas.[57] To an agency as keyed to revenue as the former MMS was,[58] these numbers were surely impressive. MMS *also* estimated—buried in an Appendix to its 1000-plus page document—that, in the forty-year life cycle of the leases then being proposed, there would be between 232 to 272 blowouts amidst the thousands of wellbores completed.[59] Matching the central estimates from the Western and Central planning areas combined (188 and 399 wells, respectively), that amounts to an expected blowout for every 2.33 "development" wells being proposed in 2007. How could *any* rational actor have preferred that future—that many events of any real severity would toxify the whole Gulf. The answer, of course, is that MMS assumed a comparatively tiny volume of oil escaping in each event: the upper bound "large spill" estimate MMS gave its modeling consultants was between 1000 and 5300 barrels—between 42,000 and 222,600 gallons.[60] And that risk is much easier to ignore in an omnibus risk assessment. It seems like a chance worth taking.

MMS's spill volume range came from its dubious assumption that *all* past spill events reported to the U.S. Coast Guard were the best guide to possible future blowouts in the Gulf of Mexico. This assumption was made notwithstanding the fact that the future operations in the Gulf would be heavily concentrated in deep water and notwithstanding the fact that all past spill events had nothing to do with "subsalt" drilling to unprecedented

57. GULF SALES EIS, *supra* note 51, at 4-13. A "development" well is a well that is actually capable of producing hydrocarbons for market. Each development well may have several "exploratory" wellbores behind it. *Id.* at 4-9. This yielded a combined projection of about 500 to 700 wells, 2007-2046 (i.e., during the forty-year planning period adopted based on the average operating lives of the wells). *Id.* Based on historic data and some modeling, MMS estimated between 28.5 and 32.5 billion barrels of oil and between 142.3 and 162.7 trillion cubic feet of natural gas could be produced from the eleven lease sales it was proposing. *Id.* at 4-5.

58. *See* NAT'L COMM'N ON THE BP DEEPWATER HORIZON OIL SPILL & OFFSHORE DRILLING, DEEPWATER: THE GULF OIL DISASTER & THE FUTURE OF OFFSHORE DRILLING 57-67 (2011), http://www.oilspillcommission.gov/sites/default/files/documents/DEEPWATER_ReporttothePresident_FINAL.pdf [hereinafter NAT'L COMM'N REP.] (describing MMS as a "cross purposes" regulator because it was tasked with maximizing revenue and supply while also being tasked with the creation and enforcement of environmental and safety standards).

59. GULF SALES EIS, *supra* note 51, at Table 4-4, http://www.gomr.boemre.gov/PDFs/2007/2007-018-Vol2.pdf.

60. PROGRAMMATIC EIS, *supra* note 4, at IV-29, http://www.boemre.gov/5-year/2007-2012FEIS/Chapter4A-BImpactsProposedAction.pdf. The Macondo well, in fact, released much more than the upper bound spill estimates in the EIS's and the Oil Spill Risk Analysis *every day* for 91 days.

depths.[61] Salt is the dominant structural element in the Gulf of Mexico's hydrocarbon plays, but explorers had long assumed that major reserves did not exist beneath the salt. Conventional seismic techniques were powerless to prove otherwise. Yet, by the 1990s, the assumption was dashed as better geology, better seismic testing, and several discoveries changed the conventional wisdom.[62] None of this changed the extremities of the environment, of course: temperature and pressure extremes dictate significant changes in most operating assumptions, as does a drill string tip that is hours away from its controller.[63]

Finer discrimination of the risks MMS confronted as it was considering ultra-deepwater drilling in the Gulf was possible, but it would not, admittedly, have been easy. Data on deep water blowouts and blowout frequencies were, in some sense, *available*.[64] A healthier respect for the risks endemic to subsalt prospecting in the Gulf may have led MMS in search of that information. Whether all of this information was *readily* available, of course, is something else altogether. NEPA has never been clarified enough to establish just *how* "available" information must be before it should be factored into NEPA documents like MMS's.[65] If we are to improve our understanding of risks by way of NEPA processes, we must update our information management ideals themselves and that means more clarity on what information should be deemed "available."

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61. As a report from the Congressional Research Service concluded in 2008, the decline in total incidents and volumes of oil spills in U.S. waters that began in 1991 is probably "attributable to the decline in volume spilled by oil tankers and barges—the vessels that transport oil and have historically spilled the most oil." CONG. RESEARCH SERV., CRS REP. FOR CONGRESS: OIL SPILLS IN U.S. COASTAL WATERS: BACKGROUND, GOVERNANCE, & ISSUES FOR CONGRESS CRS-4 (Sept. 2008 update). This trend, of course, had nothing necessarily to do with blowout risks. Just as importantly, too, the spike of both spill incidents and volumes in 2005—attributed to Hurricanes Rita and Katrina—*also* should have been part of MMS's baseline data.

62. *See* NAT'L COMM'N REP., *supra* note 58, at 42.

63. *See id.* at 51–52 (describing the need for stronger materials, contingency plans for hydrate formation, pressure loss, viscosity variabilities, etc.); *id.* at 99–103 (describing the challenge of operating thousands of feet below the surface where an apparatus can take one hour per thousand feet to descend).

64. Blowouts in the Gulf are not uncommon in any absolute sense, and information about them is relatively abundant. The 1979 IXTOC disaster spilled between140 and 148 million gallons before it was brought under control. And other blowouts in the Gulf have occurred, but have been much more manageable—likely because of the depth of water in which they occurred.

65. The current (amended) rule requires that

> If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:
>
> (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.*

At least since the philosopher David Hume wrote, we have known that "there is no justification for regarding what has been observed to happen in the past as any sort of reliable guide to the future."[66] We have known, that is, that there are no logical foundations in inductive reasoning—reasoning from something specific to something general or from something in the past to something in the future. The real puzzle has been the practice of science: our scientific knowledge vastly exceeds its observational bases, leading the philosopher C.D. Broad to have once called induction "the glory of science and the scandal of philosophy."[67] Because of our sciences' successes in prediction, we generally (happily) trade logical validity for reliability and predictive accuracy—for *probability*. It is highly probable that the force of gravity will continue to work later today, but it is not logically proven either from a lifetime of observations, Newtonian mechanics, or the general theory of relativity. Because probabilities are unknowable without information (often lots of it), our practical trouble is that, for too many real-time decisions, we lack critically important information—and rushed efforts to gather it can be a waste, or worse. Consequently, our probabilistic reasoning is often deeply flawed, and it is usually never more so than when we must make predictions about other humans' behaviors.[68]

Nevertheless, if, as Hume argued, *similarity* is the key to successful prediction, MMS should have had a much more discriminating account of the relevantly similar parts of our recorded past for it to have had any pretensions at all about having assessed the probable environmental impacts of its deepwater drilling plans.[69] As the sociologist Charles Perrow argued in his classic *Normal Accidents*, the coupling of complex technological systems can actually increase their risk of failure precisely because of those systems' interactivities and the possibilities of cascading (or "common mode") failures therein.[70] Perrow's tight coupling and the characteristic risks of bundling complex systems that are susceptible to "common mode" failures is one avenue that MMS probably should have pursued further in its NEPA analyses. The limitations of Perrow's thesis, of course, are

40 C.F.R. § 1502.22(b) (2010) (emphasis added). "The amended regulation thus 'retains the duty to describe the consequences of a remote, but potentially severe impact, but grounds the duty in evaluation of scientific opinion rather than in the framework of a conjectural "worst case analysis." ' " Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 354-55 (1989) (quoting 50 Fed. Reg. 32237 (1985)). No effort has ever been mounted to define "exorbitant" information costs.

66. COLIN HOWSON, HUME'S PROBLEM: INDUCTION & THE JUSTIFICATION OF BELIEF 1 (2000).

67. HOWSON, *supra* note 66, at 10 (quoting C.D. Broad, *The Philosophy of Francis Bacon, in* ETHICS & THE HISTORY OF PHILOSOPHY 143 (1952)).

68. *See* PHILIP E. TETLOCK, EXPERT POLITICAL JUDGMENT (2005) (showing that regression-based algorithms outperform putative experts in predicting human decision making without exception).

69. Gilboa and colleagues, for example, have suggested a way of improving frequentist probabilities by a process of what they call *similarity weighted* frequency estimates wherein more similar cases get higher weights in the computation of frequencies. *See* Itzhak Gilboa et al., *On the Definition of Objective Probabilities by Empirical Similarity*, 172 SYNTHESE 79 (2009).

70. CHARLES PERROW, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHS. 62-100 (1984). Bhopal, Chernobyl, and the *Challenger* explosion arguably further confirmed his thesis. *See* CHARLES PERROW, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHS. 353 (2d ed. 1999).

that it does not specify the various "modes" of complex systems *ex ante*. But the use of two broad-scale EISs wherein specific drilling locations—with specific geologic formations, known water depths, and particular operating equipment—were undefined, only to be later used to "tier" out of view the more concrete spill risks in subsequent EA/FONSIs and CEs,[71] was not so much a failure to imagine some given cascade of failures as it was a denial of their possibility.

Ironically, an enabling statute itself mandated that DOI assess the "cumulative" effects of its OCS lands mineral leasing and that it report the results to Congress every three years.[72] With all the power granted to it—the discretionary factoring that its enabling legislation vested in the Department of Interior—came *at least* the responsibility to fulfill a specific statutory duty to assess the probable environmental consequences of deepwater drilling as a course of conduct. To our great misfortune, though, DOI proved incapable of distinguishing between risks it had assessed and those it had not when it continued to categorically exclude particular drilling operations.

To be clear, every NEPA document MMS generated highlighted "spills" as the singularly threatening environmental possibility of more development. But none of the decision documents isolated the possible futures in which a *giant* spill—an uncontrollable blowout of massive proportions—might occur. Indeed, MMS proudly announced in May 2008 that some seventy percent of the Gulf's oil and gas were then coming from deep waters and that "[c]ontinued advancement into th[e] deepwater frontier is important to our Nation's energy security."[73] MMS had long held that the risk of offshore spills should be assessed as a function of the

71. In its post mortem "Report Regarding the Minerals Management Service's National Environmental Policy Act Policies, Practices, and Procedures as They Relate to Outer Continental Shelf Oil and Gas Exploration and Development (Aug. 16, 2010), *see* COUNCIL ON ENVTL. QUALITY, REVIEW OF MMS NEPA POLICIES, PRACTICES, & PROCEDURES OCS OIL & GAS EXPLORATION & DEV., 75 Fed. Reg. 29996 (2010), CEQ found that MMS had "relied on tiering from [its programmatic] EISs and provided no additional details or analysis in the Lease Sale 206 [EA]" and that the CERs completed in connection with particular permissions to drill raised virtually nothing to MMS's attention. *Id.* at 24-25.

72. OCSLA § 18, *codified at* 43 U.S.C. § 1346 (2010), was amended in 1978 to require the Interior Department to assess "the cumulative effect of activities conducted" on "the human, marine, and coastal environments" and to periodically report its results to Congress. *See* Pub. L. No. 95–372, 92 Stat. 649-653 (codified at 43 U.S.C. § 1346(e) (2010)). This duty was, ironically, cancelled in 2000, just as deepwater development in the Gulf was accelerating. *See* Pub. L. No. 104–66, § 3003 (2000) (repealing any provision of law requiring submittal to Congress of any regular periodic report listed in House Document 103–7 (2000), including the reports required by § 1346(e)).

73. *See* Press Release, Minerals Mgmt. Serv., Advances in Oil & Gas Leasing, Drilling & Prod. Continue in Deepwater Gulf of Mexico (May 5, 2008), *available at* http://www.gomr.mms.gov/homepg/whatsnew/newsreal/2008/080505.pdf. This press release was based on an MMS report. *See* MINERALS MGMT. SERV., DEEPWATER GULF OF MEXICO 2008: AMERICA'S OFFSHORE ENERGY FUTURE (2008) (MMS 2008-013), http://www.gomr.boemre.gov/PDFs/2008/2008-013.pdf [hereinafter DEEPWATER GULF OF MEXICO 2008] (detailing the dramatic expansion of deepwater development throughout the Gulf). By 2007, MMS noted, a record fifteen rigs were drilling for oil and gas in 5,000 feet of water or more throughout the Gulf, and thirteen more rigs were on order. *Id.* at 9.

volumes of oil handled.[74] And yet, according to MMS, "[o]ffshore leasing and development has been occurring in the Gulf of Mexico for over [fifty] years. The predictable patterns of activity that have become established there were used to estimate future activity."[75] No NEPA document even *mentioned* the sub-seafloor troubles for which the Gulf is famous among operators: extremely pressurized oil and gas reservoirs in geologically "young," unsettled, and fragile formations of salt, sand, and shale.[76] Note, finally, that these particular misjudgments went unnoticed by the plaintiffs in two lawsuits brought against MMS's Gulf OCS development plans.[77]

Just as striking, though, is how MMS never really recognized the volume of deepwater drilling and well boring as a unique, unprecedented risk.[78] In 2000+ pages of "detailed statements,"[79] in fact, MMS never once mentioned a possible event like BP's Macondo disaster, let alone attempted to quantify its probability. Indeed, at the programmatic stage—where the issue had not yet been "scoped" out of existence[80]—aggregate

74. *See* Cheryl McMahon Anderson & Robert P. LaBelle, *Comparative Occurrence Rates for Offshore Oil Spills*, 1(2) SPILL SCI. & TECH. BULL. 131, 131-33 (1994) (proposing a "simple approach for estimating oil spill occurrence, normalized as a function of the volume of oil handled").

75. PROGRAMMATIC EIS, *supra* note 4, at IV-26, http://www.boemre.gov/5-year/2007-2012FEIS/Chapter4A-BImpactsProposedAction.pdf. MMS even made the express assumption "that [seventy-five] percent of all the activity listed in [the proposed action] will occur in deepwater areas of the Gulf (defined as 1,000 feet or deeper) and [twenty-five] percent will occur in shallower water depths." *Id.*

76. *See* Kevin Spear, *Documents Show BP Chose a Less-Expensive, Less-Reliable Method for Completing Well in Gulf Oil Spill*, ORLANDO SENT., May 23, 2010, http://articles.orlandosentinel.com/2010-05-23/news/os-florida-oil-spill-unspoken-risks-20100522_1_oil-company-bp-rig-oil-spill.

77. In a lawsuit challenging Lease Sale 200 in 2006, the State of Louisiana challenged several deficiencies in the EA/FONSI prepared by MMS. In none of Louisiana's submissions (either in its administrative challenge or in its lawsuit) did the state complain about insufficient attention to deepwater drilling's risks per se. *See generally* Ryan M. Seidemann & James G. Wilkins, Blanco v. Burton: *What Did We Learn from Louisiana's Recent OCS Challenge?*, 25 PACE ENVTL. L. REV. 393 (2008). In 2007, the Center for Biological Diversity challenged the five-year plan for OCS operations, alleging several deficiencies in the NEPA process relating to the Beaufort, Bering, and Chukchi seas, and none of its complaints were aimed at insufficient analysis of deepwater drilling's risks per se. *See* Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d 466 (D.C. Cir. 2009).

78. Strictly speaking, the *P* of a catastrophic blowout like BP's is nonadditive from well to well, lease to lease. To assume otherwise is either a "Gambler's fallacy" (so named for the tendency of gamblers to bet on red after a long run of black) or a judgment from specific information about well drilling in the field and, therefore, not a *P* expression at all. JONATHAN BARON, THINKING & DECIDING 152-53 (1998). Still, consideration of the total population of "trials" where a risk is born will necessarily yield an aggregate or cumulative *P* of the named event(s).

79. EISs are often denounced as being "overstuffed" either in preparation for litigation or, as is sometimes alleged, as a way of burying the small minority of information within the document that would have the greatest public salience. *See* Karkkainen, *Toward a Smarter NEPA*, *supra* note 16, at 918-25.

80. By "tiering" its NEPA documents from (1) an OCS-wide programmatic EIS, to (2) a multi-sale EIS, to (3) a lease-sale EA/FONSI, to (4) a well-specific categorical exclusion, MMS was able to progressively narrow the spill risks under consideration such that a Gulf-wide risk assessment could only have been pertinent at the initial stages—years ahead of the actual drilling. *See* Council on Environmental Quality, Review of MMS NEPA Policies, Practices, and Procedures for OCS Oil and Gas Exploration and Development, 75 Fed. Reg. 29996, 29997 (Aug. 16, 2010). By the time a well is actually sunk, in short, "scoping" allows for analyses that "meet the needs of the project," wherein "less tangible and secondary environmental effects are usually ignored, and opportunities for public involvement are minimal." Tim Snell & Richard Cowell, *Scoping in Environmental Impact Assessment: Balancing Precaution and Efficiency?*, 26 ENVTL. IMP. ASS. REV. 359, 373 (2006).

risks of the sort *ought* to have at least entered the calculus somehow.[81] When MMS completed the Environmental Assessment (EA) and FONSI for Lease Sale 206 (the lease sale that would eventually include BP's Macondo well) in October 2007,[82] the high-profile focus was hurricane risk. The well known "availability bias"[83] was likely at work here: nerves were still raw from Hurricanes Katrina and Rita and the prospect of worsening hurricanes loomed (and still looms).[84] Hurricane risk is a proper focus of *some* attention.[85] Paying *no* attention at all to a seafloor blowout in "ultra-deep" water—which the MMS official in charge of its NEPA processes admitted after the fact[86]—turned out to be an extremely costly error, though.

Throughout its existence, MMS consistently calculated the probability and severity of possible spills based on past spill occurrence frequencies and the projected production rates in its plans. Throughout, the agency's mantra remained that "the potential consequences of an oil spill depend on many variable circumstances that are unpredictable."[87] But what federal agency imaginable could have had better, more complete information available to it for deriving a more discriminating assessment of the probable consequences of its actions than the MMS of 2007-09? MMS was deeply and consistently partnered with the firms operating on its permissions. MMS boasted in 2008 that it had been partnering with major operators to improve the technology for recovering hydrocarbons at great depths.[88] Yet, while "the technologies for drilling have advanced rapidly in

81. As MMS noted, its "estimated number of large spills that could occur is a function of the [overall] oil-resource estimate. Therefore, the impacts could be greater to some environmental resources because they could be exposed to more large spills than other environmental resources." PROGRAMMATIC EIS, *supra* note 4, at I-10, http://www.boemre.gov/5-year/2007-2012FEIS/Intro.pdf. In short, the more aggregate production is projected, the greater the aggregate probability of a "large spill."

82. Lease Sale 206 offered over 5500 tracts comprising some 29.8 million acres in areas between three and 230 miles off the coasts of Louisiana, Mississippi, and Alabama. Some tracts were in as much as 11,200 feet of water. Over 1,000 bids from eighty-five companies were received on 615 tracts, a third of which were in "ultra" deepwater. *See* David Paganie, *OCS Lease Sale Sets Record; Revenue Sharing to Begin*, OFFSHORE, Apr. 1, 2008, at 3.

83. Long noted by those who view the public as disoriented and distracted by current events, "availability cascades," the propensity of news stories—whatever their actual relevance—to dominate people's attention, were the focus of Cass R. Sunstein & Timur Kuran, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683 (1999).

84. In Louisiana's lawsuit challenging Lease Sale 200, MMS reliance on the baseline hurricane risk estimates took center stage in the state's NEPA claims. *See* Seidemann & Wilkins, *supra* note 77, at 400-15.

85. The first rig Transocean leased to BP for the Macondo prospect, the *Marianas*, had to suspend drilling in October 2009 after it was damaged by Hurricane Ida. The *Deepwater Horizon* rig resumed drilling in February 2010, missing the hurricane season but encountering many troubles in the well bore. *See* Spear, *supra* note 76 (describing several mishaps and other incidents aboard Deepwater Horizon throughout its drilling operation).

86. *See* Steven Mufson & Michael D. Shear, *Pressure Grows for Action by BP*, WASH. POST, May 1, 2010, at A1 ("Hammond Eve, who did [NEPA compliance on OCS drilling for MMS] said [MMS] never planned for response to an oil spill of this size. 'We never imagined that it would happen because the safety measures were supposed to work and prevent it from happening,' he said.").

87. PROGRAMMATIC EIS, *supra* note 4, at *ii*, http://www.boemre.gov/5-year/2007-2012FEIS/Intro.pdf

88. *See* DEEPWATER GULF OF MEXICO 2008, *supra* note 73, at 42-43.

recent decades, spill response efforts have not. People are using the same booms, dispersants[,] and oil herders as they did for [IXTOC]."[89] And still no such updated probability specific to deepwater drilling in the Gulf was even *attempted*. If anything, MMS's sham frequentist reasoning only further emboldened those who were taking the risks, protecting them in a cocoon of "unpredictability" and supposed rationality in the face thereof.

Given its overall mission, perhaps, it is little wonder that MMS never stopped to weigh—let alone seek to mitigate—"the heightened risks associated with the use of floating rigs and platforms" (which are necessary in deep water) or to dwell on the fact that, in the event of a blowout, "deepwater wells can be very productive and have flow potentials that can be [five] to [ten] times higher than shallow water wells."[90] It is little wonder, perhaps, that MMS never perceived a qualitative break between the "spills that have occurred"[91] in our recent past and the spills that were possible—perhaps even probable—in the scale of operations it planned for the Gulf's deep waters.[92] Even in the programmatic EIS—the one NEPA document broad enough in scope to approach deep water oil and gas development in U.S. waters *as a course of actions*—MMS remained steadfastly focused on the localized side-effects of drilling, rig operations, fuel transport, and generic spill frequencies.[93] Throughout that document and others MMS intoned that the "magnitude" of spill impacts would "depend upon the location, timing, and volume of the spills"[94] and that all of it was essentially unpredictable. MMS, in short, treated NEPA like a project obstruction.

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89. Jernelöv, *supra* note 53, at 183.

90. *See* SEC'Y OF THE INTERIOR, DECISION MEM. REGARDING THE SUSPENSION OF CERTAIN OFFSHORE PERMITTING & DRILLING ACTIVITIES ON THE OUTER CONT'L SHELF 9 (2010), http://www.doi.gov/deepwaterhorizon/upload/Salazar-Bromwich-July-12-Final.pdf [hereinafter DEP'T OF INTERIOR SUSPENSION DECISION]. Again, what *were* analyzed in depth were the locational impacts of rigs, drilling, and production facilities. *See* GULF SALES EIS, *supra* note 51, at 4-10 to 4-70 (reviewing the likely environmental impacts from bottom area disturbance, sediment displacement, anchoring, space-use conflicts, aesthetic interference, bottom debris, workovers and abandonments and the disposal of drilling muds, cuttings and produced waters, deck drainage, vessel wastes, air emissions, etc.). What was not analyzed: strategic alternatives to deep water development before its time. *Id.*

91. GULF SALES EIS, *supra* note 51, at 4-71.

92. Indeed, the Gulf Sales EIS seems almost calculating in its use of *certain* trend lines and date ranges that bear little connection to the actions under consideration. MMS even specially bulleted a dozen (statistically gerrymandered) points, including the following: (1) the volume of reported spill incidents in U.S. waters ha[d] been trending downward since 1973; (2) there had been no spills reported of over 1 million gallons since 1991; (3) the majority of reported spills since 1973 involved discharges of between 1 and 100 gallons; (4) almost 75% of all reported spills from 1973-2004 occurred within 3 nautical miles of shore and almost 84% of the volume of all reported spills occurred within 3 nautical miles, (5) vessels accounted for the majority of spills by volume. GULF SALES EIS, *supra* note 51, at 4-71 to 4-72. Had MMS stopped to note that spill volumes and frequencies had been declining in recent decades because of the enhancement of vessel precautions and the corresponding improvements in vessel safety, see, the agency might have stopped to consider that its data were not the relevant population of events from which to draw its *P* estimates.

93. Decision researchers characterize this kind of defect in MMS decision-making variously as "conservatism," "confirmation bias," incrementalism, "interstitial escalation of commitment," cognitive inertia, etc. *See* George Wright & Paul Goodwin, *Future-Focused Thinking: Combining Scenario Planning with Decision Analysis*, 8 J. MULTI-CRIT. DECIS. ANAL. 311 (1999).

94. *See, e.g.*, PROGRAMMATIC EIS, *supra* note 4, at II-4 to II-13, http://www.boemre.gov/5-year/2007-2012FEIS/Chapter2Alternatives.pdf.

More importantly, though, MMS's bi-modal distribution of its "small" versus "large" spills based on historic frequencies of all spills is indicative of just how simplistic federal agencies' thinking about risk and prediction has become in gargantuan NEPA processes like those MMS conducted. The *available* information on deep well boring risks, blow-out preventer valves (BPVs), ultradeep "wildcat" well control technologies—even the information on U.S. spill response capabilities—was far superior to anything included in the (overstuffed) EISs or EA/FONSI. What MMS pulled together in its documents was rather more like a kind of *telescoping boilerplate*: a measured serving of whatever was ready to hand without regard for need or propriety. Well control is especially difficult in unsettled geologic formations.[95] BPVs have long had a disturbingly high failure rate.[96] And spills originating from deepwater blowouts are known to have erratic "surface signatures" which severely complicate their cleanup.[97] The technology for bringing blowouts under control at extreme depths has not improved much in decades.[98] MMS had access to all of this information and, yet, did nothing to separate out a specific risk it was then confronting: the risk of an uncontrollable blowout at extreme depths in the salty, sandy bottoms of the Gulf. Of course, in retrospect, it is always easier to see what one had no *real* reason to believe.[99] But the fact that none of the planning documents even made an issue of the augmented and unique risk associated with extreme-depth operations—or how technically challenging the loss of well control would become at such depths—speaks volumes to how NEPA is serving us today.[100] We agonize over the potential "cumulative effects" of

95. *See* DEEPWATER FONSI, *supra* note 47, at III-7.

96. BPVs are actually many well control mechanisms rolled into one, the last resort of which are known as "blind shear rams" because, if triggered, they are designed to shear the well pipe hydraulically and seal a well on itself. David Barstow et al., *Regulators Failed to Address Risks in Oil Rig Fail-Safe Device*, N.Y. TIMES, June 20, 2010, at B21. In 2009, Transocean—the world's largest offshore rig owner and operator—commissioned a "strictly confidential" study of BPVs and, specifically, of blind shear rams' effectiveness. *Id.* By focusing on eleven cases where crews on deepwater rigs lost control of their wells and tried to activate their BPV, Transocean's study found that the well was brought under control in only six of those cases—for a failure rate of forty-five percent. *Id.* MMS may have had no (direct) access to that information in preparing its EIS's in 2007. But it presumably *did* have access to two studies, one in 2002 and one in 2004, concluding that enhancements in well pipe strength had made blind shear rams far less effective today than they had been when designed; MMS was one of the funders of those studies. *See id.*

97. DEEPWATER FONSI, *supra* note 47, at II-57 to II-60. The Department of Interior also found—*after* the Macondo well blowout—that the process of "cementing" a deepwater well (backfilling the void created with structural cement) is more complicated at extreme depths and therefore riskier. *See* DEP'T OF INTERIOR SUSPENSION DECISION, *supra* note 90, at 9-10.

98. Jernelöv, *supra* note 53, at 183.

99. *Cf.* DEP'T OF INTERIOR SUSPENSION DECISION, *supra* note 90, at 8 (highlighting the risks of seafloor BPV's and that "performance problems" have been identified on other deepwater BPV's since the Macondo well blowout).

100. MMS literally argued that "[d]espite an increased number of new sources for potential spills, as well as the possibility of much larger spills, *one should not conclude that there is an increased risk of environmental impact from spills in deep water.*" DEEPWATER FONSI, *supra* note 47, at II-57 (emphasis added). The reasoning behind this was frequentist (if flawed): most spills that had occurred in the past occurred in shallow waters and were caused by threats to and failings of shallow water technology. *See id.* at II-58 to II-59.

oil development as it will exacerbate anthropogenic climate change[101] but pay almost no attention at all to how our agencies might use NEPA as a tool for improving overall agency competence.

III. IMPROVING NEPA AND OURSELVES: LOW-PROBABILITY RISKS, RULES, AND EXPERT JUDGMENT

CEQ's NEPA rules originally required a "worst case scenario" analysis in an EIS.[102] Convinced that "worst case scenario" (WCS) analysis had become distracting and unhelpful, the CEQ repealed the WCS rules in 1986.[103] But NEPA's principals never imagined anything better when they rescinded the duty to conjure up a WCS. Instead, NEPA's agents now follow formulii to get on to some next project, never looking back to learn from the accumulated record of their own incompetence. Even our current director of the Office of Information and Regulatory Affairs displayed a striking ignorance about NEPA's actual practice history where "worst-case scenarios" were concerned when he waded into the subject in 2008.[104] Some have argued that had MMS faced a WCS requirement in its Gulf Sales EIS, the possibility of a catastrophic blowout like the BP Macondo

101. *See, e.g.*, Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d 466, 453–58 (D.C. Cir. 2009). CEQ's rules categorize the ramifications of a subject action variously as "direct effects," "indirect effects," "impacts," "cumulative impacts," and "consequences." *See* 40 C.F.R. §§ 1502.16 (2008), 1508.8 (2009). While the rules often use these terms interchangeably, there is a qualitative difference that separates "cumulative effects"—ramifications that may cascade from the subject action or a course of similar actions—from other kinds of "impacts," in the completion of an EIS.

Cumulative effects are easily the most complex dimension of the "NEPA process." *Cf.* 40 C.F.R. § 1508.7 (defining cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions"); COUNCIL ON ENVTL. QUALITY, CONSIDERING CUMULATIVE EFFECTS UNDER THE NAT'L ENVTL. POLICY ACT v (1997), http://ceq.hss.doe.gov/nepa/ccenepa/exec.pdf ("Analyzing cumulative effects is more challenging, primarily because of the difficulty of defining the geographic (spatial) and time (temporal) boundaries."). Yet they may be the least well understood. *Id.* at 1, http://ceq.hss.doe.gov/nepa/ccenepa/sec1.pdf ("Evidence is increasing that the most devastating environmental effects may result not from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time."); *see* Save the Yaak Comm. v. Block, 840 F.2d 714, 722 (9th Cir. 1988) (invalidating Environmental Assessment for failure to consider adequately the reasonably foreseeable cumulative impacts of the decision).

102. *See* Council on Environmental Quality, National Environmental Policy Act: Regulations, 43 Fed. Reg. 55978, 55997 (1978) (promulgating 40 C.F.R. § 1502.22). Prior to CEQ's issuance of the rules in 1978, a collection of court cases had yielded a long menu of directives to agencies confronting uncertainty, each with its own verbal formulation with important, if subtle, differences from the next. *See* Carla Mattix & Kathleen Becker, *Scientific Uncertainty Under the National Environmental Policy Act*, 54 ADMIN. L. REV. 1125, 1128–32 (2002). CEQ's rules replaced, in Mattix and Becker's words, a "morass" of conflicting judge-made standards. *Id.* at 1131.

103. The WCS requirement had been a favorite of action-agency opponents. *See* Edward A. Fitzgerald, *The Rise and Fall of Worst Case Analysis*, 18 U. DAYTON L. REV. 1 (1992). The WCS requirement was eventually repealed in full, but only after the 1984 presidential election. *See* Council on Environmental Quality, National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15618 (1986). CEQ had issued proposed *guidance* on the matter in early 1983. *Id.* at 15619.

104. In Sunstein's discussion of NEPA and "worst case scenarios" in 2008, he never mentioned NEPA's erstwhile requirement that agencies confronting choices with incomplete information produce a "worst case scenario" analysis; never mentioned its elimination in 1986; and never mentioned the supposedly probability-driven doctrines the courts later developed. *See* SUNSTEIN, *supra* note 38, at

disaster would have entered its calculus, and perhaps would have shaken MMS out of its "willful blindness."[105] I am not so sure.

To progress, NEPA and its agents need clearer thinking about what we might call "desired future conditions" and about creating the kind of cognitive and organizational partnerships needed for truly systemic risk planning. NEPA, like so many of the statutes that have emulated it, has become a project obstruction device in large part because our legal system encourages its agents to ignore the statute's "planning and integration" requirement.[106] So what practical steps toward the truly systemic risk planning could justify our continued recourses to federal law and centralized bureaucracies like DOI? These tools, after all, are famous for "absorbing" uncertainty, masking it, and making it seem manageable.[107] This part sketches three such steps: (1) the strategic use of NEPA's three different tracks to incentivize the relevant parties to gather, generate, or release information necessary to rational risk assessments by agencies like DOI; (2) the use of updated probability techniques in place of generic and largely uninformative "frequentist" statistical reasoning; and (3) the CEQ's amendment of the NEPA rules to require *scenario planning* whenever predictive uncertainties lead the preparers of a programmatic EIS to admit that subsequent NEPA documents will be necessary. I take each in turn.

First, it seems wrong that in forty years of practice NEPA's structural weaknesses have never been turned to its advantage. On April 9, 2010, BP's "Senior Federal Affairs Director," Margaret Laney, sent a letter to CEQ protesting CEQ's proposed *guidance* on the tightening of standards for the adoption and application of NEPA's "categorical exclusions."[108] BP's letter should serve as a poignant reminder of the power that agencies' NEPA choices possess. They often affect regulated entities directly and vitally. A decision by DOI's OCSLA administrators to prepare an EA instead of a CE could mean months of delay and uncertainty to a party like BP.[109] If determinations of the kind were to turn on the cooperation and

192–97 (2008). Sunstein's entire discussion of NEPA, it bears mentioning, evidenced a profound disinterest in—if not complete disregard for—the *information we should currently have on hand as a result of four decades of experience with NEPA*. *Id.*

105. *See, e.g.*, Oliver A. Houck, *Worst Case and the Deepwater Horizon Blowout: There Ought to Be a Law*, 40 ENVTL. L. REP. 11033, 11038–39 (2010).

106. *See* CALDWELL, *supra* note 35, at 55–58.

107. *See, e.g.*, HERBERT A. SIMON, ADMINISTRATIVE BEHAVIOR: A STUDY OF DECISION-MAKING PROCESSES IN ADMINISTRATIVE ORGANIZATIONS 242 (4th ed. 1997).

108. *See* LETTER FROM MARGARET D. LANEY, SENIOR FED. AFFAIRS DIR., BP AMERICA INC., TO NANCY SUTLEY, CHAIR, COUNCIL ON ENVTL. QUALITY, RE: STEPS TO MODERNIZE & REINVIGORATE NEPA; PROPOSED GUIDANCE: "ESTABLISHING, APPLYING & REVISING CATEGORICAL EXCLUSIONS UNDER THE NAT'L ENVTL. POLICY ACT" (FEB. 18, 2010), dated APR. 9, 2010, http://www.biologicaldiversity.org/programs/public_lands/energy/dirty_energy_development/oil_and_gas/gulf_oil_spill/pdfs/BP_letter_to_CEQ_on_CEs.pdf. In the letter, Laney reminds CEQ that CE's "are to be favored . . . when an activity can reasonably be shown not to have an effect, cumulatively or individually, on the environment" after listing all of the CEs MMS had maintained for drilling/exploration activities. *Id.* at 3.

109. *See* Jaclyn Lopez, *BP's Well Evaded Environmental Review: Categorical Exclusion Policy Remains Unchanged*, 37 ECOL. L. CURRENTS 93 (2010).

information-sharing of the affected parties, perhaps some of our information deficits could be ameliorated. As part II argued, real blowout frequency and severity data for the Gulf of Mexico and beyond were "available" in some sense when MMS was preparing its programmatic EISs, oil spill risk analysis, and EA/FONSI for the Gulf.[110] Providing material incentives to the "regulated community" to gather and share the best available information is something NEPA *could* do if its agents used their NEPA pivots strategically.

Jarring uncertainties will remain ubiquitous in forecasting environmental futures, for, even where information is actually *generated* or better *integrated* into an EIS, "it appears that relatively little NEPA-generated information is transmitted unfiltered from government to the citizenry and back again."[111] Still, if NEPA is to be the kind of information *therapy* that it purports to be,[112] its own coercive potential should be used to extend its reach. Conditioning the use of relatively expedited NEPA processes on the fullest cooperation and information sharing that an agency can gain from concerned parties could, in effect, shift some of NEPA's informational burdens. If a party like BP were convinced that its permissions to operate could be expedited by sharing information available to it with a NEPA analyst stuck in the dark, it might well decide to share rather than hold out.[113] A quid pro quo—accelerating government decision-making in exchange for the disclosure of private information—could enhance our total risk awareness in a variety of ways. And for those convinced that the larger, more comprehensive NEPA document is always better, the realities of NEPA process should be remembered:

> If an EIS were capable of generating high quality information at little or no cost, and could arrive in time to influence the agency decision, then an EIS might be preferable to a mitigated FONSI [for example]. But if, as the evidence suggests, EISs are typically costly, cumbersome, and largely uninformative, and arrive too late in the process to shape the

110. *See supra* notes 46–65 and accompanying text.

111. Karkkainen, *Toward a Smarter NEPA*, *supra* note 16, at 916. "Far more frequently, organized groups serve as a mediating agent, repackaging and translating the often highly technical information contained in an EIS for dissemination to the broader citizenry, and offering their services as the vehicle through which citizens may attempt to hold their government accountable." *Id.*

112. *Cf.* Bradley C. Karkkainen, *Bottlenecks and Baselines: Tackling Information Deficits in Environmental Regulation*, 86 TEX. L. REV. 1409 (2008) [hereinafter Karkkainen, *Bottlenecks and Baselines*] (arguing that NEPA was enacted to address pervasive failures of rationality and required impact assessments in order to subsidize the markets for environmental information but that NEPA's designers failed to appreciate the true costs of information-gathering, sorting, and processing).

113. Of course, this is not to make the unfounded assumption that regulated parties will never hold out in such circumstances. They surely will. *See, e.g.*, Mary L. Lyndon, *Information Economics and Chemical Toxicity: Designing Laws to Produce and Use Data*, 87 MICH. L. REV. 1795, 1813-14 (1989) (arguing that chemical manufacturers have powerful incentives to avoid learning or disclosing toxicity data given the consequences that such data can occasion). Without much greater power than we normally give government, though, we can do little to eliminate that possibility completely.

> real decision, then perhaps we could do with fewer of them . . . .[114]

Second, frequentist statistics are almost entirely useless in understanding and weighing unprecedented risks. A classical or "frequentist" conception of probability defines the probability (P) of an event's occurring in a particular trial as the frequency (f) with which it occurs in a long sequence of similar trials. P is the value to which the long-run f converges as the number of trials increases. This is why P is often viewed as a property or *propensity* of the system generating the events. One practical trouble with frequentist conceptions of probability, of course, is that for most events of any interest we cannot be sure of the *relevant* population of trials or similar events. A "subjectivist" alternative stems from the work of the English mathematician Thomas Bayes. Bayesian probability is best thought of as the degree of belief an agent can have that an event will occur given all of the relevant information currently known to that agent. According to Bayes, because the state of information changes over time and changes for different agents, there is no such thing as a single P. This "subjectivist" account is disciplined by what we might call the "axioms" of probability, though. For example, the P that one of a set of mutually exclusive events occurs should be the sum of their probabilities.[115] Assuming these axioms, rationally coherent degrees of belief depend almost entirely on ever-changing states of information.[116] Our so-called Bayesian probabilities must therefore be updated constantly and by recourse to as many sources of information as is feasible—making them more like working hypotheses than usable conclusions.[117]

The unpredictability of environmental outcomes given some action (A) provokes much of the conflict we see in NEPA practice today. Assigning a P value to the range of *possible* outcomes from action A will be of varying difficulty depending on how far removed the agent is from the outcome(s), i.e., how many different sources of variability can alter the outcome(s) from A in the time interval and or the space separating it from our agent. Without a frequentist distribution of a subject outcome from which to judge, though, we would seem to be better off committing ourselves to a permanent and constant updating of our beliefs. We would be better off, that is, assuming we are willing to bear the *costs* of decision making that this kind of "Bayesian" updating entails. And because NEPA assessments will often come due well in advance of an action A—or of any outcome(s)

114. Karkkainen, *Toward a Smarter NEPA*, *supra* note 16, at 935.

115. *See* HOWSON, *supra* note 66, at 62-63 (reviewing Kolmogorov axioms).

116. *See* Itzhak Gilboa, *Note: Questions in Decision Theory*, 2 ANN. REV. ECON. 1, 8–10 (2009), *available at* http://www.tau.ac.il/~igilboa/pdf/Gilboa_Questions_in_Decision_Theory.pdf (exploring the differences between frequentist probabilities and the constant updating of a "subjectivist" or Bayesian approach to probability).

117. *See* HOWSON, *supra* note 66, at 173-98. Scientifically derived knowledge of causation and the connections drawn between causal forces and outcomes/effects have a similar structure—and are similarly contrary to some of our legal traditions for that reason. *See* H.L.A. HART & TONY HONORÉ, CAUSATION IN THE LAW (2d ed. 1985).

from *A*—their practical value as predictions will be low. This is where better accounting of our information's value would be, well, invaluable.[118] Only by estimating the *expected* utility of information that could enhance the agency's (subjective) probability judgments will that agency know how much to invest in acquiring the object information.[119]

Finally, our programmatic NEPA documents, especially those from which subsequent, more specific decisions are "tiered," must do more to alert our decision-makers to the risks that have been analyzed in gross, so to speak, but not yet in particular, while at the same time alerting them to the blindspots inherent in their own "worldviews," biases, and best-laid plans. What we now call "scenario planning" seems the most promising means for doing so. Scenario planning is a family techniques pioneered in the 1970s both to envision plausible future events and to plot out strategic, outcome-inducing responses thereto.[120] It begins with the definition of a problem: something specific and generally risky. Once the problem has been identified, no more than a couple of dozen people should brainstorm "a long list of key factors and environmental forces that might influence the outcomes[s] of the focal issue."[121] And once that has been done, the group should settle on no more than a handful of scenario "plots"—stories or narratives that have a beginning, a middle, and an end.[122] Settling on these plots and populating them with events and forces normally happens in some kind of workshop the achievement of which is hopefully identifying "those areas about which we don't know enough about the present and past, much less the future."[123] Serious workshops of the kind are virtually unknown to NEPA processes today, overloaded as they have become with theatrical "public transparency" sessions that play for the record and little else.

Scenario planning of the sort under NEPA's auspices could incorporate a kind of continual "Bayesian" updating of event probabilities—assuming the action agency could sustain the necessary contact and exchange with others. With improving communications technology and partnering

118. Those who must acquire information can estimate its expected value in deciding whether it is worth the trouble to acquire. *See* BARON, *supra* note 78, at 177–78.

119. Where this expected utility comes down to disparate expert judgments, the valuation itself can quickly grow in complexity. *Id.* at 129-34. Nevertheless, *not* attempting such analyses is more impractical still. *Cf. id.* at 177–78 (likening value of information testing to the practice of modern medical diagnosis and its selection of diagnostic tools).

120. *See* JAMES A. OGILVY, CREATING BETTER FUTURES: SCENARIO PLANNING AS A TOOL FOR A BETTER TOMORROW (2002); PETER SCHWARTZ, THE ART OF THE LONG VIEW: PLANNING FOR THE FUTURE IN AN UNCERTAIN WORLD (1991).

121. *See* OGILVY, *supra* note 120, at 175. Ogilvy notes that it is best if the group is "fairly diverse—young and old, male and female, of different ethnicities, with different jobs, and from different parts of a . . . community—so that the list of key factors and environmental forces is long and varied." *Id.* Finally, "[e]xperts are not always the best resources for thinking outside the box, and often what we are looking for is the unexpected, the unlikely, the key factor that will blindside us if we remain locked in the tunnel vision of received wisdom." *Id.*

122. OGILVY, *supra* note 120, at 176.

123. *Id.*

forms, both by interagency workgroups and by agencies tapping their regulated parties, Bayesian updating of the kind is increasingly feasible. Five-year planning horizons—like those OCSLA and DOI's offices have adopted—are far too long, though. The prompts for revisiting outdated scenario plans would have to be much more routine.[124] In all events, CEQ's rules on "available" information,[125] the "purpose and need" of agency actions in alternatives analyses,[126] and its now copious interpretations of the rules on "tiering"[127] ought to be amended by a notice-and-comment rulemaking to adopt a binding rule that either rewards or, in some circumstances, requires an agency's use of state-of-the-art scenario planning in place of the disjointed, disorganized, and discredited approaches to layered environmental risks that are currently tolerated.[128]

If true scenario planning is predicated on continuous consultation and the structured accounting of possible futures, thereby stressing the irreducible uncertainties, it also entails what we might call imaginative speculation.[129] It offers the agent a method of envisioning possible futures, especially possible futures that might be outside the bounds of conventional thinking.[130] In this much, scenario planning is less prediction and forecast than *projection* and collective *hypothesis*.[131] For the risk of a catastrophic spill to have been *appropriately* discounted by its actual (im)probability, MMS would have had to have made much better use of all sources of information available to all knowledgeable actors regarding the most salient possibilities in its deepwater development plans—including

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124. *Id.*

125. 40 C.F.R. § 1502.22 (2010).

126. *Id.* § 1502.13 (2010).

127. *Id.* §§ 1502.20, 1508.28 (2010).

128. A rulemaking of the sort could be as easy as providing for the permitted use of abbreviated public processes on covered EISs, the amendment of the rules set out above to further specify valid responses to revealed uncertainties, or by providing that the kind of scenario planning described in text constitutes full compliance with NEPA § 102(2) for whatever agency "actions" are included therein.

129. *See* Garry D. Peterson et al., *Scenario Planning: A Tool for Conservation in an Uncertain World*, 17 CONSERV. BIO. 358, 360 (2003), *available at* http://www.technologyforge.net/STMWarsaw/ScenarioPlanning/ENMA291STReferences/Processes/ToolsForConservation.pdf.

130. *See* Wright & Goodwin, *supra* note 93, at 318 ("[S]cenario planning interventions in organizations construct multiple frames of the future states of the external world, only some of which may be well aligned with current strategy."); Peterson et al., *supra* note 129, at 360 (internal citation omitted) ("Scenarios describe futures that could be rather than futures that will be. In essence, scenarios are alternative, dynamic stories that capture key ingredients of our uncertainty about the future of a study system.").

131. *See* OGILVY, supra note 120, at 101–10; Peterson et al., *supra* note 120, at 359–61.

> Whereas scientists understand that predictions are conditional probabilistic statements, non-scientists often understand them as things that will happen. . . . In contrast to a prediction, a forecast is the best estimate from a particular method, model, or individual. The public and decision-makers generally understand that a forecast may or may not turn out to be true. Environmental scientists further distinguish projections, which may be heavily dependent on assumptions about drivers and may have unknown, imprecise, or unspecified probabilities. Projections lead to "if this, then that" statements.

Peterson et al., *supra*, at 359 (internal citations omitted).

the information in the spill response plans required by its own rules,[132] information about the challenges of drilling in the Gulf of Mexico,[133] and the information about BPV's disturbingly high failure rates at extreme depths.[134] Instead of remaining the *ultima thule*—that beyond the borders of the agency's "known world"—disastrous risks from oil development might have actually entered the calculus. In that much, we may even generalize from the BP Macondo disaster and suggest that NEPA's agents should more routinely stretch their own informational horizons to gather and synthesize information wherever it might be "available" and to do so by involving others by whatever means necessary. This more normative sense of "available" information remains too foreign to NEPA agents today. But it is the sense in which NEPA exercises will actually pursue the statute's lofty goals of improving our understanding of environmental risk.

IV. CONCLUSIONS

Today's "pressure build"[135] pushing us and our governments to develop heretofore unrecoverable hydrocarbons is a scenario itself, of course.[136] Executive branch decision-makers especially have long known that our nation is in a tightening vortex where oil is concerned.[137] The strategically minded multi-national enterprises whose profits rise with this building pressure today can even *augment* it with their mobile capital, mobile businesses, and legal protections as *owners*.[138] They can threaten to take their expertise and assets elsewhere, undermining a whole nation's energy plans in turn. And if a political jurisdiction chooses not to develop the oil reserves in its possession, it guarantees nothing environmentally—except perhaps that a valuable resource is left in place for some future agents' exploitation. This is where special-purpose agencies like DOI and its component bureaus confront the limitations of our multi-agency state

132. *See* 30 C.F.R. Parts 250 and 254 (2009). MMS rules have long required its operators' spill response plans include worst-case discharge scenarios and, specifically, the *volume of oil* in the worst case discharge scenario. *See id.* § 254.47.

133. *See* DEP'T OF INTERIOR SUSPENSION DECISION, *supra* note 90, at 7–17.

134. *See supra* note 96 and accompanying text.

135. *Cf.* PETER TERTZAKIAN, A THOUSAND BARRELS A SECOND: THE COMING OIL BREAK POINT & THE CHALLENGES FACING AN ENERGY DEPENDENT WORLD (2007) (arguing that oil's "energy cycle" is coming to a "break point" as the pressure builds to find other sources of energy to replace it).

136. *See* NAT'L RESEARCH COUNCIL, OIL IN THE SEA III: INPUTS, FATES, & EFFECTS 19–62 (2003) (reviewing the growing risks of oil pollution in the marine environment as development expands).

137. *See, e.g.*, DANIEL YERGIN, THE PRIZE: THE EPIC QUESTION FOR OIL, MONEY & POWER (1991). As ultra deepwater exploration continues, new finds are inevitable—but just as likely to shift and possibly augment the risks of oil development. *See, e.g.*, Joao Lima & Fred Pals, *BP's Tiber Find Underscores Challenges of Deepwater Find*, BLOOMBERG NEWS, Sept. 2, 2009, http://www.bloomberg.com/apps/news?pid=newsarchive&sid=AK0cLK9YuS1E.

138. National oil companies control four times the global petroleum reserves that the multinational majors BP, ExxonMobil, Shell, Chevron, ConocoPhillips, and Total do. *See* U.S. Energy Info. Admin., *Who Are the Major Players Supplying the World Oil Market?*, http://tonto.eia.doe.gov/energy_in_brief/world_oil_market.cfm. And in virtually every plausible scenario, oil company assets will continue to grow in the short- to medium term. *See, e.g.*, Charles Roxborough et al., McKinsey Global Inst., *The New Power Brokers: How Oil, Asia, Hedge Funds, and Private Equity Are Faring in the Financial Crisis* 82–86 (2009) (projecting "petrodollar" asset growth in several scenarios).

and the community of nations to which they belong. Strict regulatory controls on "vessels" like the "mobile offshore drilling units" Transocean, LLC, operates just encourage their owners to "reflag" them.[139] Hard limits on hydrocarbon development in one place or sector simply drive up prices and incentives to others to meet what is now a globalized demand.[140] In the meantime, our energy economy depletes and toxifies more natural capital every year and statutes like NEPA do nothing to stop or even slow it substantially. Indeed, from *Village of False Pass v. Clark*,[141] where plaintiffs sought a "worst case scenario" analysis of a "major spill" in the Interior Department's OCSLA leasing plans, to *Alaska v. Andrus*,[142] where plaintiffs sought the gathering and development of site-specific information about leasing and drilling in "high risk" waters, to *County of Suffolk v. Secretary*,[143] where plaintiffs sought a comprehensive analysis of the aggregate effects from the Department's leasing plans, to *Natural Resources Defense Council v. Morton*,[144] where plaintiffs sought the development of alternatives to oil as a fuel in an EIS for offshore oil development, the successive generations of NEPA litigation that have progressively narrowed the statute's planning horizons under the pressures of our energy economy are like the rings of a dying tree. In these generations we see an ever-diminishing range of possibilities rather than the promise of more growth.

We return, then, to NEPA as a system itself, a tool that should enhance agencies' overall competence.[145] Even if it is not necessarily more "worst case scenario" analyses, NEPA managers today must devise heuristics that will actually improve our awareness of the environmental costs of our economy-as-usual—if not in real time, then *over time*. If, under even improved CEQ rules demanding true scenario planning from its agents, NEPA documents are going to be wrong in their predictions much of the

139. Transocean LLC, which reportedly owns more than half of all the MODU's worldwide, is also reported to be one of the most cravenly strategic "reflagging" corporations in the world. *See* Barry Meier, *Owner of Exploded Rig is Known for Testing Rules*, N.Y. TIMES, July 7, 2010, http://www.nytimes.com/2010/07/08/business/global/08ocean.html. The empirical evidence suggests that "races to laxity" in regulatory competition are not as common as was once thought, although flags of convenience have been the norm in international shipping since World War II. *See* DALE D. MURPHY, THE STRUCTURE OF REGULATORY COMPETITION: CORPORATIONS & PUBLIC POLICIES IN A GLOBAL ECONOMY 45–71 (2004). Vessels like MODUs seem to be primed for reflagging and races-to-laxity, in other words.

140. Historically, fuel shifts (and locational shifts in the recovery of a traditional fuel) in response to regulatory or other governmental pressures are common. *See* TERTZAKIAN, *supra* note 135.

141. 733 F.2d 605 (9th Cir. 1984).

142. 580 F.2d 465 (D.C. Cir. 1978).

143. 562 F.2d 1368 (2d Cir. 1977).

144. 458 F.2d 827 (D.C. Cir. 1972).

145. *Cf.* 42 U.S.C. § 4332(A) (2006) (requiring all agencies to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment"); *id.* at § 4332(B) (requiring all agencies to "identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations").

time (and they surely will be), what would a practically rational agent *do* with such analyses? Clearly, if the immediate relevance of such analyses is substantially compromised by our being human, the direct role of these analyses in the real-time decisions for which they are commissioned must not define their horizons. The practically rational agent would optimally standardize them to make them more usable *as an aggregate*. The practically rational agent would engineer such analyses to enable subsequent *meta-analysis* of their preparation, content, and function.[146] Instead of yet another "guidance" that gently suggests such a systemic approach, though,[147] CEQ must start acting with more dispatch and purpose, principally by updating its regulations to reverse the dynamics traced above.

Since Glass and colleagues coined the term in the mid-1970s, meta-analysis has grown ubiquitous in fields like epidemiology and medicine. But it remains virtually unknown to agencies like DOI. A meta-analysis makes the detailed study itself into the unit of observation, aiming to reveal any underlying regularities that may exist.[148] A major challenge of conducting any meta-analysis is finding the relevant parameters,[149] a test that NEPA's data universe would certainly present to the fullest. But the possible payoffs are enormous. Indeed, some sort of meta-analytical requirement adopted at some point in our *first* forty years of experience with NEPA might have *substantially* deepened MMS's understanding of the *uncertainty absorption*—perhaps even the relative probability of catastrophic oil spills—inherent in its deepwater exploration and production programs. There is no telling what disaster we might be able to avert in the coming decades if we act now to get a better grasp of the unpredictable.

146. The "meta-analysis" of NEPA documents suggested depends on their being aggregated and then subdivided into categories from which similarities and patterns could be drawn. The conclusions from such analyses that the NEPA performance of an agency (or agency unit) meets or fails to meet some particular standard, whether as to accuracy, publicity, participation, etc., would be the output from such meta-analysis.

147. On CEQ's over-use of guidance, handbooks, memoranda, circulars, and the like as opposed to updating its regulations, see Amy L. Stein, *Climate Change Under NEPA: Avoiding Cursory Consideration of Greenhouse Gases,* 81 U. COLO. L. REV. 473 (2010).

148. Eduardo Fernandez-Duque & Claudia Valeggia, *Meta-Analysis: A Valuable Tool in Conservation Research*, 8 CONSERV. BIO. 555, 556 (1994).

149.