# Emerging Science, Adaptive Regulation, and the Problem of Rulemaking Ruts

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## I. Introduction

In theory it is hard to deny the power of information revolutions to enhance environmental policy making, but in practice it remains to be seen whether governmental institutions are up to the task of making good use of this new information as it arises. Information breakthroughs are hardly fresh developments in 2008; our information base has been expanding over the past three decades in ways that should have been influencing environmental policy on an ongoing basis. Yet, as the "Next Generation" title to this symposium implies, thus far the information revolution appears to have had only a limited impact on the steady accretion of environmental policy or law in the United States.

Rather than discuss how emergent information *could* be assimilated into regulatory policy as many of the other articles in this Symposium do, this Article takes a more skeptical tack and considers why the assimilation of information breakthroughs seems to be so slow in coming. We recognize that when new information threatens to unsettle existing regulatory requirements governing powerful stakeholders in the rulemaking process, using it to develop stricter environmental standards is unlikely to be a simple or straightforward matter. Indeed, the diffusion of information into the legal and the financial marketplaces is likely to be both complex and politically charged, rather than a linear transformation from new information to regulatory improvements. Failing to take account of some of the more predictable institutional barriers in this context may derail or discourage information breakthroughs before they come to fruition.

Others in the legal academy have similarly noticed how legal institutions can impede the assimilation of new information into regulatory requirements, but their solutions generally involve bypassing legal institutions altogether rather than confronting the institutional weaknesses directly.[1] Bypassing these institutions, however, may not be easy.

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1. Professor Daniel Esty, for example, also makes this move in his recent article about the future of environmental protection in the information age. *See* Daniel C. Esty, *Environmental*

Environmental markets, for example, are created when the government imposes limitations that create scarcity (e.g., on the right to emit certain pollutants) and then allocates those scarce resources and adopts rules governing their exchange.[2] Similarly, while the information collected by "bucket brigades" may provide powerful incentives for community organizing and empowerment, translating that information into stricter legal obligations requires regulatory action of some sort.[3] In the same vein, both Pigouvian taxes and environmental subsidies must be set by a government entity at an optimal level to provide efficient pollution-control incentives.[4] In addition, even when scientific and technological information is not intended for direct use in the regulatory process, government entities play an important role in certifying its validity. California's Proposition 65 and the federal Toxic Release Inventory, for example, offer a wealth of information to citizens, but they are backed by statutory directives that specify the types of information that must be provided by regulated parties and the penalties that will be levied for noncompliance.[5]

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*Protections in the Information Age*, 79 N.Y.U. L. REV. 115, 203 (2004) ("While legal instruments can spur information generation, some laws actively reward ignorance."). Professor Esty acknowledges that public choice and related pathologies impair the introduction of information in the current system but maintains optimism that information breakthroughs will actually change the accountability of institutions by lowering the costs of information to the diffuse public. *Id.* at 184–86. We are unconvinced. While this is likely the case in some areas of environmental law and policy, it is not the case in all areas, particularly where enhanced information technologies will remain relatively inaccessible to the public and incomplete in their ability to overcome significant uncertainties, like in the case of toxics control. Although Professor Esty does not delve into the details, his own narrative suggests he expects that some limited set of information innovations will remain inaccessible to the public and therefore might not be integrated into policy. *Id.* at 120–21, 180.

2. *See* James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 616–22 (2000) ("In establishing a market, the government first creates a new form of property—legal entitlements to emit pollutants, catch fish, develop habitat—and then imposes a set of rules governing their exchange.").

3. *See* Christine Overdevest & Brian Mayer, *Harnessing the Power of Information Through Community Monitoring: Insights from Social Science*, 86 TEXAS L. REV. 1493, 1520 (2008) (noting that while bucket brigades might help increase accountability, "[c]alling for accountability . . . does not mean that actors have the authority to correct conduct"). *But see* Barton H. Thompson, Jr., *The Continuing Innovation of Citizen Enforcement*, 2000 U. ILL. L. REV. 185, 223–26 (noting that citizen monitoring may lead to more and better citizen suits).

4. *See, e.g.*, DAVID M. DRIESEN, THE ECONOMIC DYNAMICS OF ENVIRONMENTAL LAW 68–70 (2003) (discussing the administrative challenges involved in setting Pigouvian taxes at appropriate levels to efficiently control pollution); Stephen Breyer, *Analyzing Regulatory Failure: Mismatches, Less Restrictive Alternatives, and Reform*, 92 HARV. L. REV. 549, 581–82 (1979) (explaining the government's role in setting incentive-based taxes); David M. Driesen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289, 333–47 (1998) (proposing and discussing an incentive-based emissions-trading tax system).

5. *See* Emergency Planning and Community Right-to-Know Act of 1986 §§ 302–303, 311–312, 42 U.S.C. §§ 11002–11003, 11022–11023 (2000) (requiring covered facilities to self-identify; report their storage, use, and disposal of hazardous substances; and prepare an emergency response plan); Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), CAL. HEALTH &

In this Article, we argue that beyond simply attempting to bypass legal institutions in harnessing the power of information, a concerted effort must be made to identify and ameliorate institutional impediments to assimilating this information. If agencies are encountering predictable challenges in making use of information breakthroughs, then new mechanisms should be devised to improve their ability to capitalize on the information.[6]

In order to gain meaningful purchase on this argument—that legal institutions may not always make good use of emergent information—we break off a smaller piece of the larger problem and consider the relatively discrete and straightforward ability of agencies to revise and update existing rules in accordance with changes in science and technology. Other challenges of institutional capacity to assimilate information, such as the ability of agencies to reliably certify new information with regard to its quality (e.g., the information collected by bucket brigades), to promulgate new rules in accord with new information, and to determine the validity of regulatory models or the extent of ambient data needed to evaluate environmental quality, are left for others. One must start somewhere in an exploration of institutional capacity to assimilate and even encourage information breakthroughs, and we select a place that is both manageable and important: the ability of agencies to revise existing rules in response to information advances and technological breakthroughs.

Our specific hypothesis is that agencies, under current administrative structural arrangements, generally have little institutional incentive or capacity to revise pollution-control standards in accordance with advances in scientific and technological information. The argument proceeds in three parts. In Part II of this Article, we lay out the general conceptual argument, borrowing from standard ossification theory, public- and rational-choice theory, and the political-science literature. Combining these insights provides a powerful predictive vehicle for isolating institutional structures most resistant to information advances. In Parts III and IV, this theoretical backdrop is used to focus more specifically on the problem we call

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SAFETY CODE §§ 25249.5–25249.13 (West 2006) (requiring manufacturers to label products containing reproductive and carcinogenic hazards).

6. Moreover, while both strategies—institutional repair and bypass—are important and complementary, we hasten to add that we remain convinced that ignoring the institutional roadblocks while focusing too narrowly on bypass mechanisms is dangerous. In addition to overlooking the important role played by governmental institutions in implementing these extralegal approaches, this approach ignores the long pattern of "bending science" that has been facilitated by legal institutions but largely carried out in the market, popular press, and even some litigation. *See generally* THOMAS O. MCGARITY & WENDY E. WAGNER, BENDING SCIENCE: HOW SPECIAL INTERESTS CORRUPT PUBLIC HEALTH RESEARCH (forthcoming 2008). And it neglects the unsettling reality that the government has at times played a very prominent and—at other times—a more subtle role in limiting and twisting the information that is made available to the public. *See, e.g.*, *Ex-EPA Chief Rejects Criticism over 9/11 Workers' Illnesses*, CNN.COM, June 26, 2007, http://www.cnn.com/2007/POLITICS/06/25/ground.zero/index.html?iref=newssearch (describing misleading information supplied by the Environmental Protection Agency (EPA) about air quality at Ground Zero in the weeks following the 9/11 attacks).

"rulemaking ruts," where the administrative resistance to advances in science and technology is likely to be most acute. These rulemaking ruts result from unilateral pressure brought by those opposed to the rules, thus exacerbating the problem of ossification. In Part III, we search the Environmental Protection Agency's (EPA) rulemaking record in particular, and the literature more generally, to determine whether this failure or near failure occurs with respect to standards revision more generally. Finally, in Part IV, we argue that rather dramatic changes to the administrative process are needed if agencies are to pull themselves out of these rulemaking ruts.

## II. A Theory of Rulemaking Ruts

Our study of institutional capacity to assimilate and encourage information breakthroughs in general, and to revise rules in accordance with this information in particular, begins with an explication of our conception of rulemaking ruts. This concept is based on a composition of ideas drawn from prior work on regulatory ossification, public choice theory, agency capture, and comparative institutional analysis. In essence, these insights suggest that the existing institutional structure governing administrative rulemaking is especially ill-suited for revisions of established science- or technology-based environmental and public-health standards. While revisions may—and indeed do—sporadically and erratically emerge from these rulemaking ruts, it is much more likely that existing standards will stay deeply embedded in the ossification mud. Indeed, in such an environment, regulatory revisions may be as likely to regress in favor of regulated parties as they are to advance toward more stringent standards.

### *A. The Ossification of Rulemaking*

Much has been written about the ossification of agency rulemaking, and this Article will not retread that ground.[7] While some skepticism

7. Professor Thomas McGarity wrote the seminal article on the ossification of agency rulemaking and has continued to lead the scholarship in the field. Thomas O. McGarity, *Some Thoughts on "Deossifying" the Rulemaking Process*, 41 DUKE L.J. 1385 (1992) [hereinafter McGarity, *Some Thoughts*]; *see also* Thomas O. McGarity, *The Courts and the Ossification of Rulemaking: A Response to Professor Seidenfeld*, 75 TEXAS L. REV. 525, 533–36 (1997) (detailing how "difficult" it is "for an agency to promulgate a rule" in "today's regulatory climate"). Others have contributed to our understanding of the phenomenon over the years. *See* STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION 48 (1993) (discussing the consequences of scientific and regulatory decision-making rules as tending to "produce random results"); Richard J. Pierce, Jr., *Seven Ways to Deossify Rulemaking*, 47 ADMIN. L. REV. 59, 65–66 (1995) [hereinafter Pierce, *Seven Ways*] (looking at recent court actions and evaluating seven doctrinal shifts for their potential to reduce the problem of the ossification of rulemaking). In addition, several scholars have undertaken extensive studies of the consequences of the ossification phenomenon on particular agencies or industries. *See, e.g.*, Jerry L. Mashaw & David L. Harfst, *Regulation and Legal Culture: The Case of Motor Vehicle Safety*, 4 YALE J. ON REG. 257, 263–68 (1987) (discussing how the National Highway Traffic Safety Administration (NHTSA) effectively abandoned rulemaking in favor of statutorily authorized recalls as the preferred method of regulation); Richard J. Pierce, Jr., *The Unintended Effects of Judicial Review of Agency Rules: How*

remains,[8] it "has become a virtual article of faith"[9] that regulatory roadblocks imposed by courts over the years have made notice-and-comment rulemaking so expensive, time-consuming, and uncertain that administrative agencies are increasingly reluctant to undertake it.[10] The consequences are dramatic. Important statutory directives remain unimplemented years after the deadline for implementation has passed.[11] Agencies are increasingly turning to even more informal methods—which lack adequate opportunities for public participation and evade meaningful judicial oversight—to promulgate important policies.[12] And, not surprisingly, agencies are increasingly reluctant to revisit rules after enactment, even if the factual or policy predicates underlying them have changed.[13]

While there are minor disagreements about the range of specific causes of regulatory ossification,[14] most scholars agree that the predominant culprit

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*Federal Courts Have Contributed to the Electricity Crisis of the 1990s*, 43 ADMIN. L. REV. 7, 8 (1991) (suggesting that the federal courts of appeals' attitude toward agency rulemaking was one of the indirect causes of the electricity shortage in the 1990s).

8. *See* William S. Jordan, III, *Ossification Revisited: Does Arbitrary and Capricious Review Significantly Interfere with Agency Ability to Achieve Regulatory Goals Through Informal Rulemaking?*, 94 NW. U. L. REV. 393, 396 (2000) ("[J]udicial review in the D.C. Circuit under the hard look version of the arbitrary and capricious standard generally did not significantly impede agencies in the pursuit of their policy goals during the decade [from 1985 to 1995]."); Anne Joseph O'Connell, *Political Cycles of Rulemaking: An Empirical Portrait of the Modern Administrative State*, 94 VA. L. REV. (forthcoming July 2008) (manuscript at 25), *available at* http://papers. ssrn. com/sol3/papers.cfm?abstract_id=999099 (analyzing data from *Unified Agenda of Federal Regulatory and Deregulatory Actions* for the years 1983–2003 and finding that "procedural costs to [agency] rulemaking are not so high as to prohibit considerable rulemaking activity by agencies"); Jason Webb Yackee & Susan Webb Yackee, Is Federal Agency Rulemaking "Ossified"? The Effects of Procedural Constraints on Agency Policymaking 3, 24 (Apr. 9, 2007) (unpublished manuscript, on file with the Texas Law Review), *available at* http://www.allacademic.com/meta/p196711_index.html (evaluating the same data and challenging claims of ossification).

9. Jordan, *supra* note 8, at 393.

10. *See* Pierce, *Seven Ways*, *supra* note 7, at 61 (providing examples of expensive, time-consuming, and ultimately unsuccessful attempts at notice-and-comment rulemaking).

11. Indeed, many of the 1990 amendments to the Clean Air Act were a reaction to EPA's dramatic failure to implement the dictates of the 1970 Act. *See* Thomas O. McGarity, *Hazardous Air Pollutants, Migrating Hot Spots, and the Prospect of Data-Driven Regulation of Complex Industrial Complexes*, 86 TEXAS L. REV. 1445, 1447 (2008) (discussing EPA's utter failure to implement its hazardous-air-pollutant responsibilities under § 112 of the 1970 Act and Congress's response to that failure).

12. *See* Pierce, *Seven Ways*, *supra* note 7, at 60 (citing CARNEGIE COMM'N ON SCI., TECH., AND GOV'T, RISK AND THE ENVIRONMENT: IMPROVING REGULATORY DECISION MAKING 107 (1993)).

13. *Id.* (citing CARNEGIE COMMISSION ON SCIENCE, TECHNOLOGY, AND GOVERNMENT, *supra* note 12, at 107).

14. The judiciary is only one aspect of the ossification problem. The Executive Branch has adopted regulatory priority-setting and evaluation requirements that impose costs and delay on administrative agencies. For example, Executive Order 12,291 and its successors required agencies to engage in extensive cost–benefit analysis and to submit their proposals for major regulations to the Office of Management and Budget (OMB) for review. *See* Exec. Order No. 12,291, 3 C.F.R. 127 (1982), *reprinted in* 5 U.S.C. § 601 (1988), *revoked by* Exec. Order No. 12,866, 3 C.F.R. 638 (1993), *reprinted as amended in* 5 U.S.C. § 601 (2000). In addition, Congress has imposed its own regulatory costs on agencies, and has consistently failed to fund them sufficiently. *See, e.g.*,

is the probing judicial scrutiny that characterizes judicial review under the Administrative Procedure Act's arbitrary and capricious standard.[15] This requirement—the requirement of reasoned decision making—as applied with tenacity by the courts (in particular, the D.C. Circuit[16]) in the years following *Motor Vehicle Manufacturers Ass'n v. State Farm Mutual Automobile Insurance Co.*,[17] has led to the formalization of the notice-and-comment rulemaking process. As a result, agencies systematically engage in excess data gathering, protracted analysis of the data and associated public comments, and extraordinarily detailed explanation of the bases and purposes of their final rules in an attempt to insulate their policies from judicial reversal.[18] Nonetheless, even with this extensive investment of time and resources in post-*State Farm* rulemaking, contested agency rules are often reversed.[19]

This hyperformalization of notice-and-comment rulemaking has several consequences. The most obvious is the increase in time and resources required to promulgate each rule, impeding the adoption of the regulatory

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Regulatory Flexibility Act, 5 U.S.C. § 602 (2000) (requiring agencies to publish a regulatory agenda twice each year and to consider the impact of proposed regulations on small businesses); Paperwork Reduction Act of 1980, 44 U.S.C. § 3501 (2000) (requiring OMB permission to collect information from more than ten sources). *See generally* Pierce, *Seven Ways*, *supra* note 7, at 62–65 (discussing the contributions of the Executive and Legislative Branches to ossification).

15. Administrative Procedure Act, 5 U.S.C. § 706(2)(A) (2000). As this standard was interpreted in *Motor Vehicle Manufacturers Ass'n v. State Farm Mutual Automobile Insurance Co.*, reviewing courts must engage in probing and thorough review of notice-and-comment rulemaking to ensure that an agency acted within its statutory authority, considered all relevant factors, and did not make a clear error in judgment. 463 U.S. 29, 42–43 (1983).

16. *See* Richard J. Pierce, Jr., *Two Problems in Administrative Law: Political Polarity on the District of Columbia Circuit and Judicial Deference of Agency Rulemaking*, 1988 DUKE L.J. 300, 304–05 (noting that by 1987 the rate of affirmance of agency actions in the D.C. Circuit had shrunk to less than 30%, as compared to a rate of 74% for all other circuits).

17. 463 U.S. 29 (1983).

18. *See, e.g.*, Frank B. Cross, *Beyond* Benzene*: Establishing Principles for a Significance Threshold on Regulatable Risks of Cancer*, 35 EMORY L.J. 1, 12–43 (1986) (detailing examples of judicial review forcing agencies to provide detailed technical explanations for standards); McGarity, *Some Thoughts*, *supra* note 7, at 1403 (noting that, as a result of the Supreme Court's *Benzene* decision, the Occupational Safety and Health Administration (OSHA) has found itself forced to engage "in this exceedingly precise analysis with full knowledge that the estimates provided by existing risk assessment models could vary millionfold, depending upon the model selected"); Pierce, *supra* note 16, at 311 (arguing that courts often require "that agencies 'find' unfindable facts and support those findings with unattainable evidence").

19. *See* CARNEGIE COMMISSION ON SCIENCE, TECHNOLOGY, AND GOVERNMENT, *supra* note 12, at 105–12 (noting that extensive, detailed rulemakings have often been overturned for failure to provide adequate justification); Jordan, *supra* note 8, at 412 (finding that between 1985 and 1995 the D.C. Circuit remanded agency rules sixty-one times, including twenty-nine major rulemakings); *see also* Christopher H. Schroeder & Robert L. Glicksman, Chevron, State Farm *and the EPA in the Courts of Appeal During the 1990s*, 31 Envtl. L. Rep. (Envtl. Law Inst.) 10,371, 10,374 (2001) (concluding that the agency prevailed in 53% of the rulemaking challenges against it in the 1990s). *But see* Peter H. Schuck & E. Donald Elliott, *To the* Chevron *Station: An Empirical Study of Federal Administrative Law*, 1990 DUKE L.J. 984, 1007–09 (analyzing published decisions in administrative law from 1964 to 1985 and finding "a consistent trend towards an increasing percentage of affirmances").

measures needed to implement the public-health statutes of the 1970s. Other consequences are similarly pernicious. To avoid the stultifying process of promulgating rules pursuant to notice and comment, agencies increasingly rely on interpretive rules, guidance statements, or statements of policy to inform the public of the agency's policy positions.[20] These informal statements of agency policy are easier to implement than notice-and-comment rulemaking, but (and because) they bypass the public-input process that brings legitimacy, accountability, and enhanced accuracy to notice-and-comment rulemaking.[21] In addition, these informal rules do not have the force and effect of law, rendering them less effective in altering behavior and more costly to enforce.[22] Finally, some agencies have shifted priorities in response to the probing judicial review of the "hard look" doctrine, forsaking critical but controversial public-safety responsibilities in favor of a more passive, less inflammatory regulatory agenda.[23]

Skeptics of the ossification theory challenge both its premises and its conclusions. Judge Patricia Wald, for example, challenges the premise that courts are unreasonably second-guessing the agency's expert decision making.[24] More recent empirical studies of the rulemaking process challenge

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20. McGarity, *Some Thoughts*, *supra* note 7, at 1393.

21. Administrative law scholars have long noted that the numerous "attachment points" in the rulemaking process, which in theory are designed to make the agency more accountable to the public at large, may actually work at cross-purposes, driving rulemaking into less formal, less visible, and less accountable forums. *See, e.g.*, Scott R. Furlong, *Interest Group Influence on Rule Making*, 29 ADMIN. & SOC'Y 325, 335, 341 (1997) (noting that a study surveying interest groups reveals a dynamic but informal relationship between agencies and interest groups); William F. West, *Formal Procedures, Informal Processes, Accountability, and Responsiveness in Bureaucratic Policy Making: An Institutional Policy Analysis*, 64 PUB. ADMIN. REV. 66, 67 (2004) (noting that the cumbersome process of notice-and-comment rulemaking often acts against rather than in favor of procedural accountability and agency responsiveness); *cf.* William Gormley, Jr., *Regulatory Issue Networks in a Federal System*, 18 POLITY 595, 606–08 (1986) (observing that when regulatory issues are of low salience and highly technical, they tend to be resolved through "boardroom" decision-making processes where regulated parties and the agency work together to arrive at solutions).

22. *See* United States v. Mead Corp., 533 U.S. 218, 226–27 (2001) ("We hold that administrative implementation of a particular statutory provision qualifies for *Chevron* deference when it appears that Congress delegated authority to the agency generally to make rules carrying the force of law, and that the agency interpretation claiming deference was promulgated in the exercise of that authority.").

23. *See, e.g.*, JERRY L. MASHAW & DAVID L. HARFST, THE STRUGGLE FOR AUTO SAFETY 146–71 (1990) (detailing the retreat of NHTSA from early attempts to establish effective safety standards for U.S. automobiles to the less controversial and less important role of overseeing recalls); Orly Lobel, *Interlocking Regulatory and Industrial Relations: The Governance of Workplace Safety*, 57 ADMIN. L. REV. 1071, 1121–23 (2005) (describing OSHA's attempt to implement an innovative policy without notice-and-comment rulemaking and its decision to abandon the policy rather than undertake a notice-and-comment process).

24. After examining the rulemaking decisions issued by the D.C. Circuit for a one-year period between July 1992 and July 1993, Judge Wald concluded that agency reversals in this court are most often due to the agency's failure to give an adequate explanation for its decision or statutory interpretation, not for a lack of evidence supporting its findings. *See* Patricia M. Wald, *Regulation at Risk: Are Courts Part of the Solution or Most of the Problem?*, 67 S. CAL. L. REV. 621, 636–39

the accepted wisdom that hard look review—or any other aspect of the rulemaking process—actually interferes with the ability of administrative agencies to pursue important goals.[25] Two of these studies analyze data from the *Unified Agenda of Federal Regulatory and Deregulatory Action* and conclude that there is little empirical support for the claim of rulemaking ossification.[26] Professors Jason Yackee and Susan Yackee examined every agency rule that contained a Notice of Proposed Rulemaking (NPRM) between 1983 and 2006.[27] Their data demonstrate that on average agencies managed to promulgate 560 rules per year during that time.[28] They also evaluated the length of time between the NPRMs and the issuance of final rules and concluded that, in any given year, the average length of rulemaking proceedings ranged from fourteen to nineteen months.[29] From this data, Yackee and Yackee concluded that "federal agencies are able and willing to engage in a significant amount of rulemaking, and that they are, on average, able to complete their rulemakings relatively speedily."[30] Using a similar data base, Professor Anne Joseph O'Connell drew similar conclusions.[31] Professor William Jordan, taking a slightly different approach, evaluated all the cases from 1985 to 1995 in which the D.C. Circuit remanded an agency action under the arbitrary and capricious standard and determined that the agencies were generally able to recover from the remand within a reasonable amount of time and to proceed to accomplish their initial regulatory goal.[32]

While these studies represent major contributions to our understanding of the regulatory process, the conclusions about regulatory ossification that can be drawn from these early studies are relatively limited. Professors Yackee and Yackee, for example, acknowledge that determining whether there has been too little rulemaking activity and whether the

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(1994) (noting that, of seventeen remands, seven were due to statutory misinterpretation and six were due to inadequate rationale); *see also* Patricia M. Wald, *Judicial Review in Midpassage: The Uneasy Partnership Between Courts and Agencies Plays On*, 32 TULSA L.J. 221, 234 (1996) ("In a surprising number of cases, the court is most frustrated about the agency's failure to communicate any reason for taking certain actions.").

25. *See* Cary Coglianese, *Empirical Analysis and Administrative Law*, 2002 U. ILL. L. REV. 1111, 1125–31 (contending that the case for establishing a "retreat from rulemaking in the face of stringent judicial review is not nearly as clear as has been generally supposed"); Jordan, *supra* note 8, at 403–07 (disputing claims of rulemaking ossification); *see also* O'Connell, *supra* note 8 (manuscript at 25) (challenging claims of ossification and highlighting the effects of political cycles, particularly congressional cycles, on rulemaking activity); Yackee & Yackee, *supra* note 8, at 3, 24 (finding little support for the ossification thesis based on an analysis of similar data).

26. O'Connell, *supra* note 8 (manuscript at 22–29); Yackee & Yackee, *supra* note 8, at 8–13.

27. Yackee & Yackee, *supra* note 8, at 8.

28. *Id.*

29. *Id.* at 11 tbl.1.

30. *Id.* at 11.

31. Professor O'Connell analyzes the *Unified Agenda* data between 1983 and 2003 and also challenges the claims of ossification. However, as the title of her article indicates, the primary focus of her empirical analysis is on the influence of political cycles on the administrative process. In this regard, her insights are revelatory. O'Connell, *supra* note 8 (manuscript at 22–29).

32. Jordan, *supra* note 8, at 422.

rulemaking that does occur is too slow requires a baseline against which to measure current activity levels and speed, which they acknowledge they do not have.[33] Similarly, Professor O'Connell concedes that her data shed little light on the major premises of the ossification debate.[34]

But even given these important limitations, the data is telling. Based on the analysis of the *Unified Agenda* data, it appears that agency rulemaking has declined from a high of more than 900 NPRMs in 1991 and over 800 final rules in 1994 to fewer than 400 NPRMs and approximately 550 final rules in 2005.[35] Even without a neutral baseline, scholars might well conclude that this decline is consistent with the ossification hypothesis. And, coupled with the realization that some major statutory directives from the early 1970s remain unimplemented,[36] the conclusion that agencies are regulating too little and too slowly seems hard to dispute.[37]

Yet even if ossification is occurring and can be traced to judicial review, there is no general consensus that the costs of ossification outweigh the benefits of close and sustained judicial oversight of administrative agencies by the federal courts.[38] Judicial oversight of rulemaking serves a "crucial

33. *See* Yackee & Yackee, *supra* note 8, at 9 ("We are agnostic as to what the proper level of overall rulemaking activity might be, and as such we lack a firm baseline comparator that would help us determine whether the levels illustrated in Figure 1 are 'low' in an objective sense.").

34. *See* O'Connell, *supra* note 8 (manuscript at 25) (conceding that her data have little to say about the optimal level of rulemaking or the extent to which agencies reach that level); *id.* at 22 (explaining that her data do not distinguish between regulatory and deregulatory rulemaking).

35. Yackee & Yackee, *supra* note 8, at 10. The substantial drop in the number of rulemakings could be caused by a number of factors that go beyond judicial review and related ossification-like phenomena. *See supra* note 14. Nevertheless, while the decline in total rulemakings may not establish that ossification is occurring, it at least is not in conflict with that hypothesis and is generally supportive of it.

36. *See supra* note 11 and accompanying text.

37. Similarly, Professor Jordan recognizes that almost one-half of the remands by the D.C. Circuit during the ten-year period of his study involved major federal rulemakings, and that of those major rules remanded, the agency's regulatory goals were affected in 80% of the cases. Jordan, *supra* note 8, at 412. Because the agencies managed to recover—for the most part—from these remands within a year, Professor Jordan concludes that probing judicial review did not significantly interfere with the agency's regulatory agenda. *Id.* at 440–41. This conclusion, however, is not directly responsive to the central concerns of ossification theory. Ossification theorists contend that the very delay and interference verified by Professor Jordan causes agencies to invest inordinate time and resources into their initial rulemaking and subsequent efforts to recover, thereby interfering with the agency's ability to fully implement its statutory mandate. *See supra* notes 7–14 and accompanying text.

38. *See* Mark Seidenfeld, *Demystifying Deossification: Rethinking Recent Proposals to Modify Judicial Review of Agency Decisionmaking*, 75 TEXAS L. REV. 483, 490 (1997) (arguing that, while hard look review may result in ossification, aggressive judicial review provides many benefits that should not be forfeited); Cass R. Sunstein, *In Defense of the Hard Look: Judicial Activism and Administrative Law*, 7 HARV. J.L. & PUB. POL'Y 51, 53 (1984) (noting many "substantive purposes" of hard look judicial review, including serving as a device for the achievement of political ends, ensuring that agencies are imposing regulatory controls on industry, and "testing regulatory initiatives by requiring agencies to show that the benefits of regulation justify its costs").

legitimating function in the modern administrative process,"[39] and is a "protector of increased citizen participation and deliberative government."[40] Given that the rules adopted after a notice-and-comment rulemaking generally have the force and effect of law,[41] these scholars argue that the inefficiencies caused by probing judicial scrutiny and the concomitant ossification of rulemaking are a small price to pay for these democratic safeguards.[42]

To date, however, the debate about the ossification of rulemaking and the resulting proposals for reform have centered on the promulgation of new—and generally major—regulatory initiatives. One might conclude from this focus on initial rulemaking that the process of revising existing rules—which have, by definition, already survived the probing scrutiny of hard look review—has escaped the negative consequences of ossification. But in fact, revision of existing rules may be even more likely to fall victim to the factors responsible for the ossification of initial rulemaking for several reasons. First, the standard revision process is subject to all of the same notice-and-comment procedures applicable to initial rulemaking.[43] In addition, courts are wary of agency attempts to alter existing rules and therefore apply a particularly probing version of hard look review to agency revisions.[44] Finally, while agencies have sought to mitigate the ossifying effects of notice-and-comment rulemaking by promulgating some important policies informally, this safety valve is not available for rulemaking revisions. Instead, revisions of existing standards must be made through notice-and-

39. Thomas O. Sargentich, *The Critique of Active Judicial Review of Administrative Agencies: A Reevaluation*, 49 ADMIN. L. REV. 599, 642 (1997).

40. Jim Rossi, *Redeeming Judicial Review: The Hard Look Doctrine and Federal Regulatory Efforts to Restructure the Electric Utility Industry*, 1994 WIS. L. REV. 763, 768.

41. *See* United States v. Mead Corp., 533 U.S. 218, 226–27 (2001) ("[A]dministrative implementation of a particular statutory provision . . . when it appears that Congress delegated authority to the agency generally . . . carr[ies] the force of law . . . .").

42. Rossi, *supra* note 40, at 812–13; Sargentich, *supra* note 39, at 634.

43. Agencies are free to clarify or interpret existing rules without relying on notice-and-comment rulemaking. However, when the "clarification" is in reality a revision, then the agency must undertake the full informal rulemaking process. *See* Sprint Corp. v. FCC, 315 F.3d 369, 374 (D.C. Cir. 2003) ("Underlying these general principles is a distinction between rulemaking and a clarification of an existing rule. Whereas a clarification may be embodied in an interpretive rule that is exempt from notice and comment requirements, new rules that work substantive changes in prior regulations are subject to the APA's procedures." (citation omitted)); *see also* Envtl. Integrity Project v. EPA, 425 F.3d 992, 995 (D.C. Cir. 2005) ("[A]n interpretation of a legislative rule 'cannot be modified without the notice and comment procedure that would be required to change the underlying regulation.'" (quoting Molycorp, Inc. v. EPA, 197 F.3d 543, 546 (D.C. Cir. 1999))).

44. *See, e.g.*, Motor Vehicle Mfrs. Ass'n, Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 41–42 (1983) ("A 'settled course of behavior embodies the agency's informed judgment that, by pursuing that course, it will carry out the policies committed to it by Congress. There is, then, at least a presumption that those policies will be carried out best if the settled rule is adhered to.'" (quoting Atchison, Topeka & Santa Fe Ry. Co. v. Wichita Bd. of Trade, 412 U.S. 800, 807–08 (1973))).

comment rulemaking even if the initial standards themselves were informally adopted.[45] Thus, as Professor Pierce has observed:

> Even this bleak picture [of the ossification problem] understates the impossible plight of agencies charged with the responsibility to promulgate rules concerning environmental protection, health and safety, and economic regulation. Conditions in all of these fields, and our understanding of the underlying science, change so rapidly that the average rule probably has a useful life of no longer than a decade. Agencies should be reviewing and revising their rules on a regular basis. Yet, agencies rarely amend rules because the amendment process is as daunting as the process of promulgating a rule.[46]

### *B. Public Choice, Institutional Analysis, and Issue-Network Theories*

The economic and political theory literature offers additional perspectives on the ossification problem.[47] While members of the public and public interest groups certainly attempt to make use of the public-accountability aspects of notice-and-comment rulemaking to promote their more public-oriented goals, in those many regulatory contexts in which the interests of the public are diffused and the resources of public interest groups are limited and claimed by competing priorities, the net benefit of existing "accountability checks," as currently devised, may actually work in favor of regulated parties and against the public interest.[48] Transparency, public comment, and judicial review are only useful to those who have the resources and interest to participate. If the only parties with strong interests and sufficient resources to engage in a given issue are affiliated with the regulated community, then they might dominate the very administrative proceedings that determine their regulatory fate. The economic and political theory scholarship on interest groups and issue networks complements ossification theory by attempting to distinguish between settings in which unilateral interest group pressure is likely to occur and those settings where it is less likely.[49]

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45. *See* Shell Offshore, Inc. v. Babbitt, 238 F.3d 622, 629 (5th Cir. 2001) ("'When an agency has given its regulation a definitive interpretation, and later significantly revises that interpretation, the agency has in effect amended its rule, something it may not accomplish without notice and comment.'" (quoting Alaska Prof'l Hunters Ass'n v. FAA, 177 F.3d 1030, 1034 (D.C. Cir. 1999))).

46. Pierce, *Seven Ways*, *supra* note 7, at 61.

47. *See generally* Jean-Jacques Laffont & Jean Tirole, *The Politics of Government Decision Making: A Theory of Regulatory Capture*, 106 Q.J. ECON. 1089 (1991); Mathew D. McCubbins, Roger G. Noll & Barry R. Weingast, *Administrative Procedures as Instruments of Political Control*, 2 J.L. ECON. & ORG. 243 (1987).

48. These factors are derived from Neil Komesar's basic model for assessing participation in legal institutions more generally. *See* NEIL KOMESAR, IMPERFECT ALTERNATIVES: CHOOSING INSTITUTIONS IN LAW 8 (1995) (explaining the author's basic model of institutional participation).

49. *See generally, e.g.*, Gormley, *supra* note 21 (offering a political-science perspective that, unlike an economics perspective, emphasizes accountability).

### *C. Interest-Group Pressure and the Problem of Rulemaking Ruts*

Combining ossification with these other theories clarifies the fact that ossification is not an all-or-nothing proposition. Rather, it occurs on a spectrum. Agencies are not always paralyzed by probing judicial oversight,[50] and major regulatory initiatives sometimes do manage to break through the logjam. For example, when new information is accessible, salient, and of the sort that can unify broad public concern about an issue, institutional responses can be swift and dramatic.[51] Indeed, in certain circumstances, "irrational" public responses to high-visibility public-health scares will generate regulatory responses that are vulnerable to criticisms of reflexive overregulation.[52] At this far end of the spectrum, the trend towards ossification is overcome by overpowering public demands for immediate action. While the time and resource pressures imposed by an ossified rulemaking process may still avert the worst of the regulatory miscues, they are not likely to derail most rulemakings or legislation demanded by a powerfully unified public.

At the opposite end of the spectrum, ossification will occur with such force that agencies might try to avoid regulation or proactive rule revisions entirely with almost no public oversight. Rulemaking ruts occur in this sector of the spectrum.[53] Here, the public has little information regarding the consequence of delay or inaction, and whatever information they do have is limited and not terribly energizing or salient. By contrast, other interested parties—most likely regulated groups—will have a great deal of information at their fingertips and both the incentives and the resources to use the courts and any other mechanisms at their disposal (like pressure from the White House Office of Management and Budget) to delay or "ossify" the rulemaking or rule revision. This worst case of ossification seems most likely to occur in circumstances where the new information is technical or

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50. *See* Yackee & Yackee, *supra* note 8, at 18 (noting that agencies adopt, on average, more than 500 rules per year).

51. We do not intend to suggest that the Superfund law or the Clean Water Act were mistakes, but there is certainly truth to the argument that salient events like Love Canal and the burning Cuyahoga River "tipped" the public in ways that led to demands for regulation that were not very sensitive to the concerns of industry or to the costs of implementing the ambitious statutes. *See* THOMAS P. LYON & JOHN W. MAXWELL, CORPORATE ENVIRONMENTALISM AND PUBLIC POLICY 30–31 (2004) (describing how, from the perspective of corporate strategy, dramatic environmental crises are more difficult to manage than chronic environmental problems because they often lead to swift legislative responses that eliminate the opportunity for mitigation by industry).

52. *See* Cass R. Sunstein, *Administrative Substance*, 1991 DUKE L.J. 607, 626 (arguing that an ill-informed public has led to interest-group pressures and sensational but misleading anecdotes that play far too prominent a role in regulation); Breyer, *supra* note 4, at 559–60 (arguing that paternalistic concerns over the irrationality of individuals' responses, even where small probabilities of injuries are concerned, can lead agencies to create more government regulation).

53. There is, of course, presumably also some middle ground. In the middle of the spectrum the warring factions may be sufficiently counterbalanced that information diffusion could occur effectively. As we discuss below, the ability of ambient-air-quality standards to more or less track advancements in science may provide such an example. *See infra* text accompanying notes 108–13.

scientific, the payoff to the public from acting on it is relatively modest and diffuse, and the regulated parties or others interested in opposing a rule or revisions have plentiful resources to spend and will benefit substantially from regulatory delay or inaction.[54]

Because this Article is concerned with institutional barriers to harnessing the power of information, we focus on the revision of rules and standards in this worst-case end of the spectrum. A large number of contemporary pollution-control standards, which set industry-specific limits for pollutants emitted into the air, water, and the workplace, lie in these rulemaking ruts.[55] Indeed, the revision of pollution-control standards is likely to be even more ossified and resistant to assimilating new information than the promulgation of the initial pollution-control standards since regulated parties are likely to be better organized, better funded, more expert, and better informed at this revision stage. A decade or more after the first standard-setting process, the industries' expertise will likely outstrip that of concerned public interest groups and agency officials to an even greater extent than it did the first time through the process, because they have been actually using the required pollution-control technology for years. Agencies themselves might also have become even more dependent on industry for the information they need to determine whether revisions are needed and what those revisions might be.[56] Moreover, since regulated industries have been operating from the same standard, their interests may be much more clearly aligned against a more stringent revision than they were against the range of alternatives that might have splintered their opposition when the standard was first being developed.[57] In fact, regulated industries may have developed lasting contacts and coalitions during these early standard-setting projects that make coordination in opposing the agency's efforts at the revision stage easier to orchestrate. Finally, if a proposed revised standard is likely to impose significant costs on the industry, then opposition to the revision will become a high priority that is generously financed.

In contrast, public interest groups—the main source of counterpressure—are likely to be much less engaged in revisions than they were in the original standard-setting process. Once a pollution-control

54. *See supra* note 48 and accompanying text.

55. Other circumstances are less clear. A more balanced representation of interest groups participating in a rulemaking, where some interest groups would insist on expeditious standard-setting, may reduce the extent of ossification. *See infra* text accompanying notes 108–13.

56. For a general discussion of EPA's partial (but not complete) dependence on the superior information held by regulated parties in setting technology-based standards initially, see Sanford E. Gaines, *Decisionmaking Procedures at the Environmental Protection Agency*, 62 IOWA L. REV. 839, 846–64 (1977).

57. For example, in the initial standard-setting process, EPA had to identify "average" industry pollution loads and the effectiveness of technology in that average setting. These decisions were often very controversial, and presumably EPA's ultimate decisions in some settings had the effect of benefitting some facilities within an industrial category over others. *Cf. id.* at 852–53 (discussing the problems in using averages to set standards under the Clean Water Act).

standard is in place, public attention to the issue may focus elsewhere. Moreover, as noted above, information regarding pollution-control technologies may be even more inaccessible to public interest groups during the revision process than it was during the initial standard promulgations. Finally, in contrast to the original rulemaking, for most revised standards the payoff from litigation is likely to be very low. The suits will be costly, technical, and difficult to win.[58] And because they involve modifications of industry- and media-specific standards, they will not garner the much-coveted media attention that public interest groups need to keep their members and foundations happy.[59]

Agencies similarly seem to have few incentives to take the initiative to revise technology-based pollution-control standards. Concentrated industry opposition can be expected to drive up the time and costs associated with the rulemaking (in part by taking advantage of hard look review),[60] while the political payoff to the agency for regular revisions of these relatively obscure standards seems likely to be minimal. As a result, rational resource allocation concerns will counsel in favor of pursuing initial rulemakings rather than regular revisions, and technology- and science-based standards will get stuck in "rulemaking ruts."[61]

This regulatory stasis might even infect the market for innovation in pollution-control technologies. If most of the profits in developing pollution-control technology depend on a market created by technology-based regulatory standards, then the ossification of industry-based standards could be self-perpetuating. Unless emission and effluent standards are regularly revised to reflect pollution reductions that the best available technology actually can accomplish, then the market for developing these technologies

58. This is particularly true of claims premised on an agency's failure to act. *See* Norton v. Southern Utah Wilderness Alliance, 542 U.S. 55, 64 (2004) ("[A] claim under section 706(1) [of the the APA] can proceed only where a plaintiff asserts that an agency failed to take a *discrete* agency action that it is *required to take.*") (emphasis in the original).

59. Media attention to technology-based standards over the last fifteen years has effectively been nonexistent. In fact, after a thorough search of the Internet, we were unable to locate any news articles on these standards.

60. Two articles discuss at length the travails of EPA during its first, original round of technology-based standard-setting. *See* Gaines, *supra* note 56, at 846–64 (identifying the challenges that arise in setting a technology-based standard); D. Bruce La Pierre, *Technology-Forcing and Federal Environmental Protection Statutes*, 62 IOWA L. REV. 771, 812–13 (1977) (reporting that, by 1977, EPA's technology-based standards promulgated under the Clean Water Act were attacked in 250 lawsuits that had been consolidated into twenty-one proceedings in circuit courts where, "[i]n many cases, the courts . . . invalidated the specific effluent limitations established by the two technology-based standards and remanded them to the Agency").

61. *Cf.* MASHAW & HARFST, *supra* note 23, at 24–25; Pierce, *supra* note 16, at 302–03 (both observing that the threat of judicial review of agency decisions can discourage agency rulemaking altogether or force it to engage in ad hoc policy decisions on specific issues).

will also stagnate, creating a vicious circle of inactivity in both the regulatory and the market spheres.[62]

## III. In Search of Rulemaking Ruts

While theory and common sense both support the existence of rulemaking ruts, we also sought to determine whether there is more concrete evidence of a problem. The Part begins with results from our own empirical mini-investigation of agency revisions of technology-based standards under the Clean Air Act and Clean Water Act. Our limited snapshot of standards revisions over a thirty-five year period reveals significant agency inactivity and hence generally supports the rulemaking rut hypothesis. We then explore the broader literature in search of other examples of inordinate delays in agencies' revision of science- or technology-intensive standards. Finally, we discuss our findings in light of the recent empirical studies that suggest that ossification may not be a significant problem. Although the evidence we collected is too limited to support any concrete conclusions, it at least highlights the appearance of ossification in some rulemaking areas and indicates that more detailed studies of particular subsets of rulemaking—where ruts are most likely—may be needed to credibly test the ossification thesis.

### *A. A Mini-study of Industry-Specific Pollution-Control Standards Under the Clean Air Act and Clean Water Act*

Much of the heavy lifting of pollution control is accomplished through media- and industry-specific standards that limit how much pollution industries can emit into the air, water, and workplaces. These limits are generally based on what the best available pollution-control technology (or the equivalent) can accomplish on an industry-by-industry basis. Despite efforts to supplement these standards with more restrictive, ambient-based

62. *See, e.g.*, Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1336 (1985) (arguing that technology-based standards do not provide "strong incentives for the development of new, environmentally superior strategies, and may actually discourage their development"). *But see* Nicholas A. Ashford et al., *Using Regulation to Change the Market for Innovation*, 9 HARV. ENVTL. L. REV. 419, 437 (1985) (describing how technology-based standards designed for existing mercury chlor alkali plants under the Clean Water Act encouraged innovative pollution-control efforts within the industry); Daniel H. Cole & Peter Z. Grossman, *When Is Command-and-Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection*, 1999 WIS. L. REV. 887, 911 n.56 (noting that the Clean Air Act "created positive incentives for independent environmental protection industries to innovate new pollution-control technologies"); Natalie M. Derzko, *Using Intellectual Property Law and Regulatory Processes to Foster the Innovation and Diffusion of Environmental Technologies*, 20 HARV. ENVTL. L. REV. 3, 21 (1996) (observing that industries do have incentives for pollution-control innovation under technology-based standards because they can gain a competitive advantage, and noting that "Germany . . . uses technology-based standards in environmental regulation but remains the top exporter of environmental technology" (footnotes omitted)).

requirements for particularly degraded areas, technology-based standards remain the primary and often the exclusive means by which we control pollution in the United States. Obviously, then, if agencies neglect to revise these standards to keep pace with significant changes in technology, the regulatory program will not accomplish the types of pollution reductions envisioned by Congress in the statutory framework. To get a preliminary sense of whether the revisions of technology-based standards are occurring, we examined the extent of EPA revisions of two different sets of influential, industry-specific standards: those required under the Clean Water Act for point sources and those required for new stationary sources under the Clean Air Act.[63]

Before proceeding to the substance of the empirical mini-study, however, one major caveat is in order. Our analysis assumes that there in fact were or should have been advancements in the available technology during the past thirty years that would warrant periodic updating of technology-based standards. We must make this assumption primarily because there is no easy way to measure advancements in pollution-control technology.[64] Yet we believe that this assumption is not a particularly risky one. Thirty years is a very long time in terms of technological innovation. Indeed, much of the technology we take for granted was developed during the timeframe of our inquiry, including the explosion of computer-based technologies, the World Wide Web, hybrid vehicles, and Global Positioning System devices.[65] Moreover, under both statutes, technological innovations need not be dramatic to trigger revisions. Rather, significant advances in industry processes or technologies that reduce pollutants to even lower levels

63. In the initial design of our study, we also hoped to include OSHA's revision of toxic standards promulgated for general workplaces, but we ran into significant research barriers that—until we find a way around them—preclude us from looking at this very different area of standards revision. In conducting preliminary research on OSHA's general workplace standards for toxins, we discovered that, unlike EPA, OSHA does not record the revision dates for subsections of its regulations but instead records all of the revisions in a series at the end of an entire part. This record-keeping approach makes it much more difficult to determine the revision history of individual quantitative standards, although we would be delighted for suggestions on how we might gather this information another way. We are particularly intrigued because there were often numerous revision dates recorded at the bottom of the larger rule parts that indicate that OSHA might be much more active than EPA in revising its standards—a fact that seems to go against our expectation and understanding of OSHA. *See infra* notes 99–103 and accompanying text.

64. Making these assessments would require making judgments about cost, effectiveness, and industry usefulness—precisely all the variables that EPA must contend with in the course of its rulemaking. *See* John S. Applegate, *The Perils of Unreasonable Risk: Information, Regulatory Policy, and Toxic Substances Control*, 91 COLUM. L. REV. 261, 261 (1991) ("[A] regulatory agency like [EPA] must gather, develop, and analyze relevant information about the activities that it wishes to regulate, and about available control techniques, before it can address the ultimate task of implementing the statutory trade-off between safety and cost."); *see also id.* at 267 (describing how EPA must assess and account for cost, technology, and health effects in formulating rules related to toxic substances).

65. According to the Lemelson–MIT Program, these are among the top twenty-five technological innovations since 1980. *Top 25: Innovations*, CNN.COM, June 19, 2005, http://www.cnn.com /2005/TECH/01/03/cnn25.top25.innovations/index.html.

in emissions or discharge streams, and innovations that lower the costs of employing the very best pollution-control technology both should trigger revisions of existing standards.[66] In any event, even if one were able to measure technological innovation in pollution control, it may not reflect what is technologically possible. Incentives for the development of new and improved pollution-control equipment—particularly equipment and processes that achieve lower levels of pollution—are likely to depend on the demand for that technology, which in turn is generated largely by regulatory requirements.[67] If no updating of technology-based standards occurs or is perceived to be likely to occur, there is a much weaker market for improved technologies, creating a vicious circle of sorts with respect to pollution-control innovation.

*1. Background.*—In both the Clean Air Act and the Clean Water Act, Congress required EPA to set standards based exclusively on the capabilities of existing or available pollution-control technology, rather than on science, in response to general failures in the implementation of health-based regulatory schemes.[68] In the Clean Water Act, the technology-based standards originated in 1972 after states generally declined to respond to Congress's directive to adopt water-quality standards for all interstate waters to protect the public health and welfare. Although these technology-based standards were initially limited to nontoxic pollutants, Congress ultimately extended this approach to all types of pollutants emanating from all point sources.[69] The statute also contemplated several stages of implementation in order to bring industries into the program without dramatic, adverse financial repercussions. Initially, all existing industrial sources of "nontoxic" pollutants would have to meet discharge limits reflecting the best practicable control technology (BPT) currently available.[70] New sources were required

66. There have in fact been some discussions in the literature of technological innovations of this sort. *See supra* note 62.

67. This would not include advances in pollution-control technologies that result from unrelated innovations in industrial processes, however.

68. *See generally* Oliver A. Houck, *Of Bats, Birds and B-A-T: The Convergent Evolution of Environmental Law*, 63 MISS. L.J. 403, 418 (1994) ("[B]est available technology side-stepped the age-old and irresolvable arguments of whether 'significant' harm existed and who was 'causing' it and began to abate the pollution itself."); Patricia Ross McCubbin, *The Risk in Technology-Based Standards*, 16 DUKE ENVTL. L. & POL'Y F. 1, 6 (2005) ("The technology-based standards of the Clean Water Act originated in 1972 as a response to the failed implementation of an earlier health-based regulatory program . . . .").

69. *See* ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 647–49 (5th ed. 2006) (describing Congress's insistence on a health-based, rather than technology-based, regulatory program for toxic pollutants in the early 1970s).

70. *See* 33 U.S.C. § 1314(b)(1) (2000). EPA summarized its approach to setting BPT standards in a recent rulemaking:

> Traditionally, EPA establishes BPT effluent limitations based on the average of the best performance of facilities within the industry, grouped to reflect various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, EPA may establish limitations based on higher levels of control than

to meet even more stringent standards than existing standards (the new source performance standards (NSPSs)) under the theory that it would be more cost-effective for new plants, rather than existing plants, to install process changes that accomplish greater levels of pollution-control reductions as opposed to end-of-the-pipe technologies.[71]

Although more limited in scope, the Clean Air Act similarly required EPA to set different types of national technology-based emission standards, which are promulgated through formal notice-and-comment rulemaking and contain numerical standards representing what the best available pollution control technology is able to accomplish.[72] Some of these standards govern the emission of criteria pollutants from new (or major modifications of) stationary sources (the Clean Air Act NSPSs),[73] others govern emissions from major sources of air toxins.[74] Because the latter set of standards was not required by Congress until 1990 and generally was not promulgated by EPA until the mid-1990s,[75] however, we focus only on the original NSPSs

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> currently in place in an industrial category, if the Agency determines that the technology is available in another category or subcategory and can be practically applied.

Effluent Limitations Guidelines and New Source Performance Standards for the Concentrated Aquatic Animal Production Point Source Category, 69 Fed. Reg. 51,891, 51,895 (Aug. 23, 2004) (to be codified at 40 C.F.R. pt. 451). However, by 1983 all such sources of all pollutants would have to meet more stringent limits based on the best available technology (BAT) economically feasible, 33 U.S.C. § 1314(b)(2), or, for some conventional pollutants, the Best Conventional Treatment (BCT). 33 U.S.C. § 1314(b)(4). In setting BAT, EPA considers the cost of achieving BAT, the age of equipment and facilities involved, the process employed, potential process changes, nonwater quality, environmental impacts including energy requirements, economic achievability, and other such factors as the EPA Administrator deems appropriate. "[W]here existing performance is uniformly inadequate, BAT may reflect a higher level of performance that is currently being achieved based on technology transferred from a different subcategory or category. BAT may be based upon process changes or internal controls, even when these technologies are not common industry practice." Effluent Limitations Guidelines, 69 Fed. Reg. at 51,896.

71. 33 U.S.C. § 1316 (2000). In setting these new source standards, EPA is directed to take into consideration the cost of achieving the effluent reduction, any non-water-quality environmental impacts, and energy requirements. *Id.* Congress also believed that in order to meet its zero-discharge goals, future reductions would best be obtained by insisting on even higher reductions from these future sources. 33 U.S.C. § 1251(a)(1) (2000) (providing a zero-discharge goal to be achieved by 1985).

72. EPA also provides control-technique guidance and a relatively extensive computer-searchable permit database to assist facilities in identifying the technology-based requirements for Reasonably Available Control Technology (RACT), Best Available Control Technology (BACT), and Lowest Achievable Emission Rate (LAER). *See, e.g.*, EPA, Basic Information, Technology Transfer Network: Clean Air Technology Center: RACT/BACT/LAER Clearinghouse, http://www.epa.gov/ttn/catc/rblc/htm/welcome_eg.html (last updated July 25, 2007).

73. 42 U.S.C. § 7411 (2000).

74. *Id.* § 7412.

75. *See id.* (requiring promulgation of standards governing air-toxin emissions); *see, e.g.*, 40 C.F.R. § 50.4 (2007) (promulgating EPA regulations for ambient-air-quality standards for sulfur oxides pursuant to the congressional mandate on May 22, 1996).

that were established in the 1970 Clean Air Act[76] since they provide a longer time line for observing revision patterns.

Both statutes make it clear that these technology-based standards were not intended to be static, but rather to keep pace with emerging technological developments. To that end, Congress required EPA to review the various industry-specific standards under both statutes on a regular basis.[77] Congress may have even been hopeful that the standards would encourage technological innovation over time. Since most technology-based standards take the form of quantitative pollution-emission limits and thus permit industry to choose how best to meet the standards,[78] they in fact should encourage facilities to develop new pollution-control technologies that meet the emission limits more effectively and less expensively than existing technologies.

*2. Methods and Hypotheses.*—Our mini-study seeks to assess the frequency with which these technology-based standards are revised. To determine the revision activity, we recorded the dates of *Federal Register* revisions for each technology-based standard as listed in the Code of Federal Regulations. This information was tallied for both sets of Clean Water Act and Clean Air Act standards and entered into a Microsoft Excel spreadsheet.[79]

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76. *See* 42 U.S.C. § 7411 (2000) (articulating the original Clean Air Act NSPSs).

77. *See id.* § 7411(b)(1)(B) ("The Administrator shall, at least every 8 years, review and, if appropriate, revise such standards . . . . [T]he Administrator need not review any such standard if the Administrator determines that such review is not appropriate in light of readily available information on the efficacy of such standards."); 33 U.S.C. § 1316(b)(1)(B) (2000) ("The [EPA] shall, from time to time, as technology and alternatives change, revise such [new source performance] standards following the procedures required by this subsection."); *Id.* § 1314(b) (instructing EPA to revise "if appropriate" the series of effluent standards for industry-specific sources). These periodic-review requirements are largely unenforceable through judicial review because the statute contains no firm deadlines.

78. *See, e.g.*, 40 C.F.R. §§ 400–471 (2007) (setting forth Clean Water Act technology-based standards); 40 C.F.R. § 63 (2007) (setting forth Clean Air Act NSPSs).

79. Because we are interested in a longer, thirty-year period of revision activity, we eliminated all standards that were originally promulgated in 2000 or after. Also, if a revision occurred within a year or less of the prior rulemaking (a "quick" revision), we did not count it as a revision. In our qualitative analysis of some of these quick revisions, we discovered that they generally appeared to be minor technical adjustments that came to the agency's attention after the final rule was promulgated. *See, e.g.*, 40 C.F.R. § 60.92 (2007) (setting a standard for particulate matter in hot-mix asphalt facilities, with an initial promulgation date of 1974 and an amendment date of 1975). We have only conducted a limited sample of these quick revisions, however, so our assumption that all quick revisions are without substance is not definitively established. Finally, although the NSPSs include technical requirements for testing to determine applicability and emissions monitoring that also affect the stringency of the quantitative standards themselves, we did not include them in our data analysis; instead we focus exclusively on the numeric or technical standards that apply to industry through the Clean Air Act. In a somewhat similar vein, because of limited time, we excluded from our analysis the revision of pretreatment standards under the Clean Water Act.

Based on the rulemaking rut hypothesis, we expected not only to see a pattern of general agency inaction, but also hypothesized slightly different levels of inaction depending on the regulatory circumstances. Specifically, we expected to see slightly more revision activity for the NSPSs under the Clean Air Act, in large part because it seemed likely that there would be more vigorous advocacy for revisions from both states and environmental groups, and also because there might have been less resistance to revisions from industry to the extent existing industry views the standards—which technically apply only to new sources and major modifications[80]—as adversely impacting competitors' facilities rather than their own facilities. By contrast, the revision of standards under the Clean Water Act might experience greater ossification since the states seem less likely to be interested in revisions given the tenuous link between the standards and their largely discretionary water-quality programs, and because many of the standards apply to existing industry.[81] Due to the far greater number of standards under the Clean Water Act and their more limited impact on public health, environmental groups may be less vigilant in overseeing the pace of agency revisions under the Clean Water Act.[82]

*3. Findings and Interpretation.*—Our results are generally supportive of the hypothesis that EPA is slow to revise technology-based standards, particularly for the Clean Water Act. Even though the standards are on average more than twenty years old, well over half of the industry-based standards under both the Clean Water Act and the Clean Air Act NSPSs have never been revised, and most of the standards that have been revised have been revised only once. Moreover, although it is outside the scope of this Article to conduct an in-depth examination of the nature of all of these revisions, our preliminary research on a small subset of revisions under the Clean Air Act revealed that many (and in our subset most) of the revisions that did occur through rulemaking were both technical and "minor" (according to EPA) and that, for the others, while most of the standards did become stronger, some were actually weakened in the revisions. Thus, the raw number of revisions may actually paint too rosy a picture—possibly by

80. 33 U.S.C. § 1316(b)(1)–(2).

81. While states are required to conduct Total Maximum Daily Load (TMDL) calculations for water segments that are degraded below state water-quality standards, it remains wholly within their discretion to regulate sources causing that degradation. *See, e.g.*, Pronsolino v. Nastri, 291 F.3d 1123, 1140 (9th Cir. 2002) ("States must implement TMDLs only to the extent that they seek to avoid losing federal grant money; there is no pertinent statutory provision otherwise requiring implementation of § 303 [TMDL] plans or providing for their enforcement.").

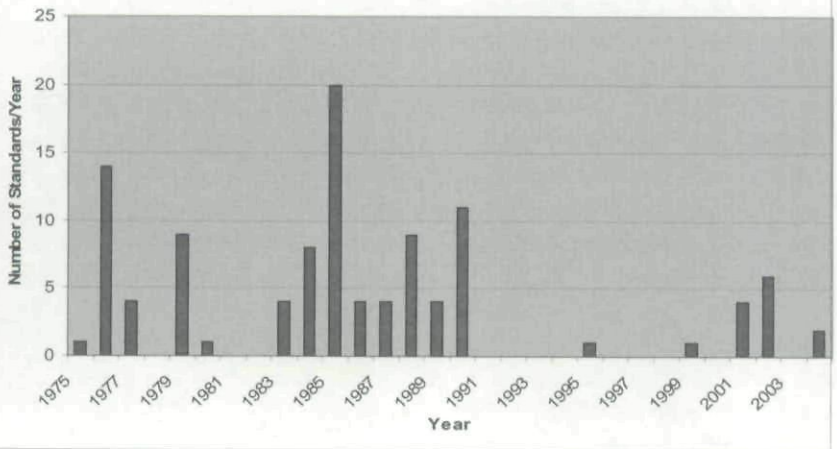
82. We readily concede the speculative nature of this hypothesis. A more rigorous effort to determine whether Clean Water Act technology-based standards are of lesser interest to environmental nonprofit groups might compare the number of citizen petitions filed against EPA for revising standards under the Clean Water Act with the number filed under the Clean Air Act, for example.

more than twofold—of the extent to which EPA is updating its technology-based standards to track advances in pollution-control technologies.

As predicted, the Clean Water Act provides the bleakest picture of the extent and nature of revisions for technology-based standards and provides at least preliminary confirmatory evidence of a rulemaking rut. On average, only one out of every three standards promulgated under the Clean Water Act has been revised during its lifetime. The vast bulk of standards—more than 72% of the 1,122 standards—have never been revised.[83]

To truly assess the significance of this slow rate of revisions, however, one needs to understand just how old the original standards are. On average, the Clean Water Act technology-based standards are about twenty-two years old (the mean year of the last date of promulgation of technology-based standards is 1986), although some are considerably older—some are as old as thirty-three years—and some are more recent. Figure 1 provides a bar chart displaying the most recent year each standard was promulgated, which is aggregated for all BCT, BAT, and new source standards under the Clean Water Act. This figure provides a more finely tuned picture of the date of the last revision of these standards.

**Figure 1: Most Recent Year the BCT, BAT, and New Source Standards were Promulgated/Revised under the Clean Water Act**




Additionally, although most of the forty-five general categories of industry have been subjected to the revision of one or more standards at least

83. Interestingly, almost twice as many of the early BPT standards (statutorily intended to be phased out by 1983) have been revised throughout the past two decades, as compared to all the other types of standards (i.e., BCT, BAT, new source) combined. It is possible that since Congress required EPA to revise BPT periodically in the 1987 amendments and since, for most industries, BPT has been replaced with BAT, BCT, or both, the revision of BPT simply involves bringing the standard up to the level of BAT or BCT, which in turn generates little opposition from industry.

once, there were thirteen general categories of industry for which no standards have ever been revised.[84] These are not necessarily industries one would expect to be minor in their contributions to water pollution.

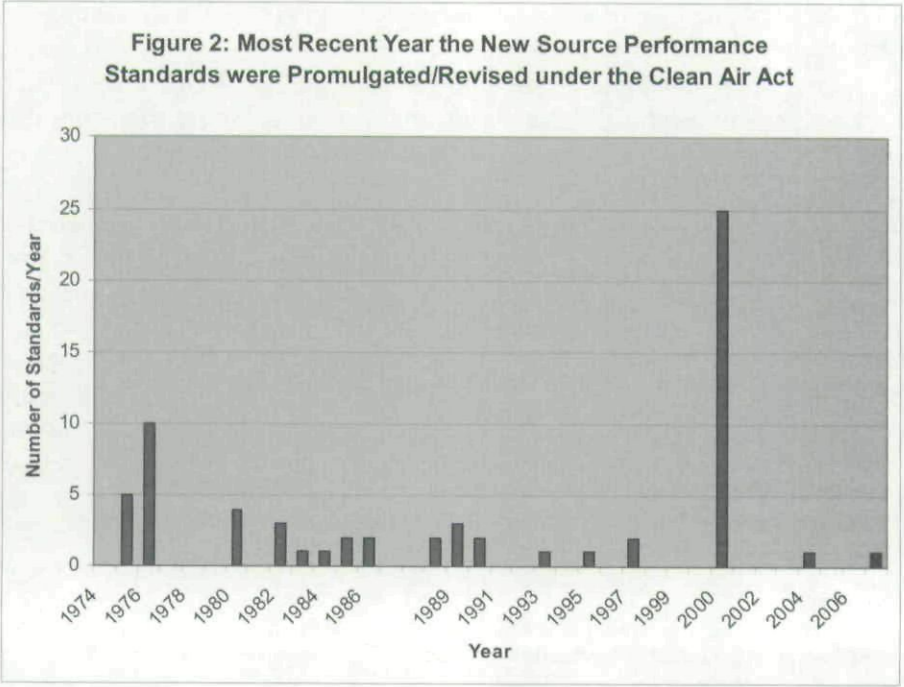
For the revision of NSPSs promulgated under the Clean Air Act, the news is somewhat better, although it is not exactly heartening. Our study revealed that about one-half of the Clean Air Act standards have been revised. That means, of course, that one-half have never been revised. In fact, nearly half of the NSPSs promulgated under the Clean Air Act are on average twenty-seven years old, and thirteen of these standards (more than one-third) are at least thirty years old, promulgated in 1978 or earlier.

Figure 2 provides a bar chart displaying the last year that a standard was promulgated for each Clean Air Act standard in each separate industry category. When all existing NSPSs are combined, the mean age of the standards is about nineteen-years old (the mean year is 1989). Additionally, twenty-three out of fifty-nine total general categories of industry have standards that have never been revised.[85] Much as is the case under the Clean Water Act, some of these industries are not necessarily those that one would expect to be minor with regard to their emissions of criteria pollutants or their influence over EPA.[86]

84. For examples of the general categories of industry for which there have been no revisions of the standards under the Clean Water Act, see: (1) Electroplating Point Source Category, 40 C.F.R. § 413 (2007); (2) Timber Products Processing Point Source Category, 40 C.F.R. § 429; (3) Metal Finishing Point Source Category, 40 C.F.R. § 433; (4) Coal Mining Point Source Category, 40 C.F.R. § 434; (5) Paint Formulating Point Source Category, 40 C.F.R. § 446; (6) Ink Formulating Point Source Category, 40 C.F.R. § 447; (7) Carbon Black Manufacturing Point Source Category, 40 C.F.R. § 458; (8) Photographic Point Source Category, 40 C.F.R. § 459; (9) Plastics Molding and Forming Point Source Category, 40 C.F.R. § 463; (10) Metal Molding and Casting Point Source Category, 40 C.F.R. § 464; (11) Coil Coating Point Source Category, 40 C.F.R. § 465; (12) Copper Forming Point Source Category, 40 C.F.R. § 468; and (13) Electric and Electronic Components Point Source Category, 40 C.F.R. § 469.

85. The revisions that occurred within one year of the original standard were uniformly technical revisions and nonsubstantive. *See supra* note 79.

86. For examples of a few of the general categories of industry with NSPSs that have never been revised, see: (1) Secondary Lead Smelters, 40 C.F.R. § 60.122; (2) Secondary Brass and Bronze Production Plants, 40 C.F.R. § 60.132; (3) Primary Copper Smelters, 40 C.F.R. §§ 60.162–.164; (4) Primary Zinc Smelters, 40 C.F.R. §§ 60.172–.173; (5) Primary Lead Smelters, 40 C.F.R. §§ 60.182–.184; (6) Primary Aluminum Reduction Plants, 40 C.F.R. § 60.193; and (7) some steel plants, 40 C.F.R. § 60.272a.




Under the Clean Air Act, we also attempted to peek inside the revisions to determine what they entailed. While it had not occurred to us that the limited standards revisions that have been made might amount to only minor or technical amendments to the original standard, in fact, in an almost-random sample of eleven revised standards, more than 70% of the revisions were characterized by EPA in this way.[87] We do not know whether these

87. Our approach entailed examining roughly every third revision on the spreadsheet that listed the standards in order by their C.F.R. section (except those that had no *Federal Register* updates) until eleven standards had been selected. Among the selected standards, there were fourteen revisions promulgated in the *Federal Register*. Ten of these revisions were either identified by EPA as "minor" or "technical" in nature or involved only changing the wording (and not the substance) of a regulation, and were therefore nonsubstantive. *See* Amendments for Testing and Monitoring Provisions, 65 Fed. Reg. 61,744, 61,753 (Oct. 17, 2000) (codified at 40 C.F.R. § 60.52) (amending paragraph (a) of particulate matter standards for incinerators by revising "the performance test required to be conducted by § 60.8 is completed" to read "the initial performance test is completed or required to be completed under § 60.8 of this part, whichever date comes first"); *id.* at 61,757 (codified at 40 C.F.R. § 60.192) (amending paragraph (a) of fluoride standards for primary aluminum-reduction plants by revising "according to § 60.8 above" to read "according to § 60.195"); *id.* (codified at 40 C.F.R. § 60.222) (amending "metric ton" to read "megagram (Mg)" in fluoride standards for diammonium phosphate plants in the fertilizer industry); *id.* (codified at 40 C.F.R. § 60.252) (amending particulate matter standards for performance of coal preparation plants by revising "0.040 g/dscm (0.018 gr/dscf)" to read "0.040 g/dscm (0.017 gr/dscf)"); *id.* at 61,758 (codified at 40 C.F.R. § 60.282) (amending "0.15 g/dscm (0.067 gr/dscf)" to read "0.15 g/dscm (0.066 gr/dscf)"); *id.* at 61,759 (codified at 40 C.F.R. § 60.332) (amending paragraph (a) in standards for nitrogen oxides in stationary gas turbines by revising the words "the date of the performance test" to read "the date on which the performance test"); *id.* at 61,760 (codified at 40 C.F.R. § 60.372) (making several rounding changes to converted units in standards for lead in lead-

minor adjustments were also somewhat more friendly to industry in terms of their requirements, although it is possible.[88]

For the remaining, more "substantive" revisions, we were also surprised to discover that several did not result in more stringent requirements that tracked the latest developments in pollution-control technology. In at least one case under the Clean Air Act, one standard was actually revised to exclude previously included facilities and thus should be considered a loosening of the standard.[89] A second revision ultimately appeared minor, although EPA did not characterize it in that way; EPA simply added a second standard—opacity—to the preexisting standard to measure compliance.[90] The two final revisions did impose substantive changes to control requirements, but even these revisions did not appear to result from technological advancements. In one case, EPA simply added new categories of covered facilities;[91] in another case, EPA set an entirely new standard for a new "secondary" source of pollution.[92]

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acid battery manufacturing plants). Some of the selected standards were also revised in earlier rulemakings in ways that also appeared nonsubstantive. *See* Standards of Performance for New Stationary Sources, 40 Fed. Reg. 46,250, 46,250, 46,258 (Oct. 6, 1975) (codified at 40 C.F.R. § 60.62) (deleting paragraph (d) from standards for particulate matter in Portland cement plants, apparently to retain consistency in light of the *Federal Register* entry's goal of promulgating "specific requirements pertaining to continuous emission monitoring system performance specifications, operating procedures, data"); *id.* at 46,259 (codified at 40 C.F.R. § 60.92) (deleting the second sentence in paragraph (a)(2) of this subsection dealing with standards for particulate matter in hot-mix asphalt facilities); *id.* (codified at 40 C.F.R. § 60.122) (deleting paragraph (c), again apparently to retain consistency in light of changed monitoring requirements).

88. It is our impression from the few cases we did investigate that industry tends to dominate the revision process. For example, in developing a technology-based standard for gas turbines in 1981, EPA appears to have relied primarily on information and communications coming from the regulated industry. *See* EPA, DOCKET NO. A-81-10, CATEGORY II: ITEMS CONSIDERED IN DEVELOPING PROPOSAL (1981), *available at* http://www.regulations.gov/fdmspublic/component/main?main=DocumentDetail&o=09000064800bcf72 (listing the documents and the communications used by EPA to develop the gas-turbine standard); *see also* Standards of Performance for New Stationary Sources; Stationary Gas Turbines, 47 Fed. Reg. 3767, 3767 (Jan. 27, 1982) (referring to these comments and their role in rulemaking).

89. *See* Standards of Performance for New Stationary Sources; Stationary Gas Turbines, 47 Fed. Reg. at 3770 (revising standards of performance for stationary gas turbines in response to a petition by industry to exclude certain types of large gas turbines located in rural areas).

90. *See* Standards of Performance for New Stationary Sources; Basic Oxygen Process Furnaces: Opacity Standard, 43 Fed. Reg. 15,600, 15,602 (Apr. 13, 1978) (announcing the new, second standard for measuring compliance); Standards of Performance for New Stationary Sources, Additions and Miscellaneous Amendments, 39 Fed. Reg. 9308, 9318 (Mar. 8, 1974) (announcing the preexisting standard for measuring compliance).

91. *See* Standards of Performance for New Stationary Sources; Stationary Gas Turbines, 47 Fed. Reg. at 3770 (modifying the types of gas turbines covered by nitrous oxides emissions standards).

92. Simultaneously with a citizen petition filed by an environmental nonprofit, EPA added a new standard addressing secondary emissions from basic oxygen-process furnace facilities, thus leading to much more significant reductions in control requirements. *See* Standards of Performance for New Stationary Sources; Basic Oxygen Process Furnaces, 51 Fed. Reg. 150,150, 150,151 (Jan. 2, 1986).

These preliminary results suggest that EPA is not revising standards frequently, and that when it does revise its standards, it is not necessarily because of advances in pollution-control technologies. Ultimately, our results should also be tracked against the literature or other evidence regarding innovation in pollution-control equipment to determine whether EPA has actually missed opportunities for updating standards. Until then, our preliminary findings lend support to the possibility that the revision of these industry-specific pollution-control standards are stuck in a rulemaking rut.

### *B. Other Evidence in the Literature*

Although there do not appear to be any other systematic investigations of the nature or extent of rule revisions, scholars have called attention to the problematic lack of regulatory revisions in several technical areas where rules lag significantly behind scientific and technological advances. These observations tend to corroborate our findings of general agency inactivity at the revision stage.[93] One particularly inactive area is the revision of the requirements governing the testing of pesticides and toxic substances. EPA's failure to update its testing requirements in light of advances in science, particularly with regard to testing for noncancer endpoints like neurological, developmental, and reproductive types of harm, has been identified by several prominent scientists as an area of concern.[94] There is also evidence that EPA has been unduly slow to revise its Integrated Risk Information System (IRIS) database with new information about the toxicity of chemicals.[95] Since the IRIS database does not require rulemakings for

93. It is important to note that the point at which the revision of standards based on changes in science is justified depends not just on the existence of some new study or published model, but on other factors as well, such as the reliability of the new scientific research, the residual uncertainty remaining in that research, and the agency's statutory directions with regard to whether and how to err on the side of uncertainty. *Compare* James W. Conrad Jr., *The Reverse Science Charade*, 33 Envtl. L. Rep. (Envtl. Law Inst.) 10,306, 10,310 (2003) (suggesting that agencies such as EPA often exaggerate the limitations of science in order to justify ignoring or delaying the use of new research), *with* Wendy E. Wagner, *EPA's Delay in Responding to Scientific Achievements: A Reply to Conrad*, 34 Envtl. L. Rep. (Envtl. Law Inst.) 10,497, 10,497 (2004) (arguing that regulatory adjustments to changes in science involve multiple factors that should not always lead to immediate regulatory adjustments).

94. *See, e.g.*, Philip J. Landrigan et al., *Pesticides and Inner-City Children: Exposures, Risks, and Prevention*, 107 ENVTL. HEALTH PERSP. 431, 435–36 (1999) (discussing the numerous limitations of EPA's current screening tests for pesticides and the resulting failure to sufficiently detect the effects of pesticides on fetal and early-childhood development).

95. *See, e.g.*, JOHN S. APPLEGATE & KATHERINE BAER, CTR. FOR PROGRESSIVE REFORM, WHITE PAPER NO. 602, STRATEGIES FOR CLOSING THE CHEMICAL DATA GAP 8 (2006), *available at* http://www.progressiveregulation.org/articles/Closing_Data_Gaps_602.pdf ("IRIS is missing values for many chemicals, and the addition of new values is slowed by an ossified peer-review process, lack of resources, increasing political meddling, and a priority list that omits many statutory needs."). There are also unpublished studies and reports of the slow pace of IRIS updates. *See, e.g.*, K.C. Osborn et al., Screening-Level Assessment of the Currentness of U.S. EPA's IRIS Database, Address Before the Society for Risk Analysis Annual Meeting (Dec. 2000), *abstract*

periodic revisions and updating, it is not clear what the causes of agency inaction are in this setting, although some have argued that EPA inaction is best explained by strong opposition from regulated parties and unnecessarily protracted notice-and-comment processes.[96] Finally, at least one EPA Administrator has expressed concern about the need for more formal processes to ensure the regular revision and updating of the dozens of models used by EPA for monitoring and assessing environmental compliance.[97] A National Research Council committee convened to review EPA's oversight of its regulatory models concluded that the iterative revision and refinement of these models was a central aspect of rigorous model use and suggested that the agency's record on this score could stand improvement, at least in some of the areas of regulatory modeling.[98]

The Occupational Safety and Health Administration's (OSHA) general record, both in setting standards and in revising them, is also notoriously poor.[99] The most publicized example of unjustified delay in revising a standard is OSHA's failure to update the workplace beryllium standard.[100] The current workplace beryllium standard was purportedly set by two

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*available at* http://www.riskworld.com/Abstract/2000/SRAam00/ab0ac267.htm (summarizing the results of a "screening-level review of IRIS [that] was performed to estimate the proportion of chemicals in IRIS for which the data cited there do not appear to reflect all current toxicity studies available in the published literature").

96. *See, e.g.*, Jennifer Sass, Editorial, *Budget Cuts to the U.S. EPA Will Reduce Government Data on Pollutants, and Increase Reliance on Industry Data*, 13 INT'L J. OCCUPATIONAL & ENVTL. HEALTH 244, 244–45 (2007) (suggesting reasons for the slow pace of IRIS revisions and assessments, many of which are linked to industry and OMB pressure).

97. *See* Memorandum from Christine Todd Whitman, Adm'r, EPA, to Assistant Adm'rs, Associate Adm'rs, Regional Adm'rs & the Science Policy Council, EPA (Feb. 7, 2003), *available at* http://www.thecre.com/pdf/whitman_memo.pdf (seeking support for the implementation of initiatives aimed at formalizing "environmental modeling").

98. *See* COMM. ON MODELS IN THE REGULATORY DECISION PROCESS, NAT'L RESEARCH COUNCIL, MODELS IN ENVIRONMENTAL REGULATORY DECISIONMAKING 160–62, 166–68 (2007) (recommending that EPA adopt continuing review and revisions of models that inform regulation).

99. *See, e.g.*, Daniel A. Graff, *Safe Workplaces? Judicial Review of OSHA's Updated Air Contaminant Standards in* AFL-CIO v. OSHA, 11 LAB. LAW. 151, 162–65 (1995) (discussing the failure of OSHA to revise existing standards or to promulgate new toxic standards, and providing cadmium as one example). In part in response to the Eleventh Circuit's invalidation of 428 air-contaminant standards, OSHA itself has bemoaned the badly out-of-date status of its workplace standards. *See* Air Contaminants, 58 Fed. Reg. 35,338, 35,340 (1993) ("OSHA continues to believe that many of the old limits which it will now be enforcing are out of date (they predate 1968) and not sufficiently protective of employee health based on current scientific information and expert recommendations.") The situation has not improved over the last decade. *See, e.g.*, Katherine Torres, *Chronicling OSHA in 2007: The Year Ahead*, OCCUPATIONAL HAZARDS, Feb. 5, 2008, http://www.occupationalhazards.com/News/Article/78213/Chronicling_OSHA_in_2007_The_Year_Ahead.aspx (discussing the need of OSHA to revise its standards as being among the top priorities of Democrats). These delays seem particularly inexcusable since a revision presumably does not require the agency to reestablish that the substance poses a "significant risk." Indus. Union Dep't, AFL-CIO v. Am. Petroleum Inst. (*Benzene*), 448 U.S. 607, 653 (1980).

100. Since the standard was promulgated without rigorous consideration, *see infra* notes 100–03, and was set initially in the late 1940s, we assume that either the science, the technology, or both have advanced enough since that time to justify at least a review of the standard, if not a wholesale revision.

scientists working for the Atomic Energy Commission during a taxicab ride in the 1940s.[101] The "taxicab" standard was adopted immediately upon passage of the Occupational Safety and Health Act of 1970[102] and has not been revised since.[103]

Outside of the pollution field, others have also noted significant delays in standards revision in areas where the underlying science is rapidly evolving. Professor Doremus identifies institutional impediments to "learning by doing" in the highly politicized and scientifically inchoate area of endangered species protection.[104] Even though the Agency's understanding of the science of species protection progresses as various management techniques are implemented and observed,[105] the management strategy used by the Agency does not adapt rapidly to reflect these emerging insights. This delay in regulatory advancement occurs largely because the regulatory costs of the Endangered Species Act are intensely concentrated on affected landowners, while the benefits of species preservation are widely diffused.[106] The resulting highly asymmetric political pressure on the Fish and Wildlife Service thus encourages underregulation, and management techniques tend to lag behind the evolving science.[107]

In at least one area of standards revision under the Clean Air Act, however, EPA appears to have at least partially extricated itself from the problem of rulemaking ruts. The Clean Air Act requires EPA to establish national ambient-air-quality standards (NAAQSs) to guide the states in setting pollution-control limitations on industry.[108] While most of the NAAQSs have not been revised during their forty-year lifetime,[109] several of the standards—most notably those for ozone and particulates—have been revised regularly.[110] In this case, a likely more balanced constellation of

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101. David Michaels, *Doubt Is Their Product*, SCI. AM., June 2005, at 98.

102. Pub. L. No. 91-596, 84 Stat. 1591 (codified as amended at 29 U.S.C. §§ 651–678 (2000 & Supp. IV 2006)).

103. *Id.*

104. Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 WASHBURN L.J. 50, 52–56 (2001).

105. *See id.* at 51 (asserting that information regarding the effects of previous management is critical to determining how future management should proceed).

106. *Id.* at 81.

107. *See id.* (noting the asymmetry of political pressure and its effects).

108. Unlike the technology-based standards in our study, these NAAQSs are based exclusively on science and are to be promulgated to ensure protection of the public health with "an adequate margin of safety." 42 U.S.C. § 7409(b)(1) (2000).

109. *See, e.g.*, PERCIVAL ET AL., *supra* note 69, at 482–85 (discussing EPA's general reluctance to revise the NAAQSs, with particular emphasis on EPA's refusal to revise NAAQSs for carbon monoxide, nitrogen oxides, and sulfur oxides).

110. *See, e.g.*, 62 Fed. Reg. 38,652, 38,652 (July 18, 1997) (revising the ozone standard to be more stringent); 62 Fed. Reg. 38,762, 38,762 (July 18, 1997) (adding a standard for fine particulates); *see also* Revisions to the National Ambient Air Quality Standards for Photochemical Oxidants, 44 Fed. Reg. 8202, 8202 (Feb. 8, 1979) (relaxing ozone NAAQSs to less stringent standards).

participating interest groups coupled with mandatory review processes subject to judicial review help explain why the NAAQSs have not been unduly ossified.[111] Specifically, although NAAQSs are likely to be heavily opposed by a variety of interests, they are also highly salient and thus garner the attention of public interest groups, public-health advocates, environmentally minded members of Congress, Executive Branch officials, and—if the media reports on these events—even the diffuse public. Perhaps equally or even more important, in contrast to the technology-based standards, which undergo a much more informal and less visible review process, Congress required an elaborate five-year review process for each of these NAAQSs.[112] This review process includes not only a mandatory judicially reviewable revision decision at each five-year review point, but also a review by "an independent scientific review committee composed of seven members including at least one member of the National Academy of Sciences, one physician, and one person representing State air pollution agencies."[113]

### *C. The Need for Further Empirical Studies*

Even though they are quite preliminary, our findings of significant delays in standards revisions do raise questions about several recent empirical projects that suggest that ossification appears not to be a significant problem in agency rulemakings.[114] As discussed in subpart II(A), these other impressive projects examine data sets of regulatory actions constructed from the *Unified Agenda of Federal Regulatory and Deregulatory Actions*, which is published twice a year in the *Federal Register*.[115] These data sets are intentionally comprehensive, incorporating as many notice-and-comment rulemakings and interim and final rules as possible.[116] However, closer consideration of the primary causes of ossification—for example, asymmetrical interest-group pressures that threaten to bog the agency down in judicial review—suggests that analyses based on carefully constructed subsets of this data might be more revealing of relevant rulemaking trends and activities. Thus, we focused our mini-study on those rulemakings most likely to be on the ossification end of the spectrum. In addition, by analyzing the revision rate for those standards for which Congress has obligated agencies to use the best available science or technology, we reduce the

111. Another way to reconcile the periodic revision of NAAQSs with agency inactivity in the revision of technology-based standards is that underlying science on air quality is changing and advances in available pollution-control technology are not. Since this explanation does not seem terribly plausible, however, we leave it to others to investigate and advance.

112. 42 U.S.C. § 7409(d)(1) (2000).

113. *Id.* § 7409(d)(2)(A).

114. *See supra* notes 25–32 and accompanying text.

115. *See* O'Connell, *supra* note 8 (manuscript at 22–24) (describing the *Unified Agenda*).

116. *Id.* at 23–24; Yackee & Yackee, *supra* note 8, at 6–7 (both describing their respective data sets).

challenges associated with baseline norms. By demonstrating that agencies rarely revise certain technology- and science-based standards, notwithstanding Congressional mandates to keep pace with emerging information and what are likely to be significant advances in the underlying technology, we have made progress in establishing the existence of rulemaking ruts.

Moreover, our mini-study has the advantage of capturing a crucial tenet of ossification theory maintains that a substantial portion of the cost and delay associated with hard look review accrues even before an NPRM. At this stage, when agencies make their initial assessments of regulatory priorities, the prospect of an arduous notice-and-comment rulemaking followed by probing judicial review may delay an NPRM for years or effectively discourage proposals for many important rules that would otherwise have been enacted.[117] Because the *Unified Agenda* data capture rulemaking activity only from the moment of an NPRM, these other empirical studies exclude an important and conceivably large component of the ossification problem.[118] Our approach, however, captures the entire rulemaking process—including the pre-NPRM portion of the agency's decision making—revealing rulemaking ruts that might escape the notice of scholars working exclusively with the *Unified Agenda* data.

## IV. Remedying Rulemaking Ruts

Ridding the administrative system of rulemaking ruts is no easy matter. Since the lopsided participation of regulated parties is likely to persist in most technical rulemaking revisions, without some burst of public interest counterpressure, agencies will continue to be discouraged from doing this tedious but important work. Before proceeding to offer our own more focused proposals for how these ruts might be redressed, we consider the proposals already in the literature that address ossification and regulatory paralysis more generally.[119] We ultimately conclude that none of these

117. *See, e.g.*, West, *supra* note 21, at 74–75 (arguing that a more relaxed notice-and-comment procedure coupled with a deferential review standard would give agencies greater liberty in making changes and would free them to move forward uninhibited with new proposals and regulations).

118. Indeed, Professor O'Connell at least appears not to have contemplated this aspect of ossification theory at all. *See* O'Connell, *supra* note 8 (manuscript at 27) ("Traditional notice and comment rulemaking typically begins when an agency publishes an NPRM in the *Federal Register*.").

119. The most radical proposal for the reform of outmoded pollution-control standards is to eliminate them and replace them with other types of standards—a position we allude to in the introduction as bypassing institutions entirely. *See* Bradley C. Karkkainen, *Bottlenecks and Baselines: Tackling Information Deficits in Environmental Regulation*, 86 TEXAS L. REV. 1409 1416–20 (2008) (highlighting several alternatives to industry-specific standards, including industry self-regulation, negotiated rulemaking, and market-based incentives). Proponents of this reform argue that industry-specific standards are far too time-consuming to promulgate and revise, and are likely to be inaccurate in any event since they depend on information supplied by regulated parties. *See id.* at 1414 (summarizing the criticisms of the "command-and-control" approach to environmental regulation taken by industry-specific standards and noting that such criticisms "bear a kernel of truth"). In the end, they conclude, other regulatory mechanisms, like taxes or cap-and-

reforms are appropriate to solve the particularized problem of rulemaking ruts, either because they are too broad and therefore extract too high a price in terms of accountability and public participation, or because they do not unsettle the distinct interest-group asymmetries that cause the rulemaking ruts.

The core reforms proposed by others to deossify and therefore reform the administrative process generally take aim at the close judicial scrutiny applied under the hard look doctrine, a feature that is not surprising given its reputation as a primary cause of the ossification problem. Professors McGarity, Shapiro, and Pierce, for example, have all proposed some version of more deferential review for major rulemakings.[120] Other, less ossification-

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trade approaches, can effectively and efficiently replace industry-specific standards and should be employed instead. *See id.* at 1416-19 (discussing the advantages and disadvantages of applying market-based incentives, including cap-and-trade programs and Pigouvian taxes, as an alternative to industry-specific standards). A thorough analysis of the comparative effectiveness of these competing regulatory instruments in various regulatory settings is well beyond the scope of this Article, but it bears noting that such mechanisms are essentially untested in these real-world contexts. In an earlier article, one of us already pointed out a number of the problems afflicting market-based approaches that must be addressed before market-based approaches can be credibly advanced as widespread alternatives to technology-based standards. *See* Wendy E. Wagner, *The Triumph of Technology-Based Standards*, 2000 U. ILL. L. REV. 83, 98–100, 101, 106, 108 (detailing problems with market-based approaches as compared to technology-based standards, including delays in pollution reduction, lack of predictability, and difficulties ensuring compliance). However, even assuming that certain technology-based standards can be effectively replaced with other regulatory approaches, these economic-based alternatives still may not be able to sidestep the problem of rulemaking ruts. For example, although some market-based approaches to pollution control incorporate baselines that automatically become more stringent over time, *see, e.g.*, Clean Air Act §§ 401–416, 42 U.S.C. §§ 7651–7651o (2000 & Supp. V 2005) (establishing deadlines for progressively more stringent limitations on sulfur dioxide emissions); *see also* PERCIVAL ET AL., *supra* note 69, at 552–53 (describing the declining cap-and-trade program in California called RECLAIM), the hot-spot problem in many pollution markets necessitates that the programs be tied back to science-based goals or some measure of health protection. *Cf.* Richard Toshiyuki Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles' Failed Experiment in Air Quality Policy*, 9 DUKE ENVTL. L. & POL'Y F. 231, 251–68 (1999) (considering the problems with pollution trading, including the tendency to focus on regional air-quality concerns and therefore overlook localized health risks, or "toxic hot spots," and the discrepancy between claimed and actual emissions reductions because of fraud, manipulation, underreporting, and "phantom" or paper reductions).

120. Professor McGarity, for example, recommends that the Supreme Court replace the *State Farm* standard of reasoned decision making with a more deferential form of substantive review. Under his formulation, judges would adopt the posture of a "pass–fail" professor reviewing a research paper on a complex problem on a topic outside her field of expertise. McGarity, *Some Thoughts*, *supra* note 7, at 1452–54. Professor Pierce concurs with the general wisdom of relaxing the substantive standard of review, but offers a different standard, one which he asserts will be more easily implemented by the courts. Pierce, *Seven Ways*, *supra* note 7, at 95 (arguing that the Supreme Court should reverse *State Farm* by abolishing the judicially enforceable duty to engage in reasoned decision making and should instruct circuit courts "to return to the prior method of applying the arbitrary and capricious test to agency rules"). Professors Shapiro and Levy have proposed an intermediate standard of review that focuses the court's attention on particular substantive standards to guide their review of agency decisions. *See* Sidney A. Shapiro & Richard E. Levy, *Judicial Incentives and Indeterminacy in Substantive Review of Administrative Decisions*, 44 DUKE L.J. 1051, 1072–78 (1995) (proposing an amendment to § 706 of the APA in order to more appropriately balance judicial authority and agency discretion). In a student note, Patrick

focused reform proposals challenge the APA's treatment of all rulemakings with a one-size-fits-all approach. In his prior life as a law professor, Justice Scalia lamented this lack of diversity in administrative process and recommended a multilayered APA with a process to fit virtually every agency need.[121] If done correctly, this might limit the judicial oversight of certain types of rulemakings where review could pose a particularly problematic deterrent to agency action. Similarly, Professor McGarity has recommended that agencies be permitted to enact "lite" or "tentative" rules, both of which would warrant judicial deference in a manner similar to that given legislative rules.[122] This proposal would similarly restrain courts and hence, in theory, free up agencies to engage in more rulemakings as well as rule revisions.

Our proposed reforms take a different approach. Rather than limit or redefine the scope of judicial review, our proposals provide agencies with greater incentives to stay abreast of the emerging science and to incorporate it expeditiously into their rulemakings. Each of our three separate reform proposals accomplishes this by targeting the cause of the rulemaking-rut problem more directly—namely the strong and unopposed pressure on agencies to refrain from revising rules—and by tilting rulemaking processes to favor public-interest-oriented revisions.

The first proposal for facilitating more prompt rulemaking revisions is to require that agencies actually incorporate future revisions into the original rulemaking process. We call this process "contemporaneous revision-planning." Contemporaneous revision-planning could be adopted voluntarily by agencies or imposed on them by Congress. While a congressional requirement is the most straightforward way to make sure this planning is done, the agency itself could include contemporaneous revision-planning during a rule simply by noting that it is including a projected default standard for the next several rounds of revisions—based on the projected capabilities of emerging technology—that will remain in place unless an industry can establish that the standard cannot be met or will lead to widespread economic dislocation.

Under a contemporaneous revision-planning regime, agencies would evaluate during the original rulemaking process the degree to which technological innovation is likely to advance in the relevant field in the future.[123] Congress in fact included an analogous type of technology-forcing

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Fuller recently revived the discussion of the appropriate standard of review, suggesting that for regulations based on peer-reviewed science, courts should defer to the agency's reasoning. Patrick A. Fuller, Note, *How Peer Review of Agency Science Can Help Rulemaking: Enhancing Judicial Deference at the Frontiers of Knowledge*, 75 GEO. WASH. L. REV. 931, 962–64 (2007).

121. Antonin Scalia, Vermont Yankee*: The APA, the D.C. Circuit, and the Supreme Court*, 1978 SUP. CT. REV. 345, 400–09.

122. McGarity, *Some Thoughts*, *supra* note 7, at 1459–60.

123. This idea is similar to Professor Doremus's suggestion that the Fish and Wildlife Service can evade inefficient political pressures by entering into "pre-negotiated commitments" with

mandate for automobile emissions in the 1970 Clean Air Act.[124] Unlike that technology-forcing mandate, however, agencies would base future standards promulgated under the contemporaneous-revision process on reasonable estimates of future technological capabilities that are judicially reviewable, rather than on an unreviewable political guess.[125] If it appears that agencies are going to be unable to make credible technological projections, then Congress could legislate an expected improvement baseline (e.g., a 1% reduction in pollutant loading each year) in pollution-control technologies. Alternatively, agencies could adopt binding revision schedules that require them—subject to notice and comment—to review standards at regular intervals as is currently required for the NAAQSs. In this latter form of contemporaneous revision-planning, agencies should also predetermine, to the maximum extent feasible, the form that future revisions will take.

The entire process of contemporaneous revision-planning would be incorporated in the original notice-and-comment rulemaking for a substantive rule and subject to judicial review at one time. Once the contemporaneous-revision plan has been adopted and has withstood judicial review, the agency would be obligated to follow its revision plan, just as it is obligated to follow its substantive and procedural rules, although a waiver could be allowed for unanticipated events, such as significant economic dislocation or circumstances that might qualify for a variance on other grounds.[126]

An illustration may help clarify the proposal. In promulgating a technology-based standard for the discharge of water pollutants by iron-making companies, for example, EPA under the contemporaneous-planning process could adopt a discharge level of 0.05 ml/hour for a pollutant like cyanide during the first five years and a standard of 0.035 ml/hour (if the technology was expected to improve significantly without a significant increase in cost) for eight years later, and would continue to project standards over at least a twenty- or twenty-five-year horizon. In devising this long-term reduction plan, EPA would consider, among other factors, the forces that should lead to innovative improvements in pollution-control technologies over time and the extent of those improvements in terms of

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landowners in which the agency and the landowner "agree in advance on specific steps that will be taken if monitoring shows that the species or system is in decline." Doremus, *supra* note 104, at 85.

124. For a brief but enlightening discussion of that historic program, see PERCIVAL ET AL., *supra* note 69, at 564–67 (describing the 1970 Clean Air Act's regulatory push for the development of improved emissions-control technology in the automobile-manufacturing industry).

125. *Id.* at 565 (describing the 1970 technology-forcing 90% reduction requirement as based on a "'back of the envelope'" calculation: "'We just picked what sounded like a good goal'" (citing Gregg Easterbrook, *Cleaning Up*, NEWSWEEK, July 24, 1989, at 29 (quoting a committee staff member involved in the legislative drafting process))).

126. *Cf.* 33 U.S.C. § 1311(m)(1)(2) (2000) (allowing certain point sources to petition for a modification of effluent limits when, in part, the source can establish that the energy and environmental costs of meeting the standard exceed by an unreasonable amount the benefits of meeting the standard).

discharge limits. EPA would also factor into the analysis the sunk costs and other expenses associated with upgrading pollution-control technologies for a particular industrial sector.

The contemporaneous-revision process is harder to envision with science-based standards, although it is possible that Congress or the agency could require a certain, steady increment of reduction in end-of-the-pipe pollutant discharges every eight years. Much like the glide path for EPA's lead phaseout, the statutory or regulatory approach would then specify in advance the levels of reductions over a twenty-year period.[127] These projections would only be adjusted if a petition indicated that they were refuted by science or were otherwise unobtainable, thus placing the burden on the regulated parties to establish that the emerging science or technology is not as advanced or affordable as originally projected.

Contemporaneous revision-planning has a number of advantages. First, by requiring agencies to consider the revisions at the time the original standard is adopted, a more complete and balanced set of interested parties is likely to take part in both the original rulemaking and the revisions.[128] The danger that the revision process in particular might become dominated by regulated parties, who might not only oppose a revision but have the information and resources to invest in obstructing it, is alleviated at least slightly by this one-shot rulemaking approach. Moreover, incorporating consideration of the revision process into the original rulemaking increases the likelihood that the agency will formulate a revision plan at the zenith of its collective commitment to addressing the underlying problem. Second, locking in future standards years ahead of time provides industry with ample notice and opportunity to plan accordingly. Indeed, the increased predictability contemporaneous revision-planning offers might defuse much of the industry opposition or even "divide and conquer"[129] among facilities once more progressive industry players realize that they may be able to meet the standards more effectively than their competitors. Third, the assurance that standards will become more stringent with predicted improvements in

127. For a description of EPA's multifaceted lead-phasedown program, which included incremental reductions in the permissible level of lead in gasoline over time, see generally Richard G. Newell & Kristian Rogers, *The Market-Based Lead Phasedown* (Res. for the Future, Discussion Paper No. 03–37, 2003), *available at* http://www.rff.org/documents/RFF-DP-03-37.pdf.

128. This may not always be the case. It is possible that some of these industry-based standards are still so technical and low in salience (we consider "high salience" to mean interesting to the media or public at large) that regulated parties will entirely dominate the rulemaking process, even at the initial rulemaking stage. To the extent that this skewed participation occurs, contemporaneous revision-planning may not be able to pull the rulemaking out of the resulting rut. Contemporaneous revision rulemaking could help a determined agency accomplish a more comprehensive standard and hence enjoy some efficiencies of scale, but much will be dependent on the determination and resources of the agency and particular circumstances operating at the time for a given standard. Indeed, the possibility of this lopsided participation at the initial rulemaking stage suggests that a congressional mandate requiring contemporaneous revision-planning is likely to be much more effective than voluntary agency adoption of this planning process.

129. *See supra* note 124 and accompanying text.

technology provides a revived market for innovation in pollution-control technologies, or at least technologies that meet the increasingly ambitious pollution-control standards at a low cost.

On the other hand, contemporaneous revision-planning is not a panacea. The voluntary form of contemporaneous revision-planning relies on agency commitment to the statutory principles underlying technology-based standards and requires agencies to bind themselves to future courses of action, which agencies may be reluctant to do. The congressional imposition of contemporaneous revision-planning addresses this concern, but others remain. In particular, it is possible that incorporating contemporaneous revision-planning into the original rulemaking will exacerbate the general ossification problem, because agencies will not only be responsible for promulgating the initial standard, but for subsequent standards in the very same rulemaking. This delay might be avoided to some extent, however, if Congress not only requires contemporaneous revisions but also sets a deadline for the promulgation of the initial, complete rulemaking.[130] There also may be technology-based rulemakings for which the future of technological innovation is simply too inscrutable to permit contemporaneous revision-planning. Any congressionally imposed contemporaneous-revision process must therefore provide an exception for this contingency, while ensuring that the exception does not swallow the general rule.

A second reform for rulemaking ruts would provide a special petition process that triggers revisions in a one-way, more stringent direction when a petitioner establishes that there is a clearly available and reasonably affordable pollution-control device that accomplishes more dramatic reductions than the existing standard.[131] The petition process would encourage competitor firms and technological innovators to use the process to gain a competitive edge over their dirtier competitors. The process would thus tap into market competition to generate pressure for revisions and reward "first movers" within industrial sectors who might gain significant market advantages by launching this type of petition.[132] This proposal also

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130. Professor McGarity has also recommended the more frequent use of statutory rulemaking deadlines as a mechanism to compel agencies to initiate rulemaking. McGarity, *Some Thoughts*, *supra* note 7, at 1458–59.

131. The more general use of competition as a regulatory instrument is discussed in DRIESEN, *supra* note 4, at 151–61 (describing the virtues of free market competition versus government regulation for environmental incentives), and Wendy E. Wagner, *Using Competition-Based Regulation to Bridge the Toxics Data Gap*, 83 IND. L.J. (forthcoming 2008) (manuscript at 19–35, on file with the Texas Law Review) (proposing a competition-based system of incentives for chemical testing and safety).

132. While this anticompetitive behavior may be viewed by some with suspicion, *see, e.g.*, Jonathan H. Adler, *Rent Seeking Behind the Green Curtain*, REGULATION, Fall 1996, at 26, 26–27 (describing attempts made by various industries to utilize environmental regulations in efforts to gain a competitive advantage), as long as there is an opportunity to rebut the petition and the standards are required to be reasonably affordable, it is difficult to see how this anticompetitive

builds on a reform proposed by Professor McGarity to enhance the petition process by inviting greater public pressure as well as judicial scrutiny to force agency action.[133]

We call this reform "revision rulemaking." Under revision rulemaking, the agency could deny a petition for a more stringent standard that tracks developments in emerging science or technology, but only after notice and comment and a detailed explanation of its reasons for denying the petition. Its decision would then be subject to judicial review under a heightened substantive standard that would incorporate a presumption in favor of granting such petitions. Agencies and interested parties opposed to the proposed revision thus would bear the burden of establishing that the technology underlying the petition would not be available over a set time frame (e.g., three years) or would not be reasonably affordable, taking into account sunk costs, maintenance, construction, and other features. If an agency granted the petition, the rulemaking adopting a more stringent standard would be subject to more deferential judicial review, consistent with the presumption in favor of regular revision.

Alternatively, revision rulemaking could be tied to existing provisions of technology-based statutes that are intended to encourage technological innovation. Professors Glicksman and Shapiro have identified several provisions of existing environmental standards that permit regulatory flexibility in order to promote private investment in pollution-control technology.[134] Section 311(k) of the Clean Water Act, for example, allows EPA to extend the deadline for complying with technology-based standards to induce the development of new technology by regulated industries.[135] Similarly, § 411(j)(1)(A) of the Clean Air Act allows EPA to issue a waiver to any person proposing to own or operate a new stationary source of air pollution in order "to encourage the use of an innovative technological system or systems of continuous emission reduction."[136] Currently, no mechanism exists for assimilating the technological innovations developed as

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effect would ultimately harm other than the least competitive firms, and it would bring much greater, offsetting benefits to innovation, first movers, and the environment.

133. *See, e.g.*, McGarity, *Some Thoughts*, *supra* note 7, at 1454 (discussing an amendment to the APA that would "lower the threshold for initiating rulemaking [by the public] and . . . signal [Congress's] intent that judicial review of agency refusals to initiate or to complete existing rulemakings be more stringent in some or all circumstances").

134. *See* Robert L. Glicksman & Sidney A. Shapiro, *Improving Regulation Through Incremental Adjustment*, 52 U. KAN. L. REV. 1179, 1203–06 (2004) (finding provisions in the Clean Water Act, the Clean Air Act, the Occupational Safety and Health Act, and the Endangered Species Act—but not in the Resource Conservation and Recovery Act—that allow time extensions as an incentive for regulated entities "to engage in research to develop innovative technologies that will help achieve health, safety, and environmental protection objectives more effectively or more efficiently").

135. 33 U.S.C. § 1331(k) (2000); *see also* Glicksman & Shapiro, *supra* note 134, at 1203–04 (describing the provision in the Clean Water Act).

136. 42 U.S.C. § 7411(j)(1)(A) (2000); *see also* Glicksman & Shapiro, *supra* note 134, at 1204–06 (describing the provision in the Clean Air Act).

a result of these statutory incentives into the industry-wide regulatory standards and, as discussed above,[137] EPA is effectively discouraged from revising the standards to reflect the technological innovations.[138] These obstacles can be overcome by tying revision rulemaking to technology-forcing regulatory flexibility. Under this approach, agencies would be obligated to revisit an existing industry standard within a prescribed period after offering a technology-forcing regulatory waiver for that particular standard. The obligatory revision would follow the revision-rulemaking procedures outlined above—if the agency proposes to adopt the standard, it need not make specific findings to that effect, although it must subject that decision to notice-and-comment rulemaking and the possibility for judicial review. If it declines to revise the standard or proposes to relax the standard, then it must justify that decision, again subject to notice, comment, and more rigorous judicial review.

Revision rulemaking, like contemporaneous revision-planning, has much to recommend it. First, it would surmount many of the existing regulatory impediments to revising technology-based environmental standards. By providing economic rewards to first movers and technological innovators, the approach would effectively scramble the current, unified group of regulated parties and would pit some of the more progressive facilities against the laggards.[139] It would also reduce at least some of the substantial costs incurred by agencies in revising rulemakings since other, more knowledgeable parties would do much of the legwork associated with proposing the revision and even defending it. Finally, the trigger for a revision would be an outsider who benefits from a revision rather than an agency who primarily faces costs from proceeding; at the same time this outside petition would jump-start the agency, forcing it to publicly reconsider some of its outmoded rulemakings.

Revision rulemaking would also create an incentive structure that favors revisions that tighten rather than relax environmental standards, consistent with the congressional commitment to technology-forcing embodied in the underlying statutory schemes. In this way, revision rulemaking would work like a modified one-way ratchet: by creating a presumption in favor of more stringent standards as science and technology evolve, the agency's job would be essentially done when a compelling petition was filed. If an agency sought to deny a petition or even relax an existing environmental standard, however, it would have to defend that move towards less stringency. This one-way ratchet effect thus not only would encourage protective revisions,

137. *See supra* notes 60–61 and accompanying text.

138. *Cf.* Ashford et al., *supra* note 62, at 446–59 (describing the inadequacies of innovation waivers under the Clean Air Act and the Clean Water Act, and recommending how the waivers could be revised to be more effective).

139. *Cf.* Wagner, *supra* note 131 (manuscript at 27–29) (discussing the benefits of a divide-and-conquer approach in regulatory settings where regulated parties might otherwise act as a united and strong block of opposition to more stringent standards or revisions).

but it would help insulate technology-based standards from politically motivated efforts to relax the standards.

The biggest drawback of revision rulemaking is that it may need to be adopted statutorily to provide for the appropriate standards of judicial review. This legislative modification could take the form of either a specific amendment to individual pollution-control statutes or a more general amendment to the Administrative Procedure Act. The former strategy would permit Congress to provide for revision rulemaking in areas where rulemaking ruts and important scientific advances are likely to converge, but it would require concentrated congressional attention. The latter strategy may be easier to implement, but it raises the risk that revision rulemaking would be utilized in areas beyond those that motivated the amendment.

A third approach—which, because of its cost, should be reserved for the most challenging revisions of science-based standards—follows the NAAQS model and requires a periodic review of science- or technology-based standards by an expert panel of scientists on a regular basis, such as every five years.[140] Under this science-review process, the agency would be required at regular intervals not only to determine whether rule revisions were needed to keep up with emerging science and technology, but also to submit its decision to review by an independent panel of scientists. Much like the Clean Air Scientific Advisory Committee (CASAC), such a panel would be charged with evaluating the agency's recommendation of whether a science-based standard should be revised.[141] If the independent scientific panel disagreed with the agency's decision, the panel's report would not only be made public, but could also form one of the main ingredients for a challenge to the agency's ultimate decision.[142] The agency's decision—to either revise or not—would also be subject to review at each of these regular intervals.

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140. *See, e.g.*, 42 U.S.C. § 7409(d)(2)(B)–(C) (2000) (establishing that the Clean Air Scientific Advisory Committee (CASAC) should review EPA's ambient-air-quality standards at five-year intervals). A similar type of scientific review is required for EPA's registration of pesticides. 7 U.S.C. § 136w(d)–(e) (2000) (requiring the Scientific Advisory Panel established under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to review the scientific basis for major regulatory proposals concerning pesticides and to adopt peer-review procedures for scientific studies carried out pursuant to FIFRA).

141. CASAC in particular has received accolades for its important service in the review of EPA's ambient-air-quality standards. *See, e.g.*, EXPERT PANEL ON THE ROLE OF SCIENCE AT EPA, EPA, SAFEGUARDING THE FUTURE: CREDIBLE SCIENCE, CREDIBLE DECISIONS 38 (1992) (praising CASAC as "consistently provid[ing] an open forum for review and discussion of the science underlying EPA's national ambient-air-quality standards" and as being "well-respected by scientific experts in the field").

142. EPA's recent decision to reject CASAC's advice on a more stringent revised standard for fine particulates serves as a case in point. *See, e.g.*, Erik Stokstad, *EPA Draws Fire Over Air-Review Revisions*, 314 SCI. 1672, 1672–73 (noting that criticism of EPA's revision of its review policies largely stemmed from EPA's rejection of CASAC's advice); Jane Kay, *EPA Ignores Advice for Annual Limits on Tiny Soot*, S.F. CHRON., Sept. 22, 2006, at A3 (detailing the disappointment among environmental and health groups when EPA ignored a recommendation agreed to by twenty of the twenty-two members of CASAC).

While this formal science review process would be costly,[143] for particularly important rulemaking revisions like the NAAQSs or even testing requirements under the pesticide and toxic substances statute, the cost may well be justified.[144] A science panel would be able to look at the advances in science or technology objectively and provide a more accurate barometer for the point at which revisions are needed to keep pace with changing technical knowledge and, to some extent, holds the agency's feet to the fire to make the needed revisions.[145]

## V. Conclusion

The prompt revision of rules based on emergent science is important to environmental protection, yet agencies face considerable costs to promulgating rule revisions where the opposition is strong and uniform and possesses far more information relevant to the rulemaking process than the agency. In the unique area of rulemaking revisions involving technical standards, these conditions tend to be at an extreme. Regulated parties enjoy almost a monopoly on information pertaining to the costs, feasibility, and efficacy of new pollution-control technologies. At the same time, they typically enjoy considerable benefits from standards that are locked in place for decades without revision. And finally, there is often little countervailing benefit to environmental groups to make the industry-specific technical issues salient, engage in the tedious revision process, or even sue the agency for blatant violations of a periodic review process.

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143. SCI., TECH., & LAW PANEL, NAT'L RESEARCH COUNCIL, ACCESS TO RESEARCH DATA IN THE 21ST CENTURY: AN ONGOING DIALOGUE AMONG INTERESTED PARTIES: REPORT OF A WORKSHOP 24–25 (2002) ("An NIH consensus development conference costs about $500,000 and takes approximately 1 year.").

144. *But see* MARK R. POWELL, SCIENCE AT EPA: INFORMATION IN THE REGULATORY PROCESS 40 (1999) (reporting that the Science Advisory Board's budget for fiscal year 1998 was "a modest $2.4 million").

145. Those who have studied science advisory boards closely have concluded that when they are employed properly, they can be extremely effective both in holding the agency accountable for developments in science and in protecting the agency from unwarranted challenges when it has done a good job. *See* SHEILA JASANOFF, THE FIFTH BRANCH: SCIENCE ADVISERS AS POLICYMAKERS 206 (1990) (observing that "[p]erhaps the clearest lesson to be drawn" is how science advice to agencies through consensual advisory boards seems essential to certifying the agency's scientific conclusions and protecting them from adversarial deconstruction); BRUCE L.R. SMITH, THE ADVISERS: SCIENTISTS IN THE POLICY PROCESS 71 (1992) (concluding in the case of EPA's Science Advisory Panel commissioned under FIFRA that "[t]he panel has served a useful purpose in enhancing the quality of internal EPA reviews and in bolstering the agency's public image as a scientifically credible regulator"); *id.* at 98 ("The EPA's scientific advisers have played a useful role in this whole process, legitimating and encouraging change initiated by the agency's leadership."); Lars Noah, *Scientific "Republicanism": Expert Peer Review and the Quest for Regulatory Deliberation*, 49 EMORY L.J. 1033, 1047–57 (2000) (discussing the varied types of peer review used by the agencies, their generally positive impact on agency science, and detailing how EPA, FDA, and the Consumer Product Safety Commission utilize these various peer-review mechanisms).

The result—when these forces are in play and come together—is a rulemaking rut. Since normal administrative processes create at least part of the legal climate producing this rut, the repair processes generally must adopt new processes that give revisions an edge or handicap over the status quo. We suggest three different mechanisms that might tilt the playing field to become more friendly to revisions needed to keep up with advances in science and technology. Until the administrative process is restructured to acknowledge the built-in inertia created by pluralistic approaches to the revision of technical rulemakings, however, stagnation seems likely to be the prevailing state in this area of environmental regulation.