November 19, 2010

SUBMITTED BY ELECTRONIC MAIL

Hazardous Waste Management System;
Identification and Listing of Special Wastes;
Disposal of Coal Combustion Residuals from Electric Utilities
Docket ID No. EPA-HQ-RCRA-2009-0640
EPA/DC, EPA West, Room 3334
1301 Constitution Ave., N.W.
Washington D.C. 20460

Re: Comments from the Center for Progressive Reform

Gentlepeople,

Please find attached comments from the Center for Progressive Reform regarding the above-referenced Notice of Proposed Rulemaking. Please include these comments in the electronic docket and consider them as you deliberate on the final rule.

Sincerely,

Rena Steinzor

Rena Steinzor
Professor, University of Maryland Law School
President, Center for Progressive Reform

Michael Patoka

Michael Patoka
Law Clerk, University of Maryland School of Law
Center for Progressive Reform

Enclosures

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Comments

The Center for Progressive Reform

Hazardous and Solid Waste Management System:

Identification and Listing of Special Wastes;

Disposal of Coal Combustion Residuals from Electric Utilities

Docket ID No. EPA-HQ-RCRA-2009-0640

November 19, 2010

Submitted by

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Executive Summary

Final Rule: Apply RCRA Subtitle C

These comments consider the Regulatory Impact Analysis (RIA) that accompanies the Environmental Protection Agency's (EPA) proposal for the regulation of coal ash under the Resource Conservation and Recovery Act (RCRA).[1] The final EPA rulemaking proposal and the RIA are the product of intense negotiations between the Agency and the Office of Information and Regulatory Affairs (OIRA) of the Office of Management and Budget (OMB), which was intent on weakening the original EPA proposal.

CPR strongly urges EPA to go back to its original proposal to regulate disposed coal ash under RCRA subtitle C (Option 1 in the proposal as it emerged from OIRA review). RCRA delegates the decision of how to regulate coal ash to EPA Administrator Lisa Jackson. In this case, if either Option 2 (subtitle D) or Option 3 (subtitle "D prime") of the revised proposal is adopted, her decision-making would be usurped by the OIRA director, a result that the statute neither contemplates nor tolerates.

The draft rule[2] that EPA forwarded to the OIRA on October 16, 2009, would have labeled coal ash destined for land disposal as a "hazardous" waste under RCRA,[3] a decision that has three implications: (1) electric utility plant operators must send the ash to landfills and surface impoundments that meet significantly more protective design requirements, such as the installation of liners, covers, and leachate detection systems; (2) the EPA would write those standards, although state regulators would write and enforce the permits for individual facilities in most places; and (3) plant operators would be required to "close" most defunct coal ash disposal units under the supervision of federal and state regulators.

A fundamentally changed proposal emerged from the OIRA. Rather than sticking with a single proposal, the rulemaking notice advanced three alternatives: (1) adopting the EPA's original option that coal ash be regulated as a RCRA subtitle C hazardous waste,[4] although in an

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[1] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,211 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac.

[2] The EPA has posted on its docket for the rulemaking both an original (324 pages) and a red-lined version (703 pages) of its proposal, with the red-lined version showing changes that were made during negotiations with the OIRA. Those documents are numbers twelve and thirteen in the docket and are entitled *Comparison of October 16, 2009 OMB Review Draft and Final CCR Proposed Rule* (EPA-HQ-RCRA-2009-0640-0012) and *Draft: Coal Combustion Residuals (CCR) Proposal Provided to the Office of Management and Budget October 16, 2009* (EPA-HQ-RCRA-2009-0640-0013), respectively. The documents are available at Docket Folder on Hazardous and Solid Waste Management System: Coal Combustion Residuals, Docket No. EPA-HQ-RCRA-2009-0640, REGULATIONS.GOV, http://www.regulations.gov/search/Regs/home.html#docketDetail?R=EPA-HQ-RCRA-2009-0640 (last visited Nov. 17, 2010) [hereinafter Docket on Coal Ash]. It is worth noting that Executive Order 12,866 requires the OIRA to release such comparative documents, but that the OIRA does not comply with this requirement. Exec. Order No. 12,866, 3 C.F.R. 638 (1993), *reprinted as amended in* 5 U.S.C.A. § 601 note (West 2010).

[3] 42 U.S.C. § 6921 (2006) ("identification and listing of hazardous waste").

[4] Subtitle C of RCRA begins at section 3001 of the public law. Pub. L. No. 94-580, 90 Stat. 2795, 2806 (codified as amended in 42 U.S.C. §§ 6921-6939f (2006 & Supp. II 2008)).

effort to placate the electric utility industry, EPA suggested calling such waste "special" rather than "hazardous"; (2) shifting back to an approach that would treat coal ash as a "solid" waste under RCRA subtitle D[5] when it is disposed on land, essentially leaving all regulatory decisions and enforcement to state discretion, as informed by federal guidelines on key issues, including what standards to apply to the closure of units used for coal ash disposal in the past; and (3) implementing a so-called "D prime" option that would allow all existing coal ash disposal landfills and surface impoundments to continue to function for the remainder of their useful life.[6]

The documentation that accompanied EPA's original rulemaking proposal included a Draft RIA that quantified the expected costs of regulation, but discussed the benefits of regulation in largely qualitative terms, without attempting to convert its description of the rule's advantages into money.[7] But when the final proposal was released by the OIRA for publication in the *Federal Register*, the document had grown from 165 to 242 pages that not only quantified all expected benefits, but predicted net *negative* benefits of the rule that could outweigh its *positive* social value by $234 billion dollars over the next 50 years.[8]

OIRA conducted 47 meetings with stakeholders concerned about the rule. Two-thirds of those sessions were with representatives of potentially regulated industries who opposed EPA's more stringent approach. The proposal took another beating during the interagency review period.[9] Other agencies that already approve of various uses for recycled coal ash (for example, in highway construction or for agricultural purposes) opposed hazardous-waste regulation, echoing private industry's concern that such a label would impose a stigma on beneficial use. Even the Tennessee Valley Authority (TVA) was given an equal opportunity to criticize the draft, despite the fact that TVA owns the Kingston plant that was the site of a catastrophic spill

[5] Subtitle D of RCRA begins at section 4001 of the public law. *Id.* at 2813 (codified as amended in 42 U.S.C. §§ 6941-6949a (2006 & Supp. II 2008)).

[6] The *Federal Register* notice setting forth these options only admits to two alternatives, although it explicitly raises the third, relatively half-baked proposal, calling it the "[subtitle] 'D prime'" approach, thereby encouraging comments in support of that outcome. Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,134.

[7] Mark Eads, U.S. Envtl. Prot. Agency, OMB Review Draft: Regulatory Impact Analysis for EPA's Proposed Regulation of Coal Combustion Residues Generated by the Electric Utility Industry (Oct. 8, 2009), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480a51278 [hereinafter EPA Review Draft RIA]. This draft analysis (EPA-HQ-RCRA-2009-0640-0010.1) may also be accessed through Docket on Coal Ash, *supra* note 2.

[8] U.S. Envtl. Prot. Agency, Regulatory Impact Analysis for EPA's Proposed RCRA Regulation of Coal Combustion Residues (CCR) Generated by the Electric Utility Industry (Apr. 30, 2010), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480ae5d01 [hereinafter Final Draft RIA]. This final draft analysis (EPA-HQ-RCRA-2009-0640-0003.1) may also be accessed through Docket on Coal Ash, *supra* note 2.

[9] Normally, the interagency comments on draft rules are kept confidential "to protect the integrity of the deliberative process," but after the comments were mistakenly posted online by the EPA, and then briefly removed, the agency decided to repost them because they had already been inadvertently disclosed. INTERAGENCY WORKING COMMENTS ON DRAFT RULE UNDER EO 12866 (2010), http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480af0f01.

of *one billion* gallons of coal ash sludge in 2008, a spill larger than the Deepwater Horizon spill in the Gulf of Mexico, triggering the current rulemaking effort.[10]

The Public Health Legacy of Disposal: Spills and Contaminated Groundwater

RCRA first provided EPA with authority to regulate solid and hazardous wastes in 1980, but the statute included the "Bevill amendment" specifically exempting several "special wastes," including fossil fuel combustion wastes like coal ash, from the statute's hazardous waste regulations, pending further study of the risks they pose to human health and the environment.[11] After two decades of study amidst intensive lobbying by the coal mining and electric utility industries, EPA in 2000 decided not to regulate either the disposal or the so-called "beneficial" reuse of coal ash.[12] Consequently, the management of coal ash was left to state regulation or voluntary industry standards.

Industry and state representatives have continued to lobby against federal regulation of coal ash, claiming that state regulatory oversight is sufficient to address any risks of improper disposal.[13] Meanwhile, the hodgepodge of existing state programs, most of which lack crucial engineering or monitoring requirements, apply such requirements only to *new* disposal units, or neglect enforcement of such mandates, leaves overwhelming gaps in coal-ash regulation.[14] The continuing trend of damage cases and structural failures further highlights the inadequacy of state regulatory efforts.[15]

U.S. coal-fired electric utility plants generate about 140 million tons of coal ash, also referred to as coal combustion residuals (CCRs) or coal combustion waste (CCW).[16] Byproducts of burning coal include a variety of toxic metals that are heavily concentrated in these residues, at levels that increase as air pollution control technologies remove more toxic particles from the gas and deposit them in the ash.[17] Or, in other words, substances considered to be hazardous air pollutants are transferred to land and water when the ash is disposed, causing additional environmental harm.

Some of this coal ash waste is "beneficially used," in products like concrete and wallboard, as well as in road beds and farmlands. But about 70 percent of coal ash (about 94 million tons per year) is dumped into colossal disposal units that pose a number of proven threats to human health and the environment, especially the groundwater contamination mentioned

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[10] *Commentary: Changes to Coal Ash Proposal Place Utility's Concerns above Public Health*, OMB Watch, http://www.ombwatch.org/node/11041 (June 2, 2010).

[11] RCRA 42 U.S.C. § 6921(b)(3)(A)(i) (Bevill exclusion for coal ash); RCRA 42 U.S.C. § 6982(n) (Bevill factors to be used in the study of coal ash disposal).

[12] *See* LINDA LUTHER, CONG. RESEARCH SERV., MANAGING COAL COMBUSTION WASTE (CCW): ISSUES WITH DISPOSAL AND USE 11-15 (2010), http://www.fas.org/sgp/crs/misc/R40544.pdf.

[13] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,143.

[14] *Id.* at 35,151-53.

[15] *Id.* at 35,157.

[16] *Id.* at 35,128, 35,211.

[17] *See* LUTHER, *supra* note 12, at 4-6; *see also* LISA EVANS, EARTHJUSTICE, FAILING THE TEST: THE UNINTENDED CONSEQUENCES OF CONTROLLING HAZARDOUS AIR POLLUTANTS FROM COAL-FIRED POWER PLANTS 1 (2010), http://www.earthjustice.org/library/reports/failing_the_test_5-5-10.pdf.

earlier.[18] Public health threats also arise when people inhale fugitive dust particles from dry landfills and or consume fish contaminated with toxic metals when coal ash disposal sites leak.[19]

Electric utilities use two kinds of disposal units: wet surface impoundments (a glorified term for man-made pits in the ground that hold coal ash mixed with water, often behind massive dams) and dry landfills. The RIA ignores imminent threats of catastrophic spills from such impoundments that will almost certainly kill and injure people and cause hundreds of millions of dollars in property damage and cleanup costs. In fact, the spill that motivated this rulemaking– the release of *one billion gallons* of inky coal ash sludge across 300 acres of Kingston, Tennessee during the night of December 22, 2008.[20] Although this catastrophic event miraculously did not result in the loss of human life, the RIA exhibits a myopic fixation on this anomalous fact: because no one died at Kingston, the analysis ignores the possibility that people will be killed or injured in future spills.

The EPA has identified 50 "high-hazard" surface impoundments likely to cause loss of life if they failed.[21] The Pennsylvania Department of Environmental Protection predicts that the failure of the Little Blue Run ash basin could kill 50,000 people.[22] For a picture of the Little Blue Run site and an explanation of the hazards it poses, see page 36 of these comments. Illustrative pictures of other dangerous sites in Ohio, Kentucky, and Illinois are presented on pages 37 to 40. Of 629 impoundments nationwide, one-third were not designed by a professional engineer[23] and 96 impoundments are at least 40 feet tall and at least 25 years old.[24] To gain a more complete understanding of the risks, EPA and OIRA staff should also have considered comparable historical spills, including the 1972 disaster at Buffalo Creek that spilled 132 million gallons of coal slurry (a byproduct of coal preparation), killing 125 people and injuring over a thousand others.[25]

Beyond understating the catastrophic implications of a sudden spill from some 629 surface impoundments, the RIA systematically underestimates the chronic environmental problems caused by these facilities, including the irreversible contamination of groundwater.

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[18] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,211-12. *See also* The Sierra Club, Coal Ash – Beyond Coal, http://www.sierraclub.org/coal/coalash (last visited Nov. 11, 2010) (displaying a map of coal-ash waste sites across the U.S.).

[19] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,215.

[20] *Toxic Tsunami*, NEWSWEEK, July 18, 2009, *available at* http://www.newsweek.com/2009/07/17/toxic-tsunami.html.

[21] U.S. EPA, Information Request Responses from Electric Utilities, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys/index.htm (last visited Nov. 11, 2010).

[22] Brian Bowling, *'High Hazard' Ash Basin in Beaver County Called Safe*, PITTSBURGH TRIBUTE-REVIEW, Dec. 25, 2008, http://www.pittsburghlive.com/x/pittsburghtrib/news/regional/s_604497.html.

[23] U.S. EPA, Information Request Responses from Electric Utilities, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys/index.htm (last visited Nov. 11, 2010).

[24] Final Draft RIA, *supra* note 8, at 146. When these 96 impoundments were identified in the RIA, the EPA had counted only 584 surface impoundments in the nation, so the number of impoundments that are at least 40 feet tall and at least 25 years old would have to be updated to reflect EPA's new count of 629 impoundments. U.S. EPA, Frequent Questions on Coal Combustion Residuals, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/coalash-faqs.htm#10 (last visited Nov. 11, 2010).

[25] West Virginia State Archives, Buffalo Creek Disaster, http://www.wvculture.org/hiSTory/buffcreek/bctitle.html (last visited Nov. 11, 2010).

Because many landfills and impoundments lack an effective liner, they can leach toxic metals like arsenic, cadmium, chromium, lead, mercury, and selenium into the groundwater, contaminating the drinking water of those who live around the units and poisoning wildlife.[26] About 140 cases of such contamination have already been documented.[27]

Systematic Bias in the RIA

As mentioned earlier, when OIRA was finally through "reviewing" the proposed rule,[28] what was once a clear call for hazardous-waste regulation had become a presentation of three alternatives:

1. ***The strong option*** **(Subtitle C)**: As in the EPA's original proposal, coal ash would be regulated as hazardous waste under RCRA subtitle C, but labeled a "special waste" in an effort to reduce any possible stigma on beneficial use that might accompany a label of "hazardous waste."[29] All states would be required to adopt requirements that are no less stringent than the federal program.[30] Federal oversight would ensure compliance with "cradle-to-grave" waste-management requirements[31] and effectively eliminate most of the risks associated with coal-ash disposal.[32] All surface impoundments would be phased out in seven years through prohibitive liner requirements and land disposal restrictions that would end the wet handling of coal ash.[33] This option would reverse the previous Bevill determination for disposed coal ash (to enable the subtitle C listing),[34] but beneficially used coal ash would remain Bevill-exempt from hazardous-waste regulation.[35]

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[26] Mark Clayton, *Coal-ash Waste Poses Risk across the Nation*, THE CHRISTIAN SCIENCE MONITOR, Jan. 9, 2009, *available at* http://www.csmonitor.com/Environment/2009/0109/coal-ash-waste-poses-risk-across-the-nation; Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,153 (listing metals of concern).

[27] The EPA has identified 27 proven damage cases and 40 potential damage cases, acknowledging that these figures are probably underestimations. Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,143, 35,155. *See also* U.S. EPA, COAL COMBUSTION WASTE DAMAGE CASE ASSESSMENTS (2007), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?D=EPA-HQ-RCRA-2006-0796-0015. An additional 70 damage cases have been identified by environmental groups. ENVIRONMENTAL INTEGRITY PROJECT & EARTHJUSTICE, OUT OF CONTROL: MOUNTING DAMAGES FROM COAL ASH WASTE SITES (Feb. 24, 2010), http://www.earthjustice.org/library/reports/ej-eipreportout-of-control-final.pdf [hereinafter Out of Control Report] (identifying 31 other damage cases); ENVIRONMENTAL INTEGRITY PROJECT, EARTHJUSTICE & SIERRA CLUB, IN HARM'S WAY: LACK OF FEDERAL COAL ASH REGULATIONS ENDANGERS AMERICANS AND THEIR ENVIRONMENT (Aug. 26, 2010), http://www.environmentalintegrity.org/news_reports/documents/INHARMSWAY_FINAL.pdf [hereinafter In Harm's Way Report] (identifying 39 more damage cases).

[28] *See* COMPARISON OF OCTOBER 16, 2009 OMB REVIEW DRAFT AND FINAL CCR PROPOSED RULE (2010), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480ae7513.

[29] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,174, 35,185.

[30] *Id.* at 35,136.

[31] *Id.* at 35,157.

[32] Final Draft RIA, *supra* note 8, at 125, 199.

[33] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,177, 35,202.

[34] *Id.* at 35,133.

[35] *Id.* at 35,161.

2. ***The weak option* (Subtitle D)**: Coal ash would be regulated as non-hazardous solid waste under RCRA subtitle D.[36] With no federal oversight, the EPA could not require states to adopt the suggested guidelines, and in the absence of state implementation, the requirements could be enforced only sporadically through expensive citizen suits.[37] The guidelines provide that surface impoundments would have to retrofit with liners or close, but with limited compliance, many impoundments would continue to operate.[38] Only disposal would be regulated, so this option does not address the generation, transportation, storage, or treatment of coal ash prior to disposal.[39]

3. ***The weakest option* (Subtitle "D prime")**: Coal ash would be regulated as non-hazardous solid waste under RCRA subtitle D, as in the "weak option," but existing surface impoundments would be allowed to operate for the rest of their useful lives without installing liners or closing.[40]

The results of OIRA's insistence on frenetic number-crunching are displayed in Table 1 below—a table that sits prominently at the front of the proposed rule's preamble.[41]

Table 1: The RIA's Comparison of Regulatory Benefits to Costs[42]

Present Values in $Millions at 7% Discount Rate over 50-Year Future Period-of-Analysis 2012 to 2061			
	Strong Option Subtitle C	Weak Option Subtitle D	Weakest Option Subtitle "D prime"
1. Regulatory Costs:	$20,349	$8,095	$3,259
2. Regulatory Benefits:	($230,817) to $102,191	$1,168 to $41,761	$593 to $17,501
3. Net Benefits (2-1)	($251,166) to $81,842	($6,927) to $33,666	($2,666) to $14,242
4. Benefit/Cost Ratio (2/1)	(11.343) to 5.022	0.144 to 5.159	0.182 to 5.370

The "regulatory costs" represent the economic costs to industry of complying with the engineering and disposal requirements of the various options.[43] The "regulatory benefits" are comprised of three major benefit categories:

[36] *Id.* at 35,192.
[37] *Id.* at 35,136.
[38] *Id.* at 35,202; s*ee* Final Draft RIA, *supra* note 8, at 147 (estimating only 48 percent compliance with the retrofitting requirement).
[39] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,136.
[40] *Id.* at 35,134.
[41] *Id.*
[42] The version of this table published in the Federal Register contains a number of errors. U.S. EPA, Coal Combustion Residuals – Proposed Rule, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/ccr-rule/index.htm (last visited Nov. 11, 2010). So, the values for Table 1 were taken from U.S. EPA, UNOFFICIAL, PRE-PUBLICATION VERSION OF THE CORRECTED RULE FOR DISPOSAL OF COAL COMBUSTION RESIDUALS FROM ELECTRIC UTILITIES; PROPOSED RULE 16 (2010), http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/ccr-rule/frn-corrections.pdf.
[43] Final Draft RIA, *supra* note 8, at 68-69.

Table 2: The RIA's Computation of Regulatory Benefits[44]

Present Values in $Millions at 7% Discount Rate over 50-Year Future Period-of-Analysis 2012 to 2061			
Benefit Category	Strong Option Subtitle C	Weak Option Subtitle D	Weakest Option Subtitle "D prime"
Groundwater Protection Benefits	**$970**	**$375**	**$188**
Avoided Human Cancer Risks	$504 (726 cancer risks)	$207 (296 cancer risks)	$104 (148 cancer risks)
Avoided Groundwater Remediation Costs	$466	$168	$84
Avoided Impoundment Spill Costs	**$1,762 to $16,732**	**$793 to $7,590**	**$405 to $3,795**
Impact on Beneficial Use	**($233,549) to $84,489**	**$0 to $33,796**	**$0 to $13,518**
Scenario #1: Increase	$84,489	$33,796	$13,518
Scenario #2: Decrease (stigma)	($233,549)	$0 (no impact)	$0 (no impact)
Scenario #3: No impact	$0 (no impact)	$0 (no impact)	$0 (no impact)
Total Benefits:	**($230,817) to $102,191**	**$1,168 to $41,761**	**$593 to $17,501**

The wide ranges in the total-benefit figures are chiefly attributable to the rule's expected impact on beneficial use. The OIRA-edited RIA considers three disparate and internally inconsistent scenarios for this category:

- ***Scenario #1***: A sharp *rise* in beneficial use due to the "avoided disposal cost incentive": utility companies will choose to sell or give away more of their coal ash to the beneficial-use industry in order to avoid the increased disposal costs associated with the new RCRA requirements.[45] This scenario produces the maximum benefits for each option.

- ***Scenario #2 (affects only the strong option)***: A sharp *decline* in beneficial use due to the "stigma effect": hazardous-waste regulation of disposed coal ash under subtitle C would impose a stigma on beneficially-used coal ash, even though beneficial use would remain Bevill-exempt from regulation. The perception that using recycled coal-ash products could lead to environmental liability down the road would cause manufacturers and contractors to use more expensive materials instead.[46] This stigma scenario produces the ridiculously *negative* minimum benefits for the strong option because it assumes that the reductions in beneficial use will result in -$233.5 *billion* in lost economic and environmental benefits.[47]

- ***Scenario #3***: The rule will have *no impact* on the baseline trend of beneficial use.[48] This scenario produces the minimum benefits for the weak and weakest options.

Even before combing through the RIA, one can see that Table 1 contributes nothing but confusion to the decisionmaking process. While CBA is intended to clarify and illuminate the

[44] The benefit ranges in Table 2 were compiled from the lower- and upper-bound values listed in Final Draft RIA, *id.* at 10-12.
[45] *Id.* at 169-71.
[46] *Id.* at 169.
[47] *Id.* at 11, 187-88.
[48] *Id.* at 169.

consequences of regulation, these numbers defy any meaningful comparison.[49] The possibilities for the strong option are all over the place: it might bring net benefits that are far greater than the alternatives, or it could result in a net loss of a quarter-trillion dollars. Administrator Sunstein himself has remarked on the uselessness of a range that extended from $23 million to $3.4 billion: "In order for CBA to be workable, regulators need to have a relatively restricted range of possibilities."[50] What, then, of a range that extends from -$251 billion to $82 billion?

Because its range is so wide, encompassing the ranges of the other options with room to spare, the strong option is presented as a giant gamble while the other options are made to appear much safer.[51] And because the RIA places the stigma-induced loss in the "benefits" category instead of the "costs" category, this enormous "negative benefit" eclipses the positive benefits of avoiding cancers and spills. With expected benefits that are already negative even before the costs are subtracted, how could the strong option stand a chance?

Minimizing Benefits

The revised RIA exemplifies what Frank Ackerman and Lisa Heinzerling have called a "complete cost-incomplete benefit analysis."[52] The analysis meticulously accounts for all possible costs to industry but captures just a small corner of the expected regulatory benefits. Because only a subset of the benefits are quantified and monetized, the numerical figures severely understate the true benefits of regulation, and any comparison with fully-calculated costs is simply misleading. The determined underestimation of regulatory benefits in documents influenced by OIRA is not a new problem.[53] However, this RIA reduces those numbers to an unprecedented extent through a converging strategy of ignoring evidence, making improbable assumptions, and relying on erroneous calculations that diminish projected benefits by a billion dollars in one startling instance.[54]

Table 3 below displays those benefits of regulation that are incorporated into the quantitative analysis, as well as those that were left out. As we shall demonstrate, the analysis further compounds this disparity by consistently underestimating the magnitudes of the benefits that it *does* incorporate.

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[49] James Goodwin, *Eye on OIRA: No Room for a More Compassionate CBA in EPA's Coal Ash Rule*, CPRBlog, http://www.progressivereform.org/CPRBlog.cfm?idBlog=CB7B0438-9412-5651-5ED96CDF99D40D13 (May 24, 2010).

[50] CASS R. SUNSTEIN, WORST-CASE SCENARIOS 202 (2007).

[51] *See* Goodwin, *supra* note 49.

[52] FRANK ACKERMAN & LISA HEINZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING 40 (2004).

[53] Winston Harrington et al., *Controversies Surrounding Regulatory Impact Analysis*, *in* REFORMING REGULATORY IMPACT ANALYSIS 10, 14 (Winston Harrington et al. eds., 2009), *available at* http://www.rff.org/RFF/Documents/RFF-Rpt-ReformingRIA.pdf.

[54] Rena Steinzor & Michael Patoka, *OIRA's Fuzzy Math on Coal Ash: A Billion Here, a Billion There*, CPRBlog, http://www.progressivereform.org/CPRBlog.cfm?idBlog=CD428D4F-DCDE-9091-533F4195CE25C5E4 (July 13, 2010).

Table 3: The RIA's Partial Accounting of Regulatory Benefits

Nature of the Regulatory Effect	Description of the Benefit	Comments
Preventing Groundwater Contamination (at coal-ash disposal sites through engineering standards and groundwater-monitoring requirements)	Preventing cancer from arsenic exposure	Through groundwater-to-drinking water pathway (Only lung and bladder cancers were estimated, even though arsenic can cause skin cancer and liver cancer as well)
	Avoiding costs of groundwater remediation (Because groundwater releases are eliminated/reduced)	Only arsenic-related cleanups are included. The avoided costs of cleanups that would have been required for other toxic metals are not calculated.
	Non-cancer human health benefits (From avoiding exposure to toxic metals like antimony, boron, cadmium, cobalt, lead, mercury, molybdenum, nickel, nitrates/nitrites, selenium, and thallium)	Avoids risk of: • Damage to heart, lung, liver, stomach, kidney, central nervous system, and other organs • Reproductive, respiratory, and cognitive effects
	Ecological and ecosystem benefits	Avoids risk of: • Elevated contaminant levels in birds and mammals • Wetland vegetative damage and plant toxicity • Fish kills, and deformities in fish and amphibians • Inhibited fish reproductive capacity and snake metabolic effects
	Avoiding human health risks from fish consumption	Fish contaminated through groundwater-to-surface water pathway
Preventing Spills from Surface Impoundments (through phase-out of impoundments)	Future cleanup costs avoided: • Owner's cleanup costs • Response, oversight and ancillary costs associated with local, state, and other Federal agencies • Ecological damages • Local (community) socio-economic damages	All components were included for the cost of future "catastrophic" releases (based on the cleanup costs of TVA's Kingston spill), but only the owner's cleanup costs were included for future "significant" releases (based on the cleanup costs of releases at Martins Creek and Widows Creek)
	Avoiding human health and safety risks	The threat to human life is evident from: (1) Deadly spills at similar disposal units (coal-slurry spill at Buffalo Creek) (2) EPA hazard ratings that indicate the risk that a spill will cause loss of life (3) Predictions like that by PA Department of Environmental Protection, asserting that if Little Blue Run Dam were to fail, it could kill 50,000 people
	Avoiding seepage-failure costs	Involving releases below one million gallons
	Avoiding litigation costs from spill events	For example, TVA faces a class-action lawsuit for the Kingston spill, and has already paid $69 million in settlements to residents and property owners
	Avoiding discharges (intentional and unintentional) from surface impoundments to surface waters	Avoids another pathway of fish contamination, and thus avoids human health risks from fish consumption

Controlling Dust from Dry Landfills (by requiring fugitive dust controls)	Human health benefits	Avoids risk of: • Cancer from inhalation of hexavalent chromium • Non-cancer effects from particulate matter inhalation, such as: o Cardiovascular and respiratory disease o Reproductive and development effects o Triggered asthma attacks and increased mortality
	Ecological and ecosystem benefits	Avoids risk of: • Changing pH and nutrient levels in water and soil • Damaging sensitive forests and farm crops • Contributing to haze • Affecting diversity of ecosystems
	Avoiding direct deposition of CCR dust in surface waters	Avoids another pathway of fish contamination, and thus avoids human health risks from fish consumption
Indirect Effects of RCRA Regulation on Beneficial Use	Scenario #1: Increase in beneficial use due to increased cost of disposal	Predicted 28% increase in beneficial use
	Scenario #2: Decrease in beneficial use due to "stigma" associated with regulating CCR under Subtitle C hazardous-waste provisions	• No decrease for public uses specified in federal Comprehensive Procurement Guidelines because they require recycled-CCR products • 50% decrease for other consolidated uses • 80% decrease for unconsolidated uses
	Scenario #3: No change in beneficial use from baseline trend	Baseline trend assumes exponential growth of beneficial use that approaches but never crosses the 100% line
Regulating off-site coal-ash disposal	Human health effects	Affecting populations surrounding off-site disposal locations
	Ecological and ecosystem effects	Affecting plants and wildlife around off-site disposal locations
Principal Sources: • 2010 Proposed Coal Ash Rule, 75 Fed. Reg. at 35,168-69, 35,215. • EPA Review Draft RIA, *supra* note 7, at 161-65. • Final Draft RIA, *supra* note 8, at 7-8, 130-31, 135-36, 165-67, 172, 175-76.		

Note: Shaded rows represent quantified/monetized benefits, while unshaded rows represent benefits that were not incorporated into the analysis.

The most prominent example of what can be called "benefits minimization" is the RIA's arbitrary and capricious determination to ignore all of the toxic substances present in coal ash except arsenic. This unexplained and unjustifiable decision disregards the risks of neurological, reproductive, and organ damage in humans (not to mention harm to wildlife) posed by cadmium, cobalt, lead, mercury, molybdenum, nitrates, and selenium, all of which are also present in elevated levels in the ash.[55]

[55] *See* ENVIRONMENTAL INTEGRITY PROJECT & EARTHJUSTICE, COMING CLEAN: WHAT THE EPA KNOWS ABOUT THE DANGERS OF COAL ASH 14-15 (2009), http://www.earthjustice.org/sites/default/files/library/reports/final-coming-clean-ejeip-report-20090507.pdf (describing the health and environmental effects of these toxic metals).

Another factor producing minimized benefits is the insistence on using an outdated leach test to measure groundwater contamination. The test is known to underestimate the aggressiveness with which toxic metals leach under real-world disposal conditions.[56]

The RIA also minimizes benefits by relying on a single study finding that people are willing to pay only two-thirds of the projected value of their lives to avoid contracting cancer if the disease is curable. Thus, the RIA adopts the median value of a statistical life (VSL) and assumes that each fatal cancer prevented by regulation is worth $8.8 million in benefits.[57] Then, based on a survey of 727 people who were asked abstract questions about whether they would prefer to live in Property A or Property B (with each area carrying different risks of cancer fatalities and auto accidents), the RIA concludes that people would pay only 58.3 percent of the VSL to avoid non-fatal cancer.[58] Through the common but controversial practice of *discounting* future health outcomes to obtain their "present value," billions of dollars in avoided-cancer benefits are reduced to millions.[59] Compounding these errors, expected cases of lung and bladder cancer are divided into "fatal" and "non-fatal" according to average five-year survival rates,[60] even though another EPA document uses 10- and 20-year survival rates to accurately capture all the deaths from these kinds of cancer.[61] This step likely underestimates the number of fatal cancers prevented by the strong option by 144.

The analysis attempts to account for the cancers it claims would be prevented by state regulation or voluntary industry self-regulation by excluding these cases from its estimation of benefits. It first assumes that in states that already require groundwater monitoring at surface impoundments, all cancers would be avoided anyway,[62] even though available data show that the discovery of contamination often does not lead to corrective action.[63] Even more disturbing, the RIA makes the unfounded assumption that utility companies will "eventually" discover and address contamination on their own, even without state monitoring requirements.[64] These final arbitrary calculations reduce the number of cancers prevented by the strong option from 2,509 to 726,[65] and reduce the avoided-cancer benefits by about $380 million.[66]

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[56] Final Draft RIA, *supra* note 8, at 111.
[57] *Id.* at 121.
[58] *Id.* (citing Wesley A. Magat et al., *A Reference Lottery Metric for Valuing Health*, 42 MANAGEMENT SCIENCE 1118, 1122 (1996)).
[59] *See Id.* at 122.
[60] *Id.* at 121.
[61] *See* U.S. EPA, COST OF ILLNESS HANDBOOK II.5-7, II.5-9 n.4, II.8-9 n.4, II.8-14 n.7, *available at* http://www.epa.gov/oppt/coi/pubs/toc.html.
[62] Final Draft RIA, *supra* note 8, at 124.
[63] *See* Out of Control Report, *supra* note 27, at vii, 89-97 (recounting the delay and inaction that followed the discovery of groundwater contamination).
[64] Final Draft RIA, *supra* note 8, at 125; U.S. Envtl. Prot. Agency, Appendix for Regulatory Impact Analysis for EPA's Proposed RCRA Regulation of Coal Combustion Residues Generated by the Electric Utility Industry 281-82 (Apr. 30, 2010), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480ae5d02 [hereinafter RIA Appendix].
[65] *Compare* Final Draft RIA, *supra* note 8, at 120 *and* RIA Appendix, *supra* note 64, at 281 (lung and bladder cancers adding up to 2,509 before reduction) *with* Final Draft RIA, *supra* note 8, at 10-12 (726 cancer risks avoided after reduction).

The RIA underestimates both the cost and the frequency of impoundment failures. First, it characterizes such incidents almost exclusively in terms of "avoided cleanup costs." To be sure, the cost attributed to future "catastrophic" spills like Kingston supposedly accounts for ecological and socioeconomic damages, but the cost of the more frequent "significant" spills (of between 1 million and 1 billion gallons) is defined only by the cleanup costs that plant-owners would have to pay.[67] Once again compounding these errors, the RIA treats Kingston as the worst-case spill. Because by some miracle no one died at Kingston, the RIA fails to account for any health or safety costs associated with spills, overlooking ample evidence of the danger.

The RIA's decision to build its predictive model of massive spills by focusing exclusively on Kingston is inexplicable;[68] a projected rate of future catastrophes should never be based on a single historical event. This methodology also ignores the likelihood that the risks of structural failure are likely to grow as impoundments age.

In yet another embarrassing example of factual and mathematical errors that produce an underestimate of the protective proposal's potential benefits as high as *$881 million*,[69] the RIA mistakenly averages the number of reported spills over a fifteen-year period, instead of the ten-year period indicated by the data.[70] Because a utility company failed to disclose the amount of a reported spill, the spill is simply excluded from the model,[71] even though a simple Internet search reveals that one of these "unknown" spills actually released two *million* gallons of coal ash.[72] With this one additional "significant" spill (how many others might there be?), the estimated benefits of avoiding spills would increase by another $20 million.[73]

Finally, the RIA develops an alternative prediction, this time focusing on factors that make some impoundments especially likely to cause a catastrophic spill—namely, age and height.[74] This methodology is an improvement on the last, but it neglects to account for several other factors that would increase the risk of catastrophe, like storage capacity, toxicity, hazard rating, or whether the impoundment was designed by a professional engineer. And because this analysis still assumes that future spills could not cost much more than Kingston (in lives, injuries, property, infrastructure, environmental damage), it continues to underestimate the benefits of regulation that would eliminate such a risk.

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[66] These steps reduced the present value of avoided-cancer benefits from $884,547,648 to $504,404,625. *Compare* RIA Appendix, *supra* note 64, at 281 (before reduction) *with id.* at 286 (after reduction).
[67] *See* Final Draft RIA, *supra* note 8, at 135.
[68] *See id.* at 137-38.
[69] *See* Appendix *infra* pages 62-66.
[70] *Compare* U.S. EPA, Survey Questions Accompanying EPA Information Request Letters to Electric Utilities (2009), http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/surveys/survey.pdf (asking utilities to report spills within the past *ten* years) *with* Final Draft RIA, *supra* note 8, at 137 n.133 (averaging spills over 15-year period).
[71] *Compare* Final Draft RIA, *supra* note 8, at 134 (listing the 42 reported spills, many of them of unknown amounts) *with id.* at 142 (explaining that only five significant releases and one catastrophic release were included in the model, reflecting only those reported spills with specified amounts above 1 million gallons).
[72] *See* S. Heather Duncan, *Plant Scherer Holds Striking Similarities to TVA Plant Where Ash Pond Contaminated Area*, THE MACON TELEGRAPH, Jan. 11, 2009, http://www.macon.com/2009/01/11/583021/plant-scherer-holds-striking-similarities.html (reporting that the 2002 spill at Plant Bowen released 2 million gallons).
[73] *See* Appendix *infra* pages 62-66.
[74] Final Draft RIA, *supra* note 8, at 146.

The Stigma Effect

As troubling as these concerted efforts to minimize benefits may be, the truly notable characteristic of this RIA that distinguishes it from all previous efforts is its projection of *$234 billion in negative benefits* as a result of the so-called "stigma effect," a construction developed by behavioral economists. The stigma effect is based on the hypothesis that electric utilities will be so fearful of potential future liability that they will shy away from the "beneficial use" of coal ash. The theory's proponents further contend that these utilities, responding irrationally to such fears, will instead pay hundreds of billions of dollars over a period of 50 years to dispose of their coal ash in lined, monitored, and therefore relatively safe disposal sites constructed post-rule.

Among all the other biased estimations in the RIA that undermine the benefits of the strong option, the prediction of an enormous "stigma" effect on beneficial use is by far the most devastating. The strong option could prevent thousands more cancer cases or 50 more catastrophic spills than estimated, and still the benefits would never be enough to outweigh the insurmountable stigma cost. But a close examination reveals that the stigma analysis (1) contradicts the reasoning and expertise of the EPA; (2) is based on arbitrary assumptions; and (3) injects behavioral economics into the framework of traditional CBA, with troubling policy implications for future regulatory efforts.

Traditional stigma analysis is based on the idea that people make irrational risk assessments and treat risks as "all or nothing," overreacting to those that are perceptually salient and seeking to avoid them at all costs[75]—in this case, the perceived risks of beneficial use. This idea, borrowed from the field of behavioral economics (one of Sunstein's special interests),[76] is fundamentally at odds with the *homo economicus* model behind traditional CBA. Traditional CBA presumes that we rationally assess risk probabilities and conduct our daily affairs based on incremental risk-dollar tradeoffs.[77] Not only does the RIA conflate the two inconsistent models of human behavior, but it reflects the worst of both worlds. The traditional model is used to undervalue the benefits of avoiding cancer (*e.g.*, valuing non-fatal cancer at 58.3 percent of the cost of fatal cancer), while the new model is used to predict an overwhelming loss of benefits from the utility industry's overreaction to hazardous-waste regulation.

Stigma analysis suggests a paradoxical view of public fear: it seeks to avoid public fear to the extent that it affects economic variables (like the supply and demand of beneficially used coal ash), but it does not consider fear to be a social cost in itself (as in the fear of spills or contamination felt by those who live around coal-ash disposal units).[78] Thus, it elevates the economic consequences of regulation over the social consequences. Such a view of public fear may even threaten the role of public participation in the regulatory process. In the words of

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[75] WILLIAM SCHULZE ET AL., STIGMA: THE PSYCHOLOGY AND ECONOMICS OF SUPERFUND 23 (2004), *available at* http://yosemite.epa.gov/ee/epa/eerm.nsf/vwGA/8B86459E07EC7DCB85256F4E00672D65 (stigma occurs when "people replace calculations of risk versus benefit with a simple heuristic of...avoidance….").

[76] *See* Benjamin Wallace-Wells, *Cass Sunstein Wants to Nudge Us*, THE NEW YORK TIMES, May 11, 2010, *available at* http://www.nytimes.com/2010/05/16/magazine/16Sunstein-t.html.

[77] *See* U.S. EPA, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 71-72, 88-90 (2000), *available at* http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html/$file/Guidelines.pdf.

[78] *See* Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025 (1999) (detailing the significant physical, psychological, sociological, and political costs incurred by the "dread" of contamination).

Sunstein himself, "There is a risk that high levels of public participation in highly technical domains will [simply] increase public fear, with unfortunate consequences for policy."[79]

The stigma argument is not novel. In response to a similar theory advanced by the petroleum industry, the D.C. Circuit held in 1988 that "the historical development of [RCRA's] statutory scheme" precluded the EPA from considering the stigma effect when deciding whether to list recycled oil as a hazardous waste under RCRA.[80] The stigma argument was arguably more direct and foreseeable in that context because it was the recycled material itself that would be subject to hazardous-waste regulation, whereas with coal ash, the stigma on reuse is a spillover effect from the regulation of only *disposed* coal ash—stigma "once removed." And yet the court refused to allow even the more straightforward stigma argument in the used-oil context.

The 1988 case involved statutory language offering the agency two distinct tracks for such regulation: (1) regulating recycled oil without listing it as hazardous and (2) listing recycled oil as hazardous.[81] The court acknowledged that the statutory language cautioned the EPA to consider whether its regulations will discourage recycling, but only in the context of the first track, with the result that the so-called stigma effect was not relevant to a "track two" listing decision.[82] In contrast, the Bevill amendment to RCRA requires the agency to consider several factors before deciding whether to regulate coal ash as a hazardous waste, including "the impact of [alternative disposal methods] on the use of coal and other natural resources" and the "current and potential utilization of such materials."[83] This language is softer with respect to the EPA's obligation to consider any impacts on coal ash recycling than the language the D.C. Circuit interpreted as barring consideration of the stigma effect, making the 1988 decision the controlling legal precedent for this aspect of the proposal. Why the EPA never mentioned it in the documents justifying the rule is a mystery.

Avid participants in environmental rulemakings worth hundreds of millions of dollars often lose sight of the common sense perspective that might have motivated Congress when it crafts a statute. In this instance, as the D.C. Circuit reaffirmed, Congress was concerned that forcing an agency to worry about stigma effects when it is sorting through waste streams to determine which are hazardous could well prove a recipe for paralysis. After all, to the extent that any stigma effect actually exists, any decision to regulate disposal of a specific waste should initiate the effect, at least initially. In fact, stigmatizing dangerous wastes is an integral part of the agency's mission under the law, along with the task of designing disposal methods that will protect human health and the environment.

In this section of the RIA, the numbers and the words seem to be telling different stories. The potential stigma cost utterly dominates the quantitative analysis, simply by virtue of its immensity. It comes almost as a surprise, then, that in the expert judgment of the EPA, a significant stigma effect is actually very unlikely. The EPA explains that the legal status of

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[79] Cass R. Sunstein, *The Laws of Fear*, 115 HARV. L. REV. 1119, 1161 (2002) (reviewing PAUL SLOVIC, THE PERCEPTION OF RISK (2000)).
[80] Hazardous Waste Treatment Council v. U.S. E.P.A., 861 F.2d 270, 275 (D.C. Cir. 1988).
[81] *Id.* at 274-76.
[82] *Id.*
[83] RCRA 42 U.S.C. § 6982(n)(7)-(8).

beneficial use would remain completely unchanged,[84] and that based on its past experience with hazardous-waste regulation, the beneficial use of coal ash is strongly expected to *increase*, not decrease.[85] But these reassuring words are overshadowed by the RIA's alarmist numbers.

Exactly how does the RIA arrive at $233.5 billion in lost benefits from reductions in beneficial use? It begins by assuming that beneficial use not only provides significant economic benefits to industry, but also big-ticket environmental benefits to society. For instance, the availability of coal ash as a substitute construction material is said to reduce the need to mine and manufacture other materials, with resulting reductions in air pollution, resource consumption, and waste generation.[86] The RIA then assumes that the stigma effect would reduce the total amount of beneficial use by 51 percent—the result of a 50 percent reduction for some kinds of beneficial use, and an 80 percent reduction for others.[87] The amount of this expected reduction is completely arbitrary. The RIA describes it only as a "reasonable approximation in the absence of information to contrary,"[88] even admitting that academic studies of stigma rarely produce such dramatic decreases. Although the revised RIA fails to cite any such studies, the draft sent to OIRA cited studies where people refused to drink water after they watched a "sterilized" cockroach being dipped in the liquid.[89] It is not surprising to us that OIRA recommended removing these citations lest commenters ridicule the quality of the experiments conducted by some behavioral economists.

The policy implications of the stigma analysis may extend well beyond the outcome of this specific rule. For the first time, the industry's fear of liability is quantified in the RIA, suggesting that agencies are required to take into account even "unwarranted" responses to regulation by those who either misinterpret or exaggerate the effect of the rule.[90] In essence, agencies would have to address the consequences of both the *legal rule* and the *perceived rule*, engaging in speculative debates over how various stakeholders will react (regardless of what the rule actually says).

Distributional Effects

Because the requirements are largely the same under the strong and weak options, and the RIA simply expects much *lower compliance* under the weak option, it just scales down the costs and benefits of the strong option to estimate those of the weak option.[91] Here, the RIA not only relies on questionable assumptions about the *level* of compliance, but also disregards the *distributional* implications of its own model—especially as they relate to environmental justice.

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[84] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186.
[85] *Id.* at 35,186-87.
[86] *Id.* at 35,154-55; Final Draft RIA, *supra* note 8, at 149.
[87] Final Draft RIA, *supra* note 8, at 176.
[88] RIA Appendix, *supra* note 64, at 333-34.
[89] Final Draft RIA, *supra* note 8, at 176 n.158.
[90] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186 ("Beneficially used CCRs are the same material as that which would be considered hazardous; this asymmetry increases confusion and the probability of lawsuits, however, unwarranted… the consumer demand may decrease as negative perceptions are not always based on reason").
[91] Final Draft RIA, *supra* note 8, at 198-203.

To estimate the level of compliance under the weak option, the RIA assumes that states with an existing framework for regulating coal ash—specifically, states that already impose any groundwater monitoring requirements on surface impoundments—will adopt the new federal standards.[92] Because 48 percent of coal ash is disposed of in those states, and would thus be subject to the new requirements,[93] the RIA assumes that 48 percent of the full costs and benefits, for most categories, will be realized under the weak option.[94]

First of all, this assumption is much too generous. These states will not automatically adopt a comprehensive set of requirements,[95] imposing compliance costs that politically influential utility companies would find onerous, just because they already address a single aspect of coal-ash disposal. And because many of these states currently exempt *existing* facilities from their monitoring requirements,[96] adopting the federal program would demand a more drastic expansion of state regulatory power than the RIA predicts.

Secondly, even if this assumption were reasonable, the predicted pattern of compliance would exacerbate the already-unequal distribution of protective regulation among the states. Populations in states with *some* regulatory controls would be more protected than before, while populations in states with *no* regulatory controls would remain completely unprotected. Even though the RIA avoids discussing the exact breakdown, it turns out that only 17 states are expected to implement the regulations ("Subset A"), while 30 states (including Tennessee, the site of the Kingston spill) are not ("Subset B").[97]

Furthermore, the RIA does not incorporate this expected breakdown into its analysis of the rule's environmental-justice impact.[98] But its own population data shows that the Subset-B states contain much higher minority, low-income, and child populations around coal utility plants, as compared to the Subset-A states.[99] So, these groups would be left particularly vulnerable to the health and safety risks of coal ash, and the weak option would save costs only at their expense. To estimate the benefits and costs of the *weakest* option, the RIA simply takes the midpoint values between the weak option and the baseline.[100] This arbitrarily simple calculation, combined with the lack of attention given to this option, suggests that the sole purpose of the weakest option is to make the weak option look like a moderate, effective compromise.

The remainder of these comments discuss the issues raised by the RIA in the order in which they appear in the EPA *Federal Register* notice.

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[92] *Id.* at 124.
[93] *Id.* at 123-24; RIA Appendix, *supra* note 64, 294-96.
[94] Final Draft RIA, *supra* note 8, at 198-99.
[95] *See id.* at 68-69 (listing all the engineering controls included in the rule's provisions).
[96] *See id.* at 124; RIA Appendix, *supra* note 64, 294-96 (showing that only 12 percent of coal ash is disposed of in states that require groundwater monitoring at existing surface impoundments).
[97] *See* Table 4 *infra* page 57 (displaying the breakdown of states expected to adopt, or not adopt, the new standards).
[98] *See* Final Draft RIA, *supra* note 8, at 216-36.
[99] *See* Table 5 *infra* page 59 (comparing the concentrations of these demographics around plants in both subsets).
[100] Final Draft RIA, *supra* note 8, at 124, 141, 198-203.

Benefits of Preventing Groundwater Contamination

The RIA first considers the risks of groundwater contamination from coal-ash disposal sites—risks that would be avoided to varying degrees under each co-proposed regulatory option. But by examining only a small sliver of those avoided risks, and employing a number of inadequate estimation techniques and unsupported assumptions, the quantitative analysis does not even begin to represent the full benefits of preventing groundwater contamination.

Summary of the Analysis in the RIA

To estimate the health benefits of preventing groundwater contamination, the RIA models the risk of getting cancer from drinking water contaminated with arsenic, as it applies to people who live within a one-mile radius of a coal-ash disposal unit. Based on the probability of cancer incidence from arsenic exposure and the predicted leaching behavior of arsenic from different kinds of disposal facilities (lined/unlined, landfill/impoundment), the RIA applies estimated cancer-risk levels to the relevant populations that surround disposal units.[101] In this way, the RIA obtains an initial estimate for the number of cancer cases expected to arise without regulation.

Then, the RIA derives estimates for the number of fatal and non-fatal cancers, and proceeds to monetize the benefits of avoiding these cancers, according to traditional cost-benefit methods (estimating people's willingness to pay to avoid risks of death and disease, and discounting future benefits).[102] Finally, the RIA reduces the avoided-cancer benefits of regulation to account for the cancers that it assumes would be prevented by early detection of contamination (due to state regulation and industry's good practice), even in the absence of the proposed rule.[103]

The RIA closes the analysis by estimating the degree of risk-avoidance under each regulatory option. Based mostly on the expected level of groundwater monitoring under each option, the RIA concludes that the strong option (subtitle C) would prevent 100 percent of predicted cancers, while the weak option (subtitle D) would prevent only 48 percent of them, and the weakest option (subtitle "D prime") would prevent 30 percent.[104]

Arsenic and Old Waste: Only a Partial Accounting of Benefits

EPA's risk assessment found that a host of toxic constituents in coal ash pose wide-ranging risks to human health and the environment through a variety of exposure pathways. Out of all these risks, the RIA quantifies *only one* human health effect (cancer) attributable to *only one* toxic constituent (arsenic) through *only one* exposure pathway (groundwater to drinking water).[105] Table 3, presented in the Executive Summary of these comments, presents some of the

[101] Final Draft RIA, *supra* note 8, at 112-20.
[102] *Id.* at 121-22.
[103] *Id.* at 122-25.
[104] *Id.* at 124-25. *See* "Comparison of Regulatory Options and Distributional Effects" *infra* pages 54-55.
[105] *See* Harrington et al., *supra* note 53, at 14 ("When the quantified benefits of a rule include only cancer cases averted, yet the rule will also prevent many other illnesses as well as adverse effects on ecosystems, a CBA of that rule will be woefully incomplete.").

non-cancer health effects, risks to wildlife, and human exposure pathways that were left out of the quantitative analysis.

The quantified benefits of avoiding cancer are inherently privileged in the analysis over non-quantified benefits because they are made uniquely available to the reader in digestible numbers. But, as Lisa Heinzerling warns, "availability should not be confused with magnitude."[106] Even more significantly, only the cancer benefits are given a seat at the "Table"—that is, they are prominently displayed in the summary tables that front-end both the RIA and the rule—while all other health and environmental benefits are only briefly mentioned, deep within the preamble.[107]

When these partially calculated benefits are juxtaposed against fully calculated costs, the result is simply an unfair comparison.[108] Such a misleading presentation distorts, rather than informs, a reasonable decisionmaking process. The EPA Review Draft RIA wisely avoided this pitfall by discussing the benefits in largely qualitative terms, implicitly recognizing that an accurate accounting of all the benefits would be impossible.[109]

Lost in Translation: The Awkward Monetization of Avoided-Cancer Risks

This structural bias toward benefit-deflation is only exacerbated by the substantial uncertainties affecting the estimation of the health benefits that the RIA *does* include. Underlying the entire process, of course, is the conversion of avoided cancer risks into money amounts. While the methods used reflect standard RIA practice, they nevertheless require a closer examination, both because they are presented more opaquely than the other estimation techniques, and because there is much that is lost in the translation, further dampening the force of the resulting benefits.

First, the RIA states that the value of avoiding fatal cancer is equivalent to the value of a statistical life (VSL). It chooses the median VSL[110] from the EPA's table of possible values ranging from $0.7 million to $16.3 million, each value the result of a separate economic study attempting to measure the risk-dollar tradeoffs that the average person would be willing to make.[111] Most of the studies apply wage-risk analysis, in which the VSL is inferred by comparing workers' wages to the risks of death that accompany their work (mostly accidental or immediate deaths). A few studies are survey-based, in which respondents are asked how much they would be willing to pay to avoid incremental risk probabilities.

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[106] Lisa Heinzerling, *Regulatory Costs of Mythic Proportions*, 107 YALE L.J. 1981, 2063 (1997-1998).
[107] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,168-69, 35,215 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac.
[108] *See* OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 10 (2003), *available at* http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf ("When important benefits and costs cannot be expressed in monetary units, [CBA] is less useful, and it can even be misleading, because the calculation of net benefits in such cases does not provide a full evaluation of all relevant benefits and costs.").
[109] EPA Review Draft RIA, *supra* note 7, at 148-65.
[110] Final Draft RIA, *supra* note 8, at 121.
[111] U.S. EPA, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 87-90 (2000), *available at* http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html/$file/Guidelines.pdf.

To calculate the value of avoiding *non-fatal* cancer, the RIA relies on a study in which 727 respondents were asked to choose between two property areas carrying different health risks.[112] The study concluded that non-fatal lymphoma risk reduction is worth only 58.3 percent of fatal lymphoma risk reduction, and the RIA adopts the same ratio for non-fatal and fatal lung/bladder cancers. After adjusting the median VSL to 2008 dollars ($8.8 million), the RIA *discounts* the value of all the avoided cancers according to the year of exposure, on the theory that people are not willing to pay as much to avoid a future risk as they would to avoid a present risk.[113]

The result of all this academic number-crunching is a money value representing the benefit of avoided cancers, presented in tables throughout the RIA, which betrays none of the assumptions, uncertainties, and controversies that shaped the process.[114] Because the projected costs of industry's compliance with regulation are already monetary by nature, they can be more easily and accurately incorporated into the cost-benefit analysis, without undergoing the awkward alchemy that turns health benefits into dollars. Furthermore, the same process that is intended to gain information about the effects of regulation ultimately strips them of their descriptive qualities to reveal a bare number—paradoxically, a net loss of information.[115] Meanwhile, the public would likely never guess how or why the wages of high-risk workers and the survey responses of 727 people relate to the safety of their drinking water. It is against the backdrop of this process, which is inherently problematic even in the ideal, that the further biases and deficiencies of the RIA must be viewed.

A Faulty Leach Test at the Root of the Cancer Predictions

The RIA's estimation of cancer cases arising from groundwater contamination is based on the predicted leaching behavior of toxic metals contained in coal ash.[116] But the standard leach test used to make those predictions—the Toxicity Characteristic Leaching Procedure (TCLP)—is known to be inaccurate. Among other shortcomings, TCLP fails to account for the effect of real-world conditions on CCR leaching, most notably the pH levels that may be present in disposal units.[117] The RIA admits that "CCR can leach significantly more aggressively under

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[112] Final Draft RIA, *supra* note 8, at 121. After establishing, for instance, that out of one million residents, 140 would get curable lymphoma and 150 would die in an auto accident in Area *A*, while 100 would get curable lymphoma and 170 would die in an auto accident in Area *B*, a typical question was: "Which place do you prefer? Choose the number that best explains how you feel," with a nine-point scale ranging from "strongly prefer Area *A*," through "about the same," to "strongly prefer Area *B*." Wesley A. Magat et al., *A Reference Lottery Metric for Valuing Health*, 42 MANAGEMENT SCIENCE 1118, 1122 (1996).

[113] Final Draft RIA, *supra* note 8, at 122.

[114] *See, e.g.*, Lisa Heinzerling, *The Rights of Statistical People*, 24 HARV. ENVTL. L. REV. 189 (2000) (discussing the logical and moral implications of monetizing the lives of "statistical people"); Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025 (1999) (arguing that discounting future benefits is essentially at odds with the forward-looking purposes of environmental regulation); Thomas O. McGarity, *Professor Sunstein's Fuzzy Math*, 90 GEO. L.J. 2341, 2370-71 (arguing that relying upon willingness-to-pay as the measure of the VSL in an arsenic-pollution scenario presumes that the contaminators are initially entitled to pollute until the public pays to stop them, and thus biases the analysis against regulation).

[115] Lisa Heinzerling, *Cost-benefit Environmentalism: An Oxymoron*, Grist, May 14, 2008, http://www.grist.org/article/cost-benefit-environmentalism-an-oxymoron.

[116] Final Draft RIA, *supra* note 8, at 111.

[117] For a discussion of the other shortcomings of the TCLP, *see* TOM FITZGERALD, KY. RES. COUNCIL, CURRENT ISSUES IN THE REGULATION OF COAL ASH (2009), http://www.flyash.info/2009/Fitzgerald-WOCA2009-plenary.pdf.

different pH conditions."[118] The underestimation is not just theoretical: a new, much more accurate test used by the EPA reveals far higher levels of leaching of toxic metals, including arsenic.[119] And in the recent damage cases in Gambrills, MD and Chesapeake, VA, the chemical constituents from CCR migrated more rapidly than would be expected according to TCLP.[120] The Environmental Integrity Project and Earthjustice have identified another 70 damage cases with high levels of groundwater contamination that further highlight TCLP's inadequacy.[121] However, the RIA treats them only as "claimed" damage cases and does not take them into account.[122]

Despite this fundamental flaw in the risk assessment, the RIA proceeds carefully through a series of steps to calculate the expected number of cancer cases according to the existing risk data. Indeed, the RIA acknowledges that there may be some underestimation;[123] but with an uncertainty this substantial, all the later attempts at mathematical precision are wasted. After all, the incorporation of uncertainty "works at the margins, but not when the margin is a cliff's edge."[124]

Underestimating the Number of Fatal Cancers Using Five-Year Survival Rates

After estimating the number of lung and bladder cancer cases expected to arise due to groundwater contamination in the absence of regulation, the RIA splits them up into fatal and non-fatal cancers according to published five-year survival rates (82 percent for bladder cancer, 14 percent for lung cancer).[125] Because the "fatal" category automatically excludes those who die from these cancers after five years, it represents a serious underestimation of each cancer's true fatalities. By contrast, EPA's own *Cost of Illness Handbook* relies on a *twenty*-year survival rate of 74 percent for bladder cancer[126] and a *ten*-year survival rate of 12 percent for lung cancer.[127] In another context, the RIA itself acknowledges that only these twenty- and ten-year periods are sufficient to capture most of the deaths that result from fatal lung and bladder cancers. In fact, it uses these periods to calculate the medical costs associated with fatal

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[118] Final Draft RIA, *supra* note 8, at 111.
[119] *See, e.g.*, U.S. Evntl. Prot. Agency, Office of Research and Development, Characterization of Coal Combustion Residues from Electric Utilities – Leaching and Characterization Data ii, 18 (Dec. 2009), *available at* http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.pdf; LISA EVANS, EARTHJUSTICE, FAILING THE TEST: THE UNINTENDED CONSEQUENCES OF CONTROLLING HAZARDOUS AIR POLLUTANTS FROM COAL-FIRED POWER PLANTS 4-5 (May 5, 2010), http://www.earthjustice.org/sites/default/files/library/reports/failing_the_test_5-5-10.pdf ("It is important to note that the EPA's new data reveal a dramatic departure from the leach test results derived from the decades-old [TCLP]. The EPA formerly relied solely upon the TCLP, and industry and state regulators still rely exclusively on its findings.").
[120] Final Draft RIA, *supra* note 8, at 111, 130.
[121] *See* Out of Control Report, *supra* note 27, at vi-vii (identifying 31 other damage cases: "Reliance on a faulty leach test ignores the ample evidence of poison in waters near all the ash sites described in this report"); In Harm's Way Report, *supra* note 27 (identifying 39 more damage cases).
[122] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,148.
[123] Final Draft RIA, *supra* note 8, at 111.
[124] Harrington et al., *supra* note 53, at 15.
[125] Final Draft RIA, *supra* note 8, at 121.
[126] U.S. EPA, COST OF ILLNESS HANDBOOK II.8-9 n.4, II.8-14 n.7 (2001), *available at* http://www.epa.gov/oppt/coi/pubs/II_8.pdf.
[127] U.S. EPA, COST OF ILLNESS HANDBOOK II.5-7, II.5-9 n.4 (2001), *available at* http://www.epa.gov/oppt/coi/pubs/II_5.pdf.

cancers[128] (of course, in another glaring omission, the RIA fails to incorporate any medical costs at all for *non-fatal* cancers). Nevertheless, the RIA insists on using the misrepresentative five-year survival rates when it first divides the cancers into fatal and non-fatal.

If the RIA were to use the more accurate, longer-term survival rates in the initial division of cancers, the number of fatal bladder cancers predicted would rise from 280 to 405, and the number of fatal lung cancers predicted would rise from 820 to 839 (a total increase of 144 fatal cancers). With the risk of a fatal cancer valued at $3.7 million higher than the risk of a non-fatal cancer, such underestimations have very significant effects on the resulting benefits. This demonstration is merely one example of the profound implications that flow from even the most innocuous sentences in the RIA.

Wishful Thinking: Most Cancers Would Be Prevented Even Without the Rule?

As if it were not enough that the avoided-cancer benefits were based on a faulty leach test, and then awkwardly monetized, strictly discounted, and improperly divided into fatal and non-fatal cancers, the RIA subjects them to one final devastating reduction. "Even without federal regulation," it claims, "there will be facilities that discover contamination and clean the contamination up before cancers occur, either due to state regulations or good practice."[129] Because these cancers would be avoided even in the absence of regulation, it follows that they should not be counted among the benefits of the rule.

The RIA first cuts the benefits by 12 percent, to reflect the amount of coal-ash tonnage in surface impoundments that is already subject to state groundwater-monitoring requirements. The RIA assumes that once contamination is detected in these states, corrective action will be taken and populations will be switched to alternative water sources before substantial exposure.[130] But, as it turns out, the RIA places too much faith in the effectiveness of groundwater-monitoring programs. For example, South Carolina is one of the nine states that require groundwater monitoring at existing surface impoundments.[131] But even after the state cited the Wateree Station in 2001 for violations of state groundwater standards, no further regulatory actions were taken, and neighboring properties still show high levels of arsenic in the groundwater.[132] Similar delay and inaction followed the discovery of contamination at two other South Carolina plants.[133]

More disconcerting, though, is the RIA's assertion that "even at sites where groundwater monitoring is not available, the contamination will eventually be discovered, and at that point residents would be placed on municipal water."[134] And so, the RIA assumes that the percentage of predicted cancers that will actually be "realized" decreases steadily each year, due to

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[128] Final Draft RIA, *supra* note 8, at 121-22.
[129] *Id.* at 123.
[130] *Id.*
[131] RIA Appendix, *supra* note 64, at 295-96.
[132] *See* Out of Control Report, *supra* note 27, at 89-91; Tony Bartelme, *Watchdog Update: More Contamination Found at SCE&G Wateree Coal Plant*, THE POST AND COURIER, Oct. 5, 2009, http://www.postandcourier.com/news/2009/oct/05/05ashwatchweb.
[133] *See* Out of Control Report, *supra* note 27, at 92-97.
[134] RIA Appendix, *supra* note 64, at 281-82.

increasing detection of contamination. The percentage decreases by the same arbitrary amount each year (about 1 percent), calculated so that it reaches zero in the year 2090 (the end of the 75-year period of analysis).[135] This analysis places far too much confidence in the industry's "good practice." Considering that utility plants are extremely reluctant to address—or even admit—contamination when it has been revealed by state-mandated groundwater monitoring (often blaming "background" levels, other sources, or faulty monitoring), it makes little sense to assume that they will voluntarily discover and address so many instances of contamination on their own.

These last steps of the analysis, unsupported by anything but wishful thinking, reduce the number of cancers prevented by the strong option by a whopping 1,783 cancer cases (from 2,509 down to 726).[136] As a result, the present value of the avoided-cancer benefits under the strong option is reduced by about $380 million dollars.[137]

Other Uncertainties

The RIA's calculation of avoided-cancer benefits is affected by a number of other omissions and uncertainties that, when taken together, exert a heavy downward pull on the estimated benefits. For instance, the populations surrounding off-site disposal units are not accounted for in the analysis, even though 18 percent of plants use off-site disposal exclusively.[138] And although the analysis assumes that surface water bodies would fully intercept any groundwater contamination plume, some bodies of water may only partially intercept the plume (or not at all). The RIA itself lists many of these uncertainties.[139] But without any attempt to quantify their effects, the reader has no way to reconcile the words with the numbers.[140] At what point do the mounting uncertainties advise against a quantitative analysis altogether?[141] Given all the gaps in data, arbitrary assumptions, and statistical manipulations, the numbers presented here convey little more than a false sense of certainty.

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[135] *Id.* at 281-83.

[136] For the 2,509 figure, *see* Final Draft RIA, *supra* note 8, at 120; RIA Appendix, *supra* note 64, at 281. For the 726 figure, *see* Final Draft RIA, *supra* note 8, at 10-12.

[137] These steps reduced the present value of avoided-cancer benefits from $884,547,648 to $504,404,625. RIA Appendix, *supra* note 64, at 281, 286.

[138] Off-site disposal units include the location at Gambrills, MD, where coal ash was used to fill sand and gravel quarries, and the location at Chesapeake, VA, where coal ash was used as fill material to contour a golf course. Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,231-2. While both were considered kinds of "beneficial uses" at the time, the proposed rule would consider these two kinds of uses to be "disposal," and thus subject to varying degrees of regulation under each co-proposed option. *Id.* at 35,163. Nevertheless, because the disposal was off-site in both cases, the RIA's model would not have predicted the benefits of avoiding these actual damage cases. *See* Final Draft RIA, *supra* note 8, at 130.

[139] Final Draft RIA, *supra* note 8, at 130-31.

[140] *See* Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025, 2065 (1999) ("All in all, there can be little doubt that numerical precision is often mistaken for accuracy and certainty…[T]here is no evidence that this problem will be solved by surrounding the numbers with words.").

[141] *See* OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 40 (2003), *available at* http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf ("Your estimates cannot be more precise than their most uncertain component. Thus, your analysis should report estimates in a way that reflects the degree of uncertainty and not create a false sense of precision.").

A Reality Check

Perhaps the citizens who are most affected by these cancer risks can provide some much-needed perspective. For example, Meigs County, Ohio is home to the second largest concentration of coal plants in the country,[142] and it also has the highest lung-cancer death rate in the state and the third-highest death rate for all cancers.[143] Unusual numbers of cows and dogs seem to be dying of cancer.[144] With coal ash virtually omnipresent in her community, resident Elisa Young has lost six neighbors to cancer in the last ten years (none of whom smoked), has had melanoma herself, and currently suffers from other precancerous conditions with no family history.[145] It is no wonder that she says, "Coal ash looks totally different to a number cruncher in Washington, DC, than it does to someone who's burying their neighbors in it."[146]

Benefits of Preventing Spills from Surface Impoundments

On December 22, 2008, a structural failure at the Tennessee Valley Authority's (TVA) Kingston Fossil Plant caused the release of 1.1 billion gallons of coal ash and water. The black sludge covered over 300 acres, causing significant damage to 40 homes, destroying local infrastructure, and contaminating waterways with toxic metals like arsenic, lead, and selenium.[147] This disaster, more than 100 times the size of the Exxon Valdez oil spill,[148] and even several times larger than the recent BP oil spill in the Gulf of Mexico,[149] has been called "the largest industrial spill in American history."[150] The magnitude of this unprecedented event stimulated the current proposal for RCRA regulation of disposed coal ash.[151]

In estimating both the cost and the frequency of impoundment spills, the RIA systematically understates the dangers that they pose. Not only does the RIA resort to methodologies that are ill-suited for evaluating the risks of impoundment spills, but the entire analysis serves only to complicate and obfuscate the danger that was made all too clear on December 22, 2008. So, instead of clarifying the risks and enabling a more informed decision, it downplays the benefits of effective regulation under the strong option (subtitle C). In conjunction with the stigma analysis that follows in the beneficial-use section of the RIA, which

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[142] Laura Bassett, *Even the Cows Have Cancer: EPA Weighs Tougher Regulation of Toxic Coal Ash*, The Huffington Post, http://www.huffingtonpost.com/2010/03/24/even-the-cows-have-cancer_n_511214.html (Mar. 24, 2010).

[143] AMERICAN CANCER SOCIETY OHIO DIVISION, OHIO CANCER FACTS & FIGURES 2009 20-21 (2009), *available at* http://our.cancer.org/downloads/COM/OhioFF2009.pdf.

[144] Bassett, *supra* note 142.

[145] *Id.*; Posting of Elisa Young to http://unc.news21.com/index.php/debating-coals-future.html (Aug. 17, 2009).

[146] Rachel Cernansky, *EPA Opens Public Comment Period on Coal Ash. What Happens If It's Not Regulated as Hazardous Waste?*, PLANET GREEN, June 30, 2010, http://planetgreen.discovery.com/travel-outdoors/epa-opens-public-comment-period-coal-ash-what-happens-if-not-regulated-hazardous-waste.html.

[147] *See* Final Draft RIA, *supra* note 8, at 16.

[148] Bryan Walsh, *Exposing the Myth of Clean Coal Power*, TIME, Jan. 10, 2009, http://www.time.com/time/health/article/0,8599,1870599,00.html.

[149] Elizabeth K. Wilson, *Oil Spill's Size Swells*, CHEMICAL AND ENGINEERING NEWS, Sep. 27, 2010, *available at* http://pubs.acs.org/cen/news/88/i39/8839notw7.html (estimating 185 million gallons of oil spilled into the Gulf).

[150] *Toxic Tsunami*, NEWSWEEK, July 18, 2009, *available at* http://www.newsweek.com/2009/07/17/toxic-tsunami.html.

[151] Final Draft RIA, *supra* note 8, at 16-17.

proves to have devastating costs for the strong option,[152] the underestimation of the strong option's avoided-spill benefits helps to drive decision-makers toward the weak option (subtitle D).

Summary of the Analysis in the RIA

To estimate the avoided-spill benefits of the proposed rule, the RIA first assigns a cost-per-spill to impoundment releases of different magnitudes (from historical releases of similar amounts),[153] and then predicts how frequently those spills are expected to occur without regulation.[154]

The strong option would effectively phase out all surface impoundments within seven years, through deadlines for retrofitting with liners and federally enforceable land disposal restrictions that would end wet handling of CCRs.[155] For this reason, the RIA assumes that all spills would be avoided after the phase-out under the strong option. By contrast, under the weak option, the EPA expects that only 48 percent of states will enforce the retrofitting requirements,[156] and because there are no land disposal restrictions, the 5.5 percent of impoundments that already have composite liners will continue to operate.[157] The RIA concludes that approximately 45 percent of strong-option benefits will be realized under the weak option.[158] Because the RIA calculates the benefits of avoiding spills for the strong option, and then simply adjusts them to the proportions of the other options, the following discussion focuses primarily on the avoided-spill benefits under the strong option.[159]

Estimating the Cost of a Spill

The RIA severely underestimates the benefits of preventing waste spills at surface impoundments by limiting the analysis to "avoided cleanup costs." First of all, the definition of "cleanup costs" is unclear and inconsistent. The RIA takes great pains to derive a "social cost" for the Kingston disaster, incorporating the costs to TVA and responding agencies, as well as ecological and socioeconomic damages.[160] This cost ($3.0 billion) is assigned to each future "catastrophic" spill[161] predicted by the RIA's model. On the other hand, the cost assigned to future "significant" spills[162] ($23.1 million), the average cost of the spills at Martins Creek and Widows Creek, apparently represents only the plant-owner's cleanup cost.[163] The magnitude of

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[152] *See* "Indirect Effects of RCRA Regulation on Beneficial Use" *infra* pages 41-54.
[153] Final Draft RIA, *supra* note 8, at 135-36, 139.
[154] *Id.* at 136-48.
[155] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,177-78, 35,202 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac.
[156] For a critique of this prediction, *see* "Comparison of Regulatory Options and Distributional Effects" *infra* pages 54-56.
[157] Final Draft RIA, *supra* note 8, at 147.
[158] ((100 percent of surface impoundments) – (5.5 percent with liners)) * (48 percent of states that enforce subtitle D guidelines) = 45.36 percent of benefits from avoiding spills at surface impoundments.
[159] *See* "Comparison of Regulatory Options and Distributional Effects" *infra* page 54.
[160] Final Draft RIA, *supra* note 8, at 135; RIA Appendix, *supra* note 64, 435-43.
[161] "Catastrophic failures" involve a billion gallons or more. Final Draft RIA, *supra* note 8, at 136.
[162] "Significant failures" involve between a million and a billion gallons. *Id.*
[163] *Id.* at 135.

the ecological and socioeconomic damages at Kingston, comprising nearly two-thirds of the total social cost,[164] suggests that their omission from the significant-spill costs substantially underestimates the benefits of avoiding these spills (which are predicted to be about five times as frequent as catastrophic spills).[165]

Secondly, by measuring these disasters only in terms of their "cleanup costs," the analysis ignores the urgent health and safety risks that they pose—as well as the substantial benefits of avoiding those risks under subtitle-C regulation. This exclusion is especially ironic because safety was a primary impetus for coal-ash regulation in the wake of the Kingston spill.[166] The threat to human life is all too apparent. The EPA explicitly acknowledges such a threat in its hazard potential rating system. Of the 200 impoundments that have been assigned a rating, 50 impoundments (25 percent) have been rated as "High Hazard Potential,"[167] meaning that "failure or miss-operation will probably cause loss of human life."[168] For example, a structural failure at the high-hazard Little Blue Run ash basin in Pennsylvania would endanger the lives of 50,000 people, according to the state Department of Environmental Protection.[169]

But because the RIA implicitly considers the Kingston spill to be the worst-case scenario, and miraculously no one died at Kingston, the threat to health and safety is conspicuously absent from the analysis. On the night of the Kingston spill, one of the coldest nights of the year, everybody in the vicinity happened to be indoors.[170] Even so, the fact that no one died is nothing short of remarkable: the spill obliterated roads, tore up trees, and completely destroyed three homes—one was even torn off its foundation and carried 40 feet away.[171] To assume that future catastrophic spills would "cost" no more than Kingston is to rely on luck and circumstance as crucial factors in the prediction. While Kingston caused enormous devastation, it would be prudent to consider it more of a "close call"—an advance warning of even greater tragedy.

According to OIRA Administrator Cass Sunstein, popular judgments about risk are rooted in the belief "that what has happened before is often the best guide to what will happen again"—a belief that may lead us to neglect a serious risk that is not prominent in recent memory.[172] But here, it is the CBA that suffers from this belief. The lack of an exact historical precedent is no excuse for ignoring the grave risk to health and life posed by an impoundment spill.

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[164] Ecological and socioeconomic damages were estimated to be 159 percent ($1.70 billion) and 24 percent ($256 million) of TVA's cleanup costs ($1.077 billion), respectively. RIA Appendix, *supra* note 64, at 441, 443.
[165] *See* Final Draft RIA, *supra* note 8, at 139, 145.
[166] On January 14, 2009, EPA Administrator Lisa Jackson stated before the Senate: "Many [surface impoundments]…are… up hill from schools or from areas where just the physical hazard of having this mountain of wet coal ash, if there's a break, can endanger lives immediately." *Id.* at 16.
[167] U.S. EPA, Information Request Responses from Electric Utilities, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys/index.htm (last visited Nov. 11, 2010).
[168] U.S. EPA, Frequent Questions on Coal Combustion Residuals, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/coalash-faqs.htm#13 (last visited Nov. 11, 2010).
[169] Brian Bowling, *'High Hazard' Ash Basin in Beaver County Called Safe*, PITTSBURGH TRIBUTE-REVIEW, Dec. 25, 2008, http://www.pittsburghlive.com/x/pittsburghtrib/news/regional/s_604497.html.
[170] *Toxic Tsunami*, NEWSWEEK, July 18, 2009, *available at* http://www.newsweek.com/2009/07/17/toxic-tsunami.html.
[171] *Id.*
[172] CASS R. SUNSTEIN, WORST-CASE SCENARIOS 57 (2007).

However, if one casts a slightly wider net, one *can* find useful historical precedents. Spills from coal *sludge* or *slurry* impoundments, which hold the liquid waste from coal-preparation plants, offer a glimpse at the destruction that could result from a structural failure at a coal-ash impoundment. In 1972, a dam burst in Buffalo Creek, West Virginia, releasing 132 million gallons of coal slurry, killing 125 people, injuring 1,100 others, and leaving over 4,000 people homeless.[173] To be sure, there are some differences between coal-sludge and coal-ash impoundments. For instance, coal-ash impoundments are located near utility plants while coal-sludge impoundments are located near coal-mining operations. These different locations could have unknown implications for the scale of catastrophe resulting from a structural failure. However, judging by the number of coal-ash impoundments that are rated "High Hazard Potential," many are situated where they could cause overwhelming loss of life, injury, and property damage, as in the Buffalo Creek disaster. Casting the net slightly wider, one might even consider the 1966 tragedy in Aberfan, Wales, where liquefied debris from a coal slag tip slid down a mountainside, killing 144 people, including 116 children who were beginning their day at school.[174] A thoughtful consideration of such historical disasters, with respect for how they may be different from coal-ash spills, would have balanced out the analysis, illuminating the dangers (costs) that are obscured by the exclusive focus on Kingston.[175]

In addition to the risk of injury and death, a coal-ash spill can cause persistent contamination of water and air, potentially causing health problems well beyond the time of the immediate disaster. For example, when the spill dries up, it leaves piles of dry ash that can easily become airborne in the cleanup efforts and trigger asthma and other ailments.[176] And because coal ash carries much higher concentrations of toxic metals than coal slurry, a massive coal-ash spill could have lasting health repercussions not seen, for instance, at Buffalo Creek.[177] Moreover, a life-threatening catastrophic spill would cause long-term psychological and sociological damage among survivors, like the "disabling character changes" that were observed two years after the Buffalo Creek disaster.[178]

Not only does the RIA fail to account for such community-wide social costs, but it also ignores the disastrous economic effect that further coal-ash spills could have on the coal-utility

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[173] West Virginia State Archives, Buffalo Creek Disaster, http://www.wvculture.org/hiSTory/buffcreek/bctitle.html (last visited Nov. 11, 2010).

[174] *See* Martin Johnes & Iain McLean, The Aberfan Disaster, http://www.nuffield.ox.ac.uk/politics/aberfan/home.htm (last visited Nov. 11, 2010); Charlie Pottins, Buried Alive by the NCB, RandomPottins, http://randompottins.blogspot.com/2006/10/buried-alive-by-ncb.html (Oct. 24, 2006, 06:12).

[175] In fact, the EPA Review Draft RIA provides a list of surface-impoundment failures over the past 48 years, including spills at impoundments used in other mining and processing operations. EPA Review Draft RIA, *supra* note 7, at 149, *citing* Wise Uranium Project, Chronology of Major Tailings Dam Failures (Sep. 3, 2009), http://www.wise-uranium.org/mdaf.html. This broader view of impoundment failures, beyond the confines of just *coal-ash* impoundments, is nowhere present in the Final Draft RIA.

[176] Days after the Kingston disaster, a six-year-old girl who lived several miles away started coughing and vomiting. After many expensive medical consultations, she was diagnosed with asthma—an ailment that her doctors thought could have been triggered by the spill. *Toxic Tsunami*, NEWSWEEK, July 18, 2009, *available at* http://www.newsweek.com/2009/07/17/toxic-tsunami.html.

[177] Jackie Ayres, *Coal Waste Sludge Ponds—How Safe Are They?*, THE REGISTER-HERALD, Dec. 30, 2008, http://www.register-herald.com/local/x519108002/Coal-waste-sludge-ponds-how-safe-are-they.

[178] CASS R. SUNSTEIN, WORST-CASE SCENARIOS 139 (2007).

industry as a whole. While the RIA employs a far-reaching stigma analysis in considering the impact of regulation on CCR beneficial use,[179] it could have just as easily predicted a stigma on coal power following a series of coal-ash spills. In fact, the literature on stigma emphasizes the role that it plays in the wake of major accidents or pollution events, like the public fear of nuclear energy after the disaster at Three Mile Island.[180] If even a handful of Kingston-like spills were to occur over the next fifty years, public opinion could shift aggressively against coal power, especially given the growing possibilities for alternative energy sources. To be sure, stringent regulation under the strong option, which would effectively eliminate the possibility of a spill, would impose substantial short-term compliance costs on the coal-utility industry. But it may also be the industry's savior in the long run, preventing it from destroying itself through a series of avoidable disasters. Because these subtle but profound costs of a spill are not amenable to cost-benefit analysis, the RIA under-represents the benefits of avoiding spills.

The litigation costs that arise from impoundment spills are also left out of the analysis.[181] The ongoing litigation over the Kingston spill gives an indication of the magnitude of these costs: TVA has already paid $69 million in settlements,[182] and it is facing a class-action lawsuit on behalf of property owners and residents affected by the spill.[183]

In light of all the spill-costs excluded from the analysis, even the $3.0-billion "social cost" ascribed to future catastrophic spills fails to give a realistic picture of the unpredictable and unprecedented damage that a massive spill could cause. As the RIA goes on to predict the number of future spills that are likely to occur over the next fifty years, this underestimation is further compounded by inadequate methodologies and flawed calculations.

Estimating the Frequency of Spills

The RIA uses two different techniques to predict the frequency of future spills. First, using a "historical methodology," it extrapolates a statistical distribution of future spills from a timeline of recent spills.[184] Secondly, the RIA derives alternative estimates by focusing on certain attributes of surface impoundments—namely, age and height—that would make a catastrophic spill more likely.[185] The former methodology eventually provides the lower bound for the estimation, while the latter provides the upper bound. However, because both methodologies respectively underestimate the risks and dangers of coal-ash spills from their own perspectives, the entire range of estimated benefits is lower than it should be.

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[179] *See* "Indirect Effects of RCRA Regulation on Beneficial Use" *infra* pages 41-54.
[180] *See* Howard Kunreuther & Paul Slovic, *Coping with Stigma: Challenges & Opportunities*, 10 RISK: HEALTH, SAFETY & ENVIRONMENT 269, 272 (1999).
[181] Final Draft RIA, *supra* note 8, at 7.
[182] J. DAVID BRITTINGHAM & THOMAS P. DOYLE, BEFORE AND AFTER KINGSTON: A COAL ASH LITIGATION UPDATE 1 (2010), http://www.jdsupra.com/documents/a3b558e1-d739-4b95-82bf-77bf081220bd.pdf.
[183] Beasley Allen, TVA Coal Ash Disaster Update, Jere Beasley Report, http://www.jerebeasleyreport.com/2010/05/tva-coal-ash-disaster-update (May 5, 2010, 16:08).
[184] Final Draft RIA, *supra* note 8, at 136.
[185] *Id.* at 146.

The Historical Methodology: Sparse Data, Subtle Errors, and Static Predictions

Based on a survey of utility companies, the RIA identifies 42 impoundment releases that occurred within the past fifteen years.[186] The RIA divides the historical releases into "catastrophic" and "significant," defining the threshold (1 billion gallons) such that only Kingston would be placed in the catastrophic category, segregated from all the other releases.[187] When the RIA predicts the frequency of future spills, it builds two separate statistical models, one for significant releases and one for catastrophic releases.[188] But is it even appropriate to build a predictive model of future catastrophic spills based on a history of only *one* event? According to J. Scott Holladay, who developed an independent cost-benefit analysis of coal-ash regulation in June 2009, "[W]ith only one recent collapse on record, estimating a robust failure rate is impossible…."[189]

Even more fundamentally, we might ask whether this historical methodology is an adequate tool for evaluating the risks posed by hundreds of immense ash ponds, any number of which could fail due to weather conditions or misoperation at an unpredictable moment. Ultimately, does the frequency of past spills tell us anything meaningful about the risks of future spills? If, within the last several years, analysts had developed a prediction of future oil spills based on a timeline of previous oil spills, would the model have predicted the occurrence (much less the unprecedented scale) of the BP oil spill in the Gulf of Mexico? To the extent that the historical methodology assumes that coal-ash spills follow some unseen and regular statistical pattern—based on a particularly impoverished data set, no less—its results are little more than abstract exercises in calculation.

Aside from the fundamental shortcomings of the historical methodology, the RIA also makes a number of significant errors in its estimation. It begins by fitting a Poisson distribution of future releases, essentially averaging the relevant historical releases over the fifteen-year time period (1995-2009) to obtain projected spill rates. The RIA then multiplies the number of expected spills by their expected costs to obtain the benefits of avoiding spills ("fifteen-year benefits").[190]

But the survey question itself asked utility companies to report spills that occurred within the last *ten* years (1999-2008), not fifteen.[191] Presumably, the RIA used a fifteen-year period because one of the 42 releases is reported as occurring in 1995, so that the list of releases appears

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[186] *Id.* at 133.

[187] The EPA Review Draft RIA, in one of its brief forays into quantitative benefits-analysis, had essentially averaged the Kingston damages with the damages from much smaller spills. EPA Review Draft RIA, *supra* note 7, at 148-60. In its draft comments, OMB complained that by averaging in the unprecedented Kingston disaster with other historical damage cases, EPA's Draft RIA skewed the estimated costs of future spills dramatically upward. INTERAGENCY WORKING COMMENTS ON DRAFT RULE UNDER EO 12866 9 (2010), http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480af0f01. The final RIA's breakdown of CCR releases into "catastrophic" and "significant" seems to be in response to OMB's criticism.

[188] *See* Final Draft RIA, *supra* note 8, at 137-8.

[189] J. SCOTT HOLLADAY, INSTITUTE FOR POLICY INTEGRITY, NO MORE EXCUSES: THE ECONOMIC CASE FOR COAL ASH REGULATION 24 (2009), *available at* http://policyintegrity.org/files/publications/NoMoreExcuses.pdf.

[190] Final Draft RIA, *supra* note 8, at 137 n.133.

[191] U.S. EPA, Survey Questions Accompanying EPA Information Request Letters to Electric Utilities (2009), http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/surveys/survey.pdf.

to span a fifteen-year period.[192] Of course, the fact that one utility company might have disclosed a spill outside of the scope of the question is no justification for widening the time period of the other reported releases by five years. Even more alarming, though, is that the "1995" spill—the 100-gallon release at the Colstrip Steam Electric Station owned by PPL Montana LLC—actually occurred in 1999, according to PPL's survey response.[193] Apparently, the year was changed to 1995 due to a typographical error in transcribing the survey response into the database of results.[194]

Using a ten-year period instead of the fifteen-year period, the average number of predicted catastrophic releases over the next fifty years would rise from 3 to 5,[195] and the average number of predicted significant releases would rise from 17 to 25.[196] Proceeding then through the calculations that follow in the RIA, the average benefits of avoiding spills would increase by about $881 million at a 7-percent discount rate.[197]

In addition, while all 42 releases are listed in Exhibit 5B-1,[198] only a small fraction of them are used to predict the frequency of spills. First, all "seepage failures" (involving releases below one million gallons) are excluded from the analysis, even though the RIA admits they may present risks to human health and the environment[199]—not to mention significant cleanup costs and fines.[200] Furthermore, for 27 of the listed spills, the amount of the release is designated as "unknown" because the utility companies failed to specify how many gallons were spilled in their survey responses.[201] Although the RIA never quite makes it clear, all of these spills are also excluded from the analysis, presumably because there is not enough information to decide whether or not they were "significant." This leaves only five significant spills to be included in the predictions.[202]

In excluding all the "unknowns," the analysis implies that *none of them* were significant—an affirmative assumption that is no more justified than assuming that *all of them* were significant. If anything, considering the damaging effects of coal-ash spills, an over-

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[192] Final Draft RIA, *supra* note 8, at 134.
[193] PPL Response to EPA's Information Collection Request (ICR) for Colstrip Units 1&2 Stage Two Evaporation Pond (STEP) 3, Attachment to Letter from Neil Dennehy, Manager, Fossil Generation Assets, PPL Mont., LLC, to Richard Kinch, U.S. EPA (Mar. 26, 2009), http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/surveys/ppl-colstrip.pdf.
[194] U.S. EPA, Database of Survey Responses 10 (2010), http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/surveys/survey2.pdf.
[195] (1 catastrophic release) / (10 years) * (50-year period-of-analysis) = 5 catastrophic releases on average.
[196] (5 significant release) / (10 years) * (50-year period-of-analysis) = 25 significant releases on average.
[197] From $1.762 billion to $2.642 billion. *See* Appendix *infra* pages 62-65 (calculating the additional $881 million in benefits).
[198] Final Draft RIA, *supra* note 8, at 134.
[199] *Id.* at 136.
[200] A 2008 spill in Georgia, while relatively small, nevertheless released coal ash to 14 properties, which Georgia Power had to clean up under state and federal supervision. The company was also fined $35,000 by the state. S. Heather Duncan, *Plant Scherer Holds Striking Similarities to TVA Plant Where Ash Pond Contaminated Area*, THE MACON TELEGRAPH, Jan. 11, 2009, http://www.macon.com/2009/01/11/583021/plant-scherer-holds-striking-similarities.html.
[201] Final Draft RIA, *supra* note 8, at 134.
[202] *Id.* at 142.

inclusion would be preferable to such a restrictive window. In addition, the analysis is woefully incomplete in relying only on the companies' vague survey responses, without demanding more detailed information from the companies or conducting even the slightest independent investigation of recent spills. For instance, a simple Internet search reveals that the 2002 spill at Bowen Power Station in Georgia, whose magnitude is listed as "unknown" in the RIA, released more than two million gallons of coal ash "when a huge sinkhole opened beneath its pond."[203] A spill of this magnitude would qualify as "significant," and thus, with this one additional detail, the average number of predicted significant spills would rise from 25 to 30,[204] and the average benefits of avoiding spills would increase by about $20 million at a 7-percent discount rate.[205] How many other spills of "unknown" magnitude could turn out to have been "significant"?

These are just a handful of the errors that tend to get obscured as surreal quantities of hypothetical money are shuffled about in the CBA. OIRA Administrator Cass Sunstein sees CBA as a more accurate alternative to the "error-prone intuitions" that often drive the behavior of individuals and institutions.[206] But CBA is simply prone to different kinds of errors—ones that often go unnoticed amid the dense calculations and opaque assumptions.

The RIA concludes its historical methodology by attempting to account for the growing frequency of spills over the past five years ("five-year benefits"). Because all the spills included in the analysis occurred between 2005 and 2009, the analysis simply tightens the period to five years and performs the same calculations again.[207] This time, it arrives at average benefits that are three times as large as its original estimations—an increase of about $3.5 billion at a 7-percent discount rate.[208] However, the analysis does not adequately capture any growing frequency of spills; it merely fixes the probability at a slightly higher rate, based on the last five instead of the last fifteen years. As a result, the analysis implies that spills will occur at this static frequency all throughout the next fifty years, even though the aging of impoundments suggests otherwise.[209]

In any case, the "five-year benefits" are obscured by the "fifteen-year benefits" calculated earlier because the latter eventually become the lower bound for this estimation.[210] If all the above errors in the "fifteen-year benefits" were remedied, then the reported lower bound of estimated benefits from avoiding spills would increase from $1.762 billion to $2.662 billion at a 7-percent discount rate. If the more justifiable "five-year benefits" were used instead, then the lower bound would further increase from $2.835 billion to $5.285 billion. And if the analysis were modified to account for a continually *growing* frequency of spills, as evidenced by the recent spate of releases at decades-old impoundments, the lower bound would be even higher. After all, a "lower bound" is no excuse for reporting an estimation that artificially ignores the mounting degree of danger.

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[203] Duncan, *supra* note 200.
[204] (6 significant releases) / (10 years) * (50-year period-of-analysis) = 30 significant releases.
[205] From $2.642 billion to $2.662 billion. *See* Appendix *infra* pages 62-66 (calculating the additional $20 million in benefits).
[206] CASS R. SUNSTEIN, WORST-CASE SCENARIOS 6 (2007).
[207] *See* Final Draft RIA, *supra* note 8, at 141-46.
[208] *Id.* at 146.
[209] *See* HOLLADAY, *supra* note 189, at 24-25.
[210] *See* Final Draft RIA, *supra* note 8, at 10-12.

The "Age and Height" Methodology: Neglect of Other Attributes and Surroundings

After completing the historical methodology, the RIA takes a more targeted approach to predicting *catastrophic* releases, based on two factors: (1) the age of the impoundment, which increases the likelihood of a structural failure and (2) the height of the impoundment, which increases the likelihood that a release will be catastrophic—meaning that a release at a tall impoundment is more likely to spread over a larger area.[211] The RIA identifies 96 out of 584 impoundments that are at least 40 feet tall and at least 25 years old, and then assumes that 10 or 20 percent of these 96 impoundments will fail over the next twenty years.[212] The selection of 10- and 20-percent failure rates is never explained in the RIA; and considering how vulnerable these plants could be, much higher percentages would have been justified.

Under this analysis, which still assumes that each catastrophic failure would cost $3.0 billion (as in the Kingston spill), the estimated benefits of avoiding the spills are much greater than they were under the previous analysis.[213] Indeed, the new focus on the real-world conditions of surface impoundments is a welcome shift from the abstract statistical manipulations of the historical methodology. However, a number of impoundment attributes are conspicuously absent from the analysis. The RIA considers these alternative estimates to be "much higher than the actual benefits from preventing catastrophic failures" and explains that the predicted spills "define the upper bound of what is possible under current practices of mismanagement."[214] But because of the arbitrary failure rates (10- and 20-percent) and the factors missing from the analysis, these estimates cannot be said to represent a worst-case scenario.

The exclusive focus on impoundment age ignores the fact that 186 impoundments were not designed by a professional engineer. This fact is mentioned in the preamble of the proposed rule,[215] but the RIA fails to incorporate it into the analysis. Because this attribute would independently increase the likelihood of a spill, the universe of impoundments for this estimation should have included those that are (at least 40 feet tall) and (at least 25 years old *or* not designed by a professional engineer).

As for the severity or magnitude of a release, the exclusive focus on height ignores the crucial role of other impoundment attributes. First of all, surface impoundments with larger storage capacities, if they were to fail, would be more likely to spill devastating quantities of coal ash than those with smaller capacities, independent of height. For instance, compared to the ash

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[211] *Id.* at 146.

[212] *Id.* The EPA has updated the national count of surface impoundments to 629 instead of 584, so the numbers used in this section of the RIA would have to be updated to reflect the new information. U.S. EPA, Frequent Questions on Coal Combustion Residuals, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/coalash-faqs.htm#10 (last visited Nov. 11, 2010).

[213] The estimated benefits range from $8.366 billion to $16.732 billion at a 7-percent discount rate, and from $13.046 billion to $26.092 billion at a 3-percent discount rate. Final Draft RIA, *supra* note 8, at 148.

[214] *Id.* at 147.

[215] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,153 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac.

pond at Kingston, the pond at Plant Scherer in Georgia is almost 19 times as large,[216] and the Little Blue Run ash basin in Pennsylvania is at least 30 times larger.[217] Secondly, surface impoundments with greater concentrations of toxic metals, if they were to fail, would be more likely to cause persistent damage to human health and ecosystems, independent of the magnitude of the spill. For example, the Stanton Energy Center in Florida deposits into its surface impoundments more than ten times the amount of arsenic deposited by the Kingston plant; many other plants similarly outrank Kingston with respect to quantities of chromium, lead, nickel, selenium, and thallium.[218]

To be sure, the height-factor may capture many of these other impoundments; after all, taller impoundments are also likely to have greater storage capacities and greater concentrations of toxics. But by grouping together all the old, tall impoundments *indiscriminately*, the analysis fails to account for the variables that could push the costs of future spills well beyond the $3.0-billion costs of Kingston.

Another way to gauge the severity of future spills would be to incorporate the hazard ratings of surface impoundments. Where height relates only to the size of the area that could be affected, the hazard ratings supposedly take into account the real-world surroundings of each surface impoundment. That is, the presence of sensitive ecosystems, residential developments, or critical infrastructure in the vicinity of a surface impoundment would be reflected only in its hazard rating.[219] And of course, these special vulnerabilities would indicate higher cleanup costs, greater threats to human health and life, and more profound ecological damage. In other words, the scale of catastrophe—the costs, not the probability, of a spill—would be directly proportional to the hazard rating.[220]

Presumably, the RIA did not incorporate hazard ratings because 429 out of 629 impoundments have not even been assigned a rating.[221] And surprisingly, the Kingston plant was rated "Low Hazard Potential" prior to its history-making spill.[222] This could either be a reflection of how unreliable the rating system is—after all, the ratings are based on self-reporting by utility companies[223]—or of how much *more* damage (specifically, tremendous loss of human life) could result from a spill at a "high hazard" plant. But the kind of information captured by the hazard ratings, if reliably obtained, would be indispensable to a realistic assessment of the costs of future spills.

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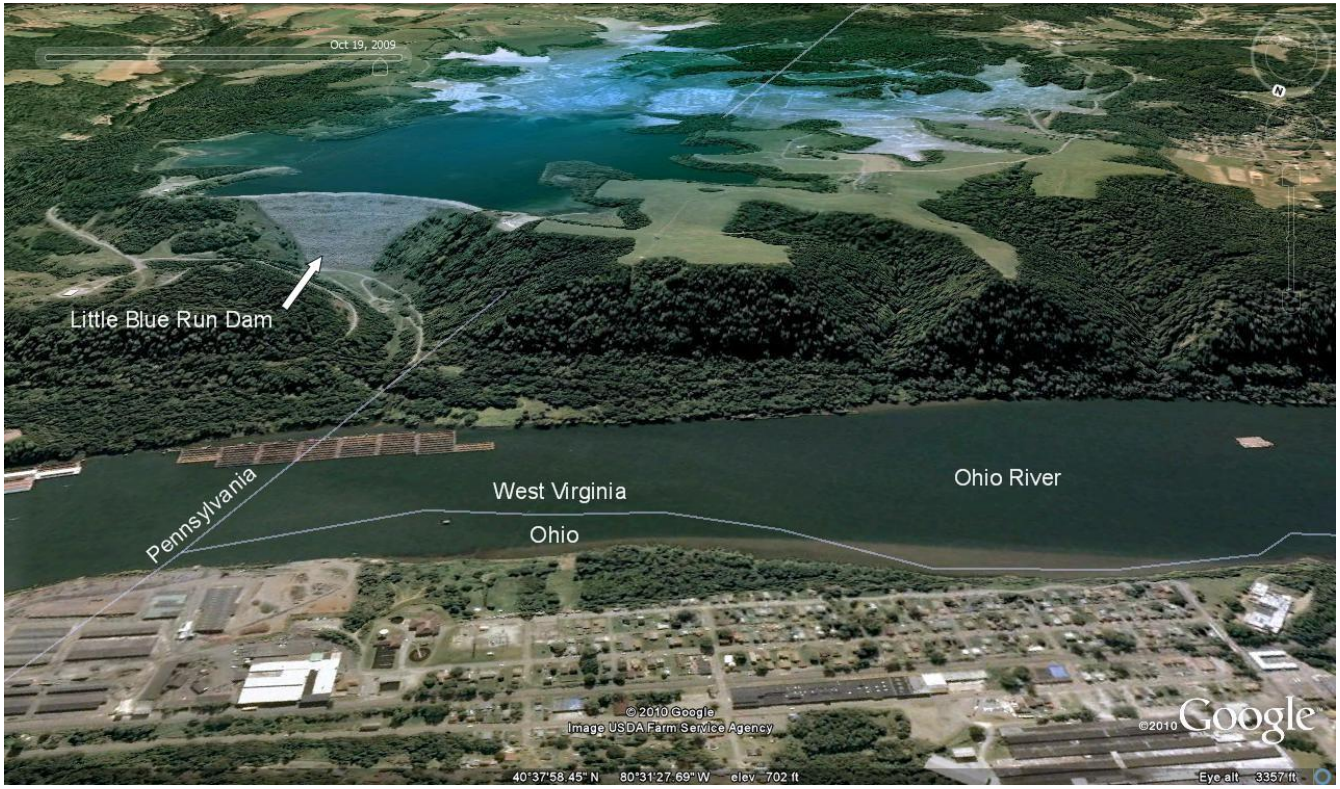
[216] Duncan, *supra* note 200.
[217] Brian Bowling, *'High Hazard' Ash Basin in Beaver County Called Safe*, PITTSBURGH TRIBUTE-REVIEW, Dec. 25, 2008, http://www.pittsburghlive.com/x/pittsburghtrib/news/regional/s_604497.html.
[218] ENVIRONMENTAL INTEGRITY PROJECT, DISASTER IN WAITING: TOXIC COAL ASH DISPOSAL IN SURFACE IMPOUNDMENTS (2009), http://www.environmentalintegrity.org/pdf/newsreports/2009-01-07-DISASTER.pdf [hereinafter Disaster in Waiting Report].
[219] *See* U.S. EPA, Frequent Questions on Coal Combustion Residuals, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/coalash-faqs.htm#13 (last visited Nov. 11, 2010).
[220] *See id.*
[221] U.S. EPA, Information Request Responses from Electric Utilities, http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys/index.htm (last visited Nov. 11, 2010).
[222] In the wake of the Kingston spill, TVA raised the hazard ratings at several of its other disposal sites to "High Hazard Potential." Shaila Dawan, *Tennessee Valley Authority Increases Hazard Ratings on Coal Ash Sites*, THE NEW YORK TIMES, July 17, 2009, *available at* http://www.nytimes.com/2009/07/18/science/earth/18ash.html.
[223] *Id.*

Because the alternative frequency analysis applies the Kingston cost uniformly to all future catastrophic spills, it suffers from the same shortsightedness that afflicts the historical methodology. That is, its "worst-case scenario" reflects only our past experience, projected onto more frequent occurrences. Ultimately, the analysis of spills lacks the foresight to predict what has not yet happened. If the recent BP oil spill has taught us anything, we should know by now that expecting the familiar, and failing to consider the unprecedented, is a recipe for disaster.

Intermission: A Visual Tour of Coal-Ash Threats

Out of all 629 surface impoundments, the following pages display satellite images for just a few "high-hazard" impoundments (out of 44 identified by the EPA), along with the clearly visible residential communities that surround them. These communities would be especially imperiled in the event of groundwater contamination or a structural failure. And in all these cases, the inadequacy of state regulation illustrates the need for uniform, federally enforceable requirements under the strong option.



Little Blue Run reservoir*:* While parts of it look like a tranquil blue lake, "Little Blue" is actually an unlined coal-ash surface impoundment 30 times larger than the one that spilled at Kingston.[224] Built in 1975, and straddling the line between Pennsylvania and West Virginia, the reservoir covers an area of 1,300 acres, with a mixture of coal ash and scrubber slurry sitting behind a 400-foot dam made of earth and rock.[225] Between 2000 and 2006, more than 167,000 pounds of selenium (extremely toxic to fish) were dumped into the reservoir—almost four times the amount in the Kingston pond.[226] Because it was reaching capacity, Little Blue was scheduled to close in 2008, but then Pennsylvania approved a plan to make it 62 feet higher, postponing the closing date back to 2031 or later.[227] Only in anticipation of *federal* hazardous-waste regulation by the EPA, and under pressure from stakeholders concerned about the financial liabilities of wet disposal, the utility company decided to stop disposing wastes into Little Blue and chose to build a lined dry landfill instead.[228] But the groundwater of nearby residents has already exhibited levels of some toxic metals at up to 300 times the federal drinking water standards.[229] And even if it is no longer used, a catastrophic spill from the lake could endanger 50,000 people, according to the Pennsylvania Department of Environmental Protection.[230]

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[224] Brian Bowling, *'High Hazard' Ash Basin in Beaver County Called Safe*, PITTSBURGH TRIBUTE-REVIEW, Dec. 25, 2008, http://www.pittsburghlive.com/x/pittsburghtrib/news/regional/s_604497.html.

[225] Don Hopey, *Massive Coal Ash Reservoir Holding up in Beaver County*, PITTSBURGH POST-GAZETTE, Jan. 11, 2009, http://www.post-gazette.com/pg/09011/941065-57.stm.

[226] Disaster in Waiting Report, *supra* note 218, at 2.

[227] Hopey, *supra* note 225.

[228] Bob Downing, *FirstEnergy Ending Ash Storage in Pa. Lake*, AKRON BEACON JOURNAL, Jan. 29, 2010, *available at* http://thedirtylie.com/blog/?p=2691.

[229] Hopey, *supra* note 225.

[230] Duncan, *supra* note 200.

Cardinal Fly Ash Reservoirs: Located in Brilliant, OH, this unlined impoundment is the sixth-largest in the nation.[231] The No. 2 dam reaches a height of 230 feet, with the No. 1 dam rising over 50 feet above it.[232] Ohio does not impose any groundwater monitoring requirements on surface impoundments.[233]

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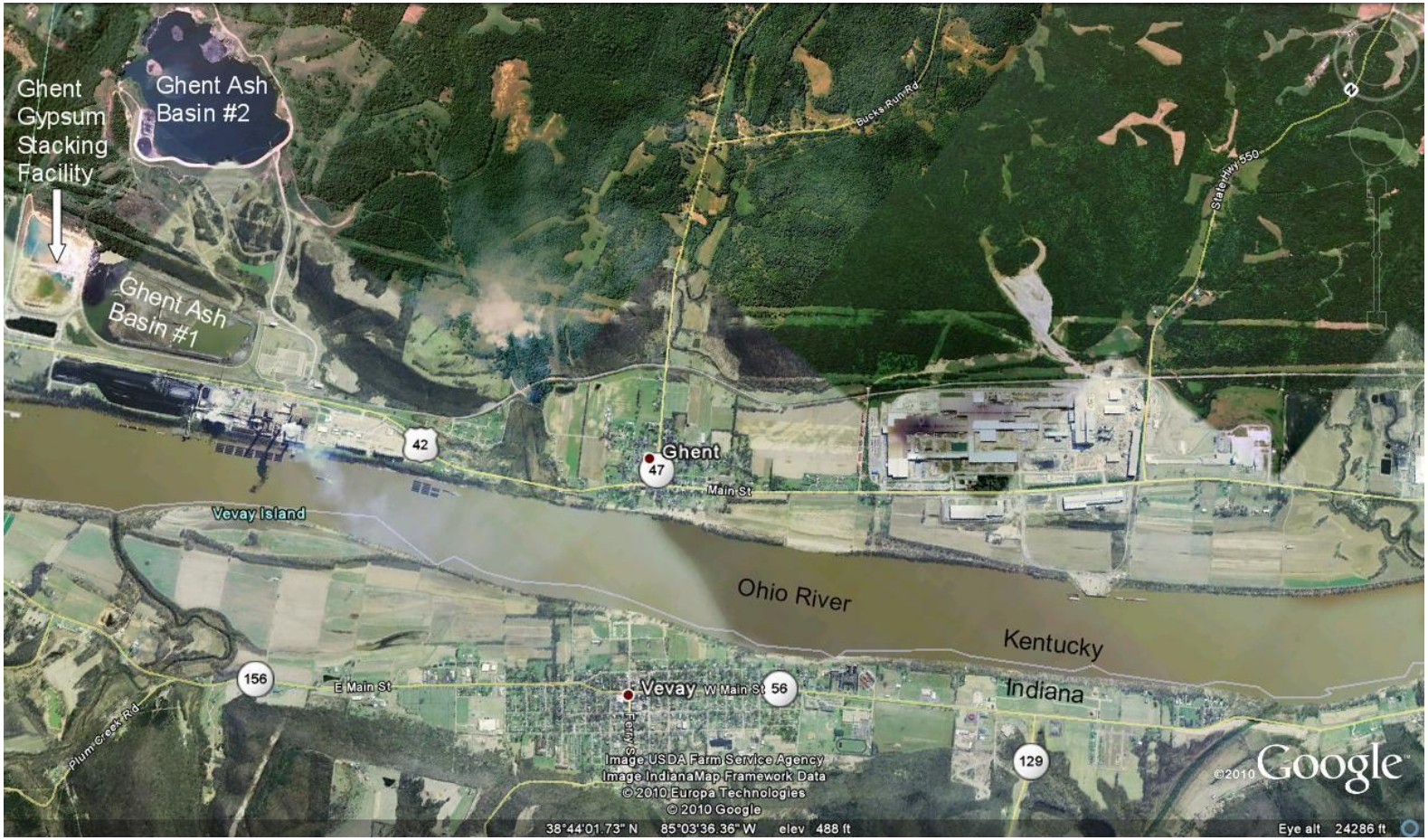
[231] Paul Giannamore, *Cardinal Ash Pond 6th Largest in U.S.*, HERALD STAR ONLINE, Jan. 9, 2009, http://www.hsconnect.com/page/content.detail/id/514213.html?nav=5010.

[232] CLOUGH, HARBOUR & ASSOCIATES (CHA), FINAL REPORT, ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS, AMERICAN ELECTRIC POWER, CARDINAL POWER PLANT 5 (2009), http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys2/aep-cardinal-final.pdf.

[233] *See* RIA Appendix, *supra* note 64, 294-96.



Ghent Ash Basins and Gypsum Stacking Facility: Located in Kentucky, all three of these facilities are rated "high-hazard" by EPA, with ash basin #2 reaching a height of 227 feet.[234] The nearby towns of Ghent, KY and Vevay, IN are only 1-2 miles away, [235] with many schools and churches arranged along the Ohio River.[236] Furthermore, the unlined[237] impoundments contain some of the highest levels of lead, nickel, and thallium in the nation.[238]

[234] CLOUGH, HARBOUR & ASSOCIATES (CHA), FINAL REPORT, ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS, KENTUCKY UTILITIES, GHENT GENERATING STATION 3 (2010), http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys2/eon-ky-ghent-final.pdf.
[235] *Id.* app. A.
[236] *Id.* at 13.
[237] *Id.* app. A.

Havana East Ash Pond System: Located in Havana, IL, this 4-cell impoundment system is only slightly elevated (with dams no higher than 40 feet).[239] Nevertheless, if a dam were to fail, the resulting flood could envelop the immediately adjacent homes and a school within two miles.[240] Also, in 1989, it was discovered that Havana was leaking "as much as [it] held" into the groundwater.[241] At that time, Illinois began to require new impoundments to be lined, but old impoundments like Havana remain unlined, and the state still does not impose any groundwater monitoring requirements on surface impoundments.[242]

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[238] Disaster in Waiting Report, *supra* note 218, at 2; Press Release, Environmental Integrity Project, EIP Report: Other Toxic Coal Pollution Dumps Around the U.S. Pose Greater Potential Danger Than Tennessee Coal Ash Spill Disaster Site 2 (Jan. 7, 2009), http://www.environmentalintegrity.org/pdf/newsreports/2009-01-07-TOXIC.pdf.

[239] Kim McGuire, *Coal Ash Disposal Rules Vary from State to State*, THE SOUTHERN NEWS SERVICES, Jan. 24, 2009, http://www.thesouthern.com/news/article_beb4d263-d133-5820-96b4-ab9e80026126.html.

[240] DEWBERRY & DAVIS LLC, COAL COMBUSTION WASTE IMPOUNDMENT DAM ASSESSMENT REPORT: SITE 18 – HAVANA POWER PLANT, DYNEGY MIDWEST GENERATION, INC. 2-5 (2009), http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys2/havana-final.pdf.

[241] McGuire, *supra* note 239.

[242] *Id.*; *see* RIA Appendix, *supra* note 64, at 294-96.

Cane Run Ash Basin and Landfill: These unlined disposal units (one wet and one dry) are located in Louisville, KY, literally "across the street" from a residential community.[243] Water from the pond is drained continuously into the Ohio River (millions of gallons per year) to prevent overflow.[244] Moreover, Kentucky does not require groundwater monitoring for existing impoundments like this one.[245] Because the landfill is almost full, the utility is planning to add another 60-acre, 14-story-tall landfill, with a clay liner[246] (far less effective than the composite liner required by EPA's proposed rule[247]). At a public hearing, one resident said, "You've got black soot everywhere…I've lived there for 35 years and all I do is watch people die." An old woman "fought back tears as she told the room that she's raised so many kids, her own and the neighborhood's, and is so tired of seeing them all get sick."[248]

[243] CLOUGH, HARBOUR & ASSOCIATES (CHA), FINAL REPORT, ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS, LOUISVILLE GAS & ELECTRIC COMPANY, CANE RUN POWER STATION app. A (2010), http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys2/eon-cane-final.pdf.

[244] *Coal Ash Disaster Prompts New Scrutiny*, OHIO RIVER RADIO CONSORTIUM, Feb. 26, 2009, http://www.ohioriverradio.org/2009/02/coal-ash-disaster-prompts-new-scrutiny.

[245] *Id.*; *see* RIA Appendix, *supra* note 64, at 294-96.

[246] *See* Marisela Burgos, *Proposal to Expand Coal Ash Landfill Upsets Neighborhood Residents*, WAVE3, May 25, 2010, http://www.wave3.com/Global/story.asp?S=12543445; KENTUCKIANS FOR THE COMMONWEALTH, COAL ASH FACT SHEET 2 (2010), http://www.kftc.org/publications/canary/coal_ash_factsheet_8410.doc/view; U.S. Army Corps of Engineers, Louisville District, Public Notice No. LRL-2010-35-mdh (Feb. 12, 2010), http://www.kftc.org/blog/linked-documents/EON%20Cane%20Run%20public%20notice%20w-maps.pdf.

[247] *See* Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,144 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac.

[248] Beth Bissmeyer, *Community Members Organize and Speak Out at Hearing on Coal Ash Landfill*, Kentuckians for the Commonwealth, June 2, 2010, http://www.kftc.org/blog/archive/2010/06/01/community-members-organize-and-speak-out-against-coal-ash-landfill.

Indirect Effects of RCRA Regulation on Beneficial Use

More than any other estimation, the impact of the proposed rule on the beneficial use of coal ash remains the central, inscrutable wild-card in the analysis. Most crucially, the RIA's prediction that the strong option could impose a "stigma" on beneficial use, with far-reaching economic and environmental costs, threatens to discredit the only effective regulatory alternative. This devastating quantitative analysis is especially troubling for several reasons. First of all, the EPA explains that a significant stigma effect is unlikely. Secondly, the RIA's estimation of the stigma effect is thoroughly arbitrary. And finally, the stigma analysis conflates inconsistent models of human behavior by injecting behavioral economics into the framework of traditional CBA, with unforeseen policy implications that could frustrate future regulatory efforts.

Summary of the Analysis in the Proposed Rule

As an alternative to disposal in a landfill or surface impoundment, coal ash is commonly applied to a number of *beneficial uses.* In 2008, almost 37 percent (50.1 million tons) of coal ash was beneficially used, excluding the amount that was placed in mines.[249] The proposed rule ascribes substantial economic and environmental benefits to coal-ash recycling.

The economic benefits are two-fold: beneficial-use industries save costs by purchasing low-priced coal ash from electric utility plants instead of higher-priced raw materials, and the utility plants themselves avoid the costs of disposing coal ash by selling it to the beneficial-use industries. The environmental benefits are largely attributed to avoided air pollution, including reduced emissions of nitrous oxides, particulate matter, and greenhouse gas (GHG). For instance, the use of coal ash as a replacement for Portland cement in the making of concrete may reduce the need for cement manufacturing, with its heavy GHG emissions. Also, the amount of industrial raw materials that have to be mined and processed may be reduced when coal ash is used in place of such materials—for instance, when coal ash takes the place of mined gypsum in the production of wallboard. Finally, beneficial use reduces the amount of coal-ash disposal in limited-capacity and potentially dangerous landfills and surface impoundments.[250]

Beneficial uses can be divided into *consolidated* (or encapsulated) uses, where the ash is bound into products like concrete, wallboard, and bricks,[251] and *unconsolidated* (or unencapsulated) uses, where the ash "has not been chemically fixed within a product."[252] The proposed rule provides that all beneficial uses would retain the Bevill exemption, and thus would not be subject to RCRA regulation.[253] To address the risks presented by damage cases where

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[249] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,151 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac. While the placement of coal ash in minefilling operations presents its own risks of environmental contamination, this proposed rule does not address this "beneficial use." Instead, EPA plans to work with the Office of Surface Mining (OSM) to develop federal regulations on minefilling. *Id.* at 35,165.

[250] *Id.* at 35,154-55; Final Draft RIA, *supra* note 8, at 149, 155-56.

[251] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,154.

[252] Final Draft RIA, *supra* note 8, at 176.

[253] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,160.

coal ash was "beneficially used" as fill material to contour large landscapes, or to fill quarries or gravel pits, the proposal specifies that these two types of use would not be covered by the Bevill exemption, and thus would be subject to the same requirements that apply to coal-ash disposal.[254] To the extent that other unconsolidated uses (like road sub-base or agricultural uses) may include the placement of large amounts of ash on the land, and thus resemble disposal, they may present similar risks to human health and the environment.[255] The EPA is soliciting comments on whether and how to regulate such uses while continuing to promote beneficial use.[256]

Summary of the Analysis in the RIA

The RIA first projects a baseline trend for beneficial use over the next 50 years. Extrapolating from the recent increases in beneficial use, the RIA predicts that the percentage of coal ash that is beneficially used would increase exponentially, reaching 88 percent in 2061, in the absence of regulation. The RIA then considers three scenarios outlining the possible induced effects of RCRA regulation on the amount of beneficial use, as compared to the baseline trend.

In scenario #1, because regulation would increase disposal costs, it may cost less for utility plants to transport their coal ash farther distances, to be beneficially used by other industries, than it would to dispose of it.[257] The RIA predicts a 28-percent increase in beneficial use due to this "avoided disposal cost incentive" under the strong option (subtitle C).[258] The present value of this predicted increase is $84.5 billion in "social benefits" (encompassing economic and environmental benefits) at a 7-percent discount rate.[259] Because the other options would also increase disposal costs, but not to the same extent as the strong option, the RIA assumes smaller increases in beneficial use, and thus smaller amounts of social benefits: $33.8 billion for the weak option (subtitle D), and $13.5 billion for the weakest option (subtitle "D prime").

In scenario #2, regulation under the strong option would "stigmatize" beneficial use. Despite the fact that beneficial uses would be exempt from the regulation, all coal ash would nevertheless be perceived as "hazardous" because *disposed* coal ash would be regulated under subtitle C. As a result, consumer demand for products containing coal ash would plummet due to safety concerns, and the industries that use coal ash would shift to using higher-priced virgin materials due to a fear of liability.[260] The RIA assumes that, if this stigma were to arise, baseline beneficial use would decrease by 51 percent. The present value of this predicted decrease is *negative* $233.5 billion in social "benefits" at a 7-percent discount rate.[261] This scenario does not apply to the other options because subtitle D (non-hazardous solid waste) carries no stigmatizing label.

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[254] *Id.* at 35,161.
[255] *Id.* at 35,160.
[256] *Id.* at 35,161.
[257] Final Draft RIA, *supra* note 8, at 169.
[258] *Id.* at 172.
[259] *Id.* at 149-50, 192.
[260] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186; Final Draft RIA, *supra* note 8, at 169.
[261] Final Draft RIA, *supra* note 8, at 194. The word "benefits" is placed in quotes because these *negative* benefits are essentially costs, even though they are analyzed in the benefits section of the RIA.

In scenario #3, the regulation is expected to have no effect on the baseline trend of beneficial use. Thus, under this scenario, regulation would carry zero net benefits.[262]

Underestimation of the Potential Increase in Beneficial Use

For scenario #1, the RIA predicts a 28-percent increase in beneficial use under the strong option; but it fails to incorporate two crucial market conditions that might significantly contribute to an even larger increase. First, because aspects of RCRA regulation may require utility plants to switch to dry coal-ash management, a much greater amount of dry ash would be available for beneficial use.[263] Secondly, RCRA regulation could stimulate new markets and technologies for beneficial use, as utility plants grow eager to sell (or even give away) increasing amounts of generated ash for beneficial use to avoid higher disposal costs.[264] Crucially, some new technologies, like the use of coal ash in the production of bricks and roofing tiles, have already shown the potential to use considerably more coal ash than other established uses, like the use of ash as a replacement for Portland cement.[265]

The RIA's exclusion of these factors from its quantitative analysis is understandable—these kinds of market evolution are inherently unpredictable, especially over a *50-year* period-of-analysis like the one used in the RIA. Unlike the "avoided cost disposal incentive," these market effects are not amenable to a clever calculation comparing average disposal and transportation costs. But this difference merely reflects CBA's bias toward highlighting those effects that can be easily calculated, while other effects that may be just as determinative are relegated to brief qualifications that fall by the wayside in the final accounting. When the consequences are in the billions of dollars, the focus is a market that is subject to far-reaching innovation and regulation, and the period-of-analysis spans half a century, any numerical predictions about the future become little more than ambitious stabs in the dark. Perhaps the EPA's original Draft RIA appreciated the impracticality of such a prediction, for it declined to quantify the induced increase in beneficial use.[266] Nevertheless, any underestimation of the potential increase in beneficial use under scenario #1 pales in comparison to the staggering and unsupported overestimation of the stigma effect under scenario #2.

Arbitrary Assumptions in the Analysis of the Stigma Effect

While market uncertainties plague the analysis under scenario #1, they operate even more profoundly in the RIA's analysis of the stigma-induced decrease in beneficial use under scenario #2. To fill the information gap, the RIA makes unsupported assumptions that result in predicted *negative* benefits (i.e., costs) so massive that they dwarf all the other estimations in the analysis. That the most significant (and possibly determinative) calculation in the RIA turns out to be the most untenable demonstrates, once and for all, that this RIA is wholly inadequate as a decisionmaking tool.

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[262] *Id.* at 196.
[263] *Id.* at 174.
[264] *Id.*; EPA Review Draft RIA, *supra* note 7, at 134.
[265] *See* Final Draft RIA, *supra* note 8, at 174 n.155; *see also id.* at 165, *citing* Emma Ritch, *CalStar Gives Sneak Peek of Low-Carbon Brick Factory*, CLEANTECH GROUP, Oct. 27, 2009, *available at* http://cleantech.com/news/5217/calstar-flyash-low-carbon-brick.
[266] EPA Review Draft RIA, *supra* note 7, at 134.

The RIA assumes different amounts of stigma-induced reductions for different kinds of beneficial uses. First, consolidated uses of coal ash that are covered under the federal Comprehensive Procurement Guidelines (CPGs) and used in public construction projects are expected to suffer no reductions at all. Federal, state, and local agencies, and their contractors, that use federally procured funds to buy EPA-designated items are generally required to purchase those items that are made from recovered materials (in this case, beneficially used ash). As a result, these uses would not be affected by any market stigma.[267] This assumption is entirely reasonable, given the legal requirements of the CPGs.

Next, private *consolidated* uses (whether covered by the CPGs or not) are assumed to suffer 50-percent reductions due to stigma.[268] The RIA provides absolutely no justification for this amount of reduction. In fact, the RIA seems almost to apologize for such an irresponsible assumption as soon as it makes it. It implies that a reduction of this magnitude is unlikely, considering that consolidated uses like coal-ash concrete (1) often provide performance benefits over equivalent products made without coal ash, (2) provide such benefits at competitive costs compared to virgin materials, and (3) are likely to gain or maintain the approval of Leadership in Energy and Environmental Design (LEED), a green building certification system.[269] Then, the RIA notes that "academic studies of 'stigma' associated with products rarely leads to decreased usage to this extent," although it fails to cite any of these academic studies.[270] In addition, the lack of any evidence of damage from consolidated uses,[271] as well as the continued use by public agencies under the CPGs, would further encourage such uses. Thus, the assumption that consolidated uses would be reduced by 50 percent (or even at all) is highly questionable.

Finally, *unconsolidated* uses are assumed to suffer 80-percent reductions due to stigma because some of these uses might resemble disposal, which would be considered hazardous under the strong option, and they might present similar risks to health and the environment under certain conditions.[272] Thus, these uses "are likely to be particularly sensitive to public concerns and liability concerns."[273] Again, however, there is no justification for the amount of reduction. The RIA decided on 80 percent because it assumed that stigma would play a "significant" role for unconsolidated uses, but not eliminate them altogether, considering how well some of these uses have operated in states with "rigorous beneficial use programs."[274] Where were these generous assumptions in the analyses of the avoided cancer risks and the avoided impoundment spills? Why are those estimations required to show careful restraint, while the stigma estimation, despite its massive impact on the analysis, is permitted to play fast and loose with the numbers?

The lack of support for the 50- and 80-percent reductions is all too apparent: in the RIA Appendix, they are each described as a "reasonable approximation in the absence of information to the contrary."[275] In effect, the RIA applies *as a default* an arbitrary amount of reduction that is

[267] Final Draft RIA, *supra* note 8, at 175-76.
[268] *Id.* at 176.
[269] *Id.* at 176 n.158.
[270] *Id.*
[271] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,154.
[272] Final Draft RIA, *supra* note 8, at 176.
[273] *Id.* at 176 n.159.
[274] *Id.*
[275] RIA Appendix, *supra* note 64, 333-34.

overwhelmingly favorable to industry interests, in that it makes the expected costs of the strong option appear to devastate the expected benefits. Instead of placing the burden of proving such an enormous effect on industry commenters, the RIA places the burden on those who would challenge these numbers to supply "information to the contrary."

When the percentage reductions for consolidated and unconsolidated uses are applied to their respective quantities of beneficially used coal ash, the result is an overall 51-percent decrease in beneficial use.[276] This decrease is expected to go into effect immediately in 2012, and after the market had adjusted, beneficial use is expected to grow at the same rate as the baseline trend—just from a much lower starting point.[277] This expectation implicitly assumes that any stigma effect would be essentially permanent, thus ignoring the possibility that the stigma would fade or disappear altogether as (1) some beneficial uses are proven to be absolutely safe, (2) industry's fear of liability is shown to be unjustified over time, or (3) the countervailing pressures to reduce air pollution and conserve resources eventually outweigh any stigma effect. Any number of market forces could enlarge or reduce the stigma on beneficial use over a period as long as 50 years.

Also, in quantifying the effects of any expected reductions in beneficial use, the RIA treats each beneficial use as an unmitigated positive, despite the health and environmental concerns raised by some kinds of unconsolidated uses.[278] Limited by the current state of knowledge about beneficial use, the RIA chooses to analyze only the loss of economic and environmental benefits resulting from a stigma-induced reduction in beneficial use, without accounting for the value of any avoided risks that accompany such reductions. After all, if some unconsolidated uses are suspicious enough to warrant the assumption of an 80-percent reduction, perhaps there is a prudential silver lining to such a reduction.

The RIA notes that the expected reductions are worst-case assumptions.[279] Not only is this "qualification" entirely unjustified in itself—a "worst-case assumption" is still not a free license to pick an arbitrary number—but it is also incongruent with the treatment of the resulting numbers throughout the RIA and the proposed rule. Indeed, the remaining exhibits and tables in Chapter 5 of the RIA, as well as the cost-benefit comparison tables in Chapter 6, fail to mention the caveat that this is merely a worst-case assumption.[280] Instead, the estimated negative benefits of such a reduction (in the hundreds-of-billions of dollars) are simply incorporated into the numerical comparisons, while the caveat is "left behind."[281] Even if the RIA made it apparent that this was only a worst-case assumption, the lack of a best-case or average-case assumption for scenario #2 leaves the impression that, if the stigma effect materializes, this would be the

[276] Final Draft RIA, *supra* note 8, at 176.
[277] *Id.* at 180. For a graphical comparison of expected beneficial use trends, *see id.* at 183.
[278] Some stakeholders have petitioned the EPA to ban certain unconsolidated uses due to such concerns—for instance, uses where coal ash is placed in direct contact with water bodies. Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,160.
[279] Final Draft RIA, *supra* note 8, at 176 n.158, n.159.
[280] Not unsurprisingly, the only tables that remind the reader that this is a worst-case or conservative assumption are buried in the lengthy and technical Appendix. *See* RIA Appendix, *supra* note 64, 331-35.
[281] *See* Catherine A. O'Neill, *The Mathematics of Mercury*, *in* REFORMING REGULATORY IMPACT ANALYSIS 108, 119 (Winston Harrington et al. eds., 2009) ("[C]aveats may tend to get left behind, whereas the quantitative analysis comes to dominate the public debate.").

expected amount of stigma-induced reduction. Such a limited presentation is inconsistent with the best practices guidance of OMB's 2003 "Circular A-4: Regulatory Analysis" ("OMB's Circular A-4"):

> Worst-case or conservative analyses are not usually adequate because they do not convey the complete probability distribution of outcomes, and they do not permit calculation of an expected value of net benefits…If benefit or cost estimates depend heavily on certain assumptions, you should make those assumptions explicit and carry out sensitivity analyses using plausible alternative assumptions. If the value of net benefits changes from positive to negative (or vice versa) or if the relative ranking of regulatory options changes with alternative plausible assumptions, you should conduct further analysis to determine which of the alternative assumptions is more appropriate.[282]

Indeed, the value of net benefits *does* change from positive to negative solely as a result of this stigma analysis, and so alternative plausible assumptions about the magnitude of any stigma effect would be especially important.

Of course, given the lack of any basis for quantifying this stigma effect, alternative assumptions would be just as arbitrary. The only appropriate way to account for such an effect would have been to discuss it qualitatively—which is precisely what EPA's Draft RIA did.[283] In any event, a significant stigma effect seems unlikely on closer examination of the proposed rule's preamble.

A Significant Stigma Effect Is Unlikely

In generously quantifying the potential stigma effect, the RIA gives considerable credence to the concerns of industry stakeholders, despite the fact that the EPA convincingly neutralizes the threat of stigma in the preamble of the proposed rule. First, *all* beneficial uses would retain the Bevill exemption, even despite concerns about the risks associated with some unconsolidated uses. Secondly, coal ash that is incorporated into a product would not even be considered "waste" in the first place because it would not be destined for disposal; such products would also be subject to long-standing product specifications.[284] Thirdly, to combat the stigma that might accompany a "hazardous waste" label, the proposed rule would list coal ash as a "special waste."[285] Finally, the EPA's "continued promotion" of beneficial use will do much to offset any stigma effect.[286]

The argument that standards-setting organizations will automatically prohibit the use of coal ash in various products upon a subtitle-C designation is merely speculative, and is further weakened by the fact that they currently provide for the use of other hazardous materials.[287] And

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[282] OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 40, 42 (2003), *available at* http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.
[283] EPA Review Draft RIA, *supra* note 7, at 131-32.
[284] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186.
[285] *Id.* at 35,187.
[286] *Id.*
[287] *Id.*

after examining a variety of state regulations, the EPA concludes that its decision to keep the Bevill exemption in place for beneficially used coal ash would likely protect their ongoing use, even in those states whose beneficial-use programs do not allow the use of "hazardous wastes."[288] Finally, the EPA's past experience suggests that listing a material as a hazardous waste (or otherwise regulating it under subtitle C) does not discourage the beneficial use of such materials. Instead, non-regulated uses of the materials typically increase due to the heightened costs of disposal, as in scenario #1.[289] Example after example demonstrates the continued use of such recycled products in both industrial and consumer contexts.[290]

So, despite the preamble's vigorous response to concerns about stigma, the RIA elevates the stigma effect to a level where it seriously jeopardizes the strong option. That is, the RIA's alarmist numbers are in direct conflict with the proposed rule's reassuring words. As a result, the CBA is incongruent with the expertise and informed judgment of the EPA.

Policy Implications of the Stigma Analysis

Not only may the stigma analysis have a disastrous effect on the outcome of this specific rulemaking, but it may also have profound policy implications for future regulatory efforts. For the first time, the industry's fear of liability is quantified in the analysis; such a practice will only complicate and frustrate the development of effective regulation. Secondly, the presumptions underlying the stigma analysis are theoretically inconsistent with the established methods of CBA. Thirdly, the analysis considers the effects of public fear in a way that dismisses their legitimacy and threatens the role of public participation in the regulatory process. Fourthly, only the disastrous economic consequences of public fear are taken into account, while the social benefits of avoiding such fear are ignored. And ultimately, the stigma analysis, if taken to its logical conclusions, would drag countless speculative and incalculable factors into CBA, further undermining its utility as a tool for regulatory decisionmaking.

Quantifying the Industry's Fear of Liability for the First Time

Because the strong option would consider coal ash hazardous when disposed, while considering the same materials non-hazardous when beneficially used, industry commenters are concerned that "this asymmetry increases confusion and the probability of lawsuits, however, unwarranted…."[291] So, even though the legal status of beneficially used coal ash would be totally unchanged, contractors would avoid using recycled-CCR products, despite their substantial cost-saving incentives, fearing potential environmental liability down the line.[292] To address such concerns, the RIA attempts to quantify the effect of this fear of liability by

[288] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,187. There seems to be some disagreement between the proposed rule and the RIA Appendix concerning beneficial use in Florida. The proposed rule states, "However, we are also aware that, in the case of Florida, its state definition of hazardous waste would likely prohibit the beneficial use of CCRs were the co-proposed RCRA subtitle C regulation finalized and were there no change to Florida's definition of hazardous waste." *Id.* The Appendix more convincingly states that "beneficial uses…should remain unaffected" in Florida, noting that Florida's program "turns on EPA's designation" of hazardous wastes, not Florida's. RIA Appendix, *supra* note 64, 315-17.
[289] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186.
[290] *Id.* at 35,186-87.
[291] *Id.* at 35,186.
[292] *Id.*

assuming drastic reductions in the demand for products made with coal ash. This unprecedented analysis suggests that agencies are required to take into account not only the economic and social effects of the actions actually taken by a proposed rule, but also the "unwarranted" responses to regulation by those who either misinterpret or exaggerate the rule's impact.

In effect, agencies would have to address the consequences of both the "legal rule" and the "perceived rule"—with perception, of course, being in the eye of the beholder and subject to intractable uncertainties. To illustrate: how does one predict and *quantify* an industry's fear of liability? Because there is no reasonable answer, the RIA simply assumes that the resulting reductions in beneficial use would come in two sizes—"large" for consolidated uses (50 percent) and "extra large" for unconsolidated uses (80 percent). In other words, the arbitrariness of the means reveals the absurdity of the end. If considered at all, the fear of liability should be considered an "intangible" under OMB's Circular A-4 because it is "inherently too difficult to quantify or monetize given current data and methods."[293]

The existence of the industry's fear of liability is evidenced mainly by the vague claims of the coal-utility and beneficial-use industries themselves.[294] Indeed, the proposed rule exhibits some skepticism, seeking further information on exactly what kinds of liability are feared, and on what information these industries base their claims.[295] Ultimately, the perceivers themselves are the only authorities on how they perceive the rule and how their behaviors may change as a result. Thus, a perceptual CBA would require agencies to quantify unverifiable claims by stakeholders, who are also seeking to protect their own interests, about how they might respond to regulation.

The implications of the stigma analysis could be particularly destructive to health and environmental regulations. In order to effectively control some dangerous material, an agency may have to ban its use or otherwise group it with other strictly regulated materials, whether or not the grouping carries a well-known label (e.g., "hazardous"). Paradoxically, the more stringent or effective the regulation is at controlling the material, the greater the stigmatic fallout could be for materials that are unregulated but somehow associated with the regulated material (by some perceived similarity or by incorporation of the regulated material in a safer context). In this case, the strong option is the only one that will provide federal oversight to ensure nationwide compliance with protective standards for coal-ash disposal, effectively preventing all cancers and impoundment releases.[296] But this option pays the price for being so effective—that is, the EPA cannot accurately characterize the danger posed by disposed coal ash as "hazardous" without also having to assume that such a characterization, by virtue of its intensity, would spread to non-dangerous uses of coal ash. The stigma analysis implies that it would be preferable to allow for lower compliance with the disposal standards under the weak option, and sacrifice the clear benefits of universal compliance, in order to avoid the highly speculative "fear of liability" that might result from stricter standards.

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[293] OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 26-27 (2003), *available at* http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.
[294] *See* Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186.
[295] *See id.* at 35,222-23.
[296] Final Draft RIA, *supra* note 8, at 125.

As this case illustrates, quantifying the industry's fear of liability pulls regulatory efforts toward diluted, middle-of-the-road rules that avoid even the possibility of stigmatizing non-regulated materials by watering down their treatment of the truly dangerous, regulated material. The stigma analysis also places little confidence in the government's ability to clarify the actual implications of its regulations—to eliminate any confusion and alleviate unjustified fears, so that the legal rule and the perceived rule are brought closer together. Instead, it requires agencies to quantify the intangible fears of industries that claim hyper-sensitivity to liability. This opens up the rulemaking process to a whole new category of hyper-responsive economic factors. Why not quantify the expected "fear of investment" in an industry that is about to lose profits due to impending regulation? Why not prepare an internal CBA before deciding to even publicize a regulatory proposal, because the mere suggestion of regulation could harm the industry's reputation and reduce the ancillary benefits of the industry's activities?[297] The limitless implications could present unforeseen hurdles for effective health and environmental regulations.

Conflating Inconsistent Models of Human Behavior

Intertwined with the "fear of liability" factor is the expectation that regulating disposed coal ash under "hazardous waste" standards will trigger unwarranted safety concerns about beneficial-use products among consumers and the general public. Due to this component of the "market stigma," the demand for these products will supposedly drop as the public grows wary of coal ash in all contexts; after all, "people are very concerned about even minute exposures to carcinogenic substances."[298] To justify this stigma hypothesis, EPA's Draft RIA cites an academic study that explores how hazardous-waste contamination stigmatizes property values in neighboring communities, especially when Superfund cleanup is substantially delayed.[299]

In discussing the nuances of stigma, the study cites a classic experiment in which subjects refused to drink a glass of juice after a medically sterilized cockroach was dipped into it.[300] In another classic experiment, even though subjects saw sugar water being poured into a clean jar, they nevertheless refused to drink it after a cyanide label was placed on the jar.[301] These experiments illustrate the basic concept of stigmatization: "[If] risks are perceived as being excessive, people replace calculations of risk versus benefit with a simple heuristic of shunning, the avoidance of the stigmatized object."[302]

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[297] Even before any regulation has been promulgated, commenters from the beneficial-use industry have complained that "uncertainty is already hurting business as customers are switching to products where there is less regulatory risk and potential for environmental liabilities." Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,186.

[298] EPA Review Draft RIA, *supra* note 7, at 132.

[299] WILLIAM SCHULZE ET AL., STIGMA: THE PSYCHOLOGY AND ECONOMICS OF SUPERFUND (2004), *available at* http://yosemite.epa.gov/ee/epa/eerm.nsf/vwGA/8B86459E07EC7DCB85256F4E00672D65, *cited in* EPA Review Draft RIA, *supra* note 7, at 131 n.118. *See also* Baruch Fischhoff, *Defining Stigma*, *in* RISK, MEDIA, AND STIGMA 361, 364-365 (James Flynn et al., eds., 2001) (exploring other explanations for the subjects' behavior, aside from direct stigmatization of the juice).

[300] SCHULZE ET AL., *supra* note 299, at 23-24.

[301] *Id.* at 24.

[302] *Id.* at 23.

The scholarly work of OIRA Administrator Cass Sunstein,[303] borrowing from the field of *behavioral economics*,[304] expresses similar views about the gap between popular and expert risk beliefs.[305] Sunstein posits that "people's reactions to risks are often based mostly on the badness of the outcome, and the vividness of that outcome, rather than the probability of its occurrence."[306] Or, in the words of Rachel Moran, Sunstein "believes that people are 'intuitive toxicologists' who treat risks as all or nothing rather than as part of a spectrum of probabilities."[307] Thus, the presumption underlying the stigma analysis—that people make irrational risk assessments, out of a simplistic desire to avoid perceptually salient risks at all costs—is fundamentally at odds with the presumption underlying the risk-dollar tradeoffs that are so integral to the valuation of health risks in CBA.

Traditional CBA is based on the model of *homo economicus*,[308] who is capable of appraising incremental levels of risk and deriving their monetary equivalents with unparalleled rationality. Not only is he consciously aware of the price he puts on avoiding certain risks, but he also conducts his everyday affairs according to such appraisals, whether he knows it or not, from working at a high-risk job for a certain wage, to spending only a small amount of time to put on a life-saving seatbelt. These presumptions are at the root of stated-preference studies, which use direct questions to determine what people would be willing to pay to avoid risks, as well as revealed-preference studies, which often infer such values by examining people's risk-averting behavior in labor or consumer markets.[309] Both kinds of studies are used to calculate the value of a statistical life (VSL), the value that plays such a central role, for instance, in quantifying the avoided cancer benefits in the proposed rule on coal ash.

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[303] OIRA is located within the Office of Management and Budget (OMB). In the working comments filed by OMB during the interagency review of the draft proposal, OMB urged the EPA to quantify the effect of market stigma on beneficial use. Thus, while the role of Sunstein or OIRA in the development of the final quantitative analysis is unknown, the RIA's quantification of the stigma effect appears to have been largely in response to OMB's critique. INTERAGENCY WORKING COMMENTS ON DRAFT RULE UNDER EO 12866 13 (2010), http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480af0f01.

[304] *See* Benjamin Wallace-Wells, *Cass Sunstein Wants to Nudge Us*, THE NEW YORK TIMES, May 11, 2010, *available at* http://www.nytimes.com/2010/05/16/magazine/16Sunstein-t.html.

[305] *See* Cass R. Sunstein, *The Laws of Fear*, 115 HARV. L. REV. 1119 (2002) (reviewing PAUL SLOVIC, THE PERCEPTION OF RISK (2000)).

[306] *See id.* at 1141.

[307] Rachel F. Moran, *Fear Unbound: A Reply to Professor Sunstein*, 42 WASHBURN L.J. 1, 7 (2002).

[308] John Adams, a critic of cost-benefit analysis, derisively calls him "*Homunculus economicus*":

> [He] is a beady-eyed little fellow who looks after number one…He is extremely well informed, and knows the price of everything, and exactly how much of everything he wants at the prevailing prices. He has a sharp mathematical brain and can re-order his wants in a flash if the price of anything changes…He is a nasty, egotistical little fellow who lurks within all of us, and most of us are thoroughly ashamed of him - but economists equate his behaviour with *rationality*.

JOHN ADAMS, THE ROLE OF COST-BENEFIT ANALYSIS IN ENVIRONMENTAL DEBATES 16, *available at* http://john-adams.co.uk/wp-content/uploads/2006/The%20role%20of%20cost-benefit%20analysis%20in%20environmental%20debates.pdf.

[309] U.S. EPA, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 71-72 (2000), *available at* http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html/$file/Guidelines.pdf.

Thus, the two conceptions of human behavior—we are either sober-minded actuaries or quasi-hysterical worrywarts—are theoretically inconsistent. On the one hand, we clear-headedly decide that, in order to avoid non-fatal cancer, we would pay only 58.3 percent of what we would pay to avoid fatal cancer. On the other hand, when we find out that a product is made with coal ash, which is hazardous only when disposed, we irrationally overreact to the association and decide to shun the product altogether.

This juxtaposition highlights another inconsistency between the two methodologies of modeling human behavior. The willingness-to-pay studies presume participation in the risk-dollar market; that is, survey respondents and observed subjects are not allowed to simply refuse to accept the risk.[310] Meanwhile, the stigma analysis permits the public to withdraw from the beneficial-use market out of exaggerated fear. Because the latter market in fact operates in a free economy in the real world, the allowance is justified—people can choose to buy or reject such products. But there is nothing inherently different about the risk-dollar market that would constrain us to accept those risks. Just because individuals may require the aid of the regulatory system to avoid exposure to large-scale risks, they still may prefer to shun those risks in the same way as they would in real, private markets. The inevitable question arises: what role do the public's subjective fears and concerns play in a regulatory process that is dominated by technocratic risk assessments?

Promoting a Condescending View of Public Fear

The view implied by the stigma analysis and the work of Sunstein is that public fear is no more than a "cognitive mistake," a faulty appraisal of the true risk.[311] Thus, if the regulatory system were to defer to "the public's preoccupations" to any degree, people's intuitive "blunders" would have "harmful consequences for regulatory policy."[312] Of course, "[t]o be effective, regulators must be aware of perceived risk, not only actual risk. But for purposes of policy, what is most important, most of the time, is actual risk rather than perceived risk."[313] This is precisely the approach taken by the RIA. The stigma analysis takes into account the disastrous effects that public fear may have on real economic variables—supply and demand for beneficial-use products—but public fear is neither legitimized as an alternative indicator of "actual risk" nor valued as a social cost to be avoided in its own right.

Another view, espoused by Paul Slovic and Rachel Moran, holds that "lay people bring a 'rival rationality' to the regulatory process."[314] Far more than the series of cognitive errors dismissed by Sunstein, this rival rationality provides a system of values and emotions that can at least supplement the technocratic risk assessments of experts and scientists:

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[310] In contingent-valuation studies, the coerciveness of the interview situation may deter subjects from declining to place a value upon a given risk. Nevertheless, many respondents do note their objections to the nature of the task. JOHN ADAMS, THE ROLE OF COST-BENEFIT ANALYSIS IN ENVIRONMENTAL DEBATES 6-8, *available at* http://john-adams.co.uk/wp-content/uploads/2006/The%20role%20of%20cost-benefit%20analysis%20in%20environmental%20debates.pdf.

[311] Moran, *supra* note 307, at 28.

[312] Sunstein, *supra* note 305, at 1168.

[313] *Id.*

[314] Moran, *supra* note 307, at 1.

> An agency considers only the number of lives at stake, but the general public weighs whether the risk is dreaded, potentially catastrophic, inequitably distributed, involuntary, uncontrollable, new, and faced by future generations. As a result, lay people account for some concerns that experts miss, and the regulatory process should be both democratic and technocratic.[315]

Thus, the coal-ash RIA treats the expected stigma on beneficial use only as an unwelcome economic overreaction, to be minimized at all costs, even though such public wariness may exhibit a valuable rationality of its own.

Indeed, the stigma may be the wisest response to the situation. After all, the risks of many beneficial uses, from melting ice and snow[316] to placing it in the soil to nourish crops,[317] are either unknown or potentially alarming. And yet, just by describing the public's possible avoidance of beneficial use as a "stigma," the RIA actually stigmatizes that reaction by presuming that the real risks could never warrant such a response—despite the dearth of real-risk information in the first place.[318] Professor Vern Walker has cautioned that, especially when the real risk is uncertain, an institution's attempt to prevent or reduce a stigma-like reaction may in fact undermine society's long-established ways of protecting itself.[319] Such interference would be justified only if "it is indeed an instance of stigma, and not just another occasion when nonexpert perceptions of risk differ from those of the experts, and when experts are labeling all dissenters as 'irrational' and 'stigmatizing.'"[320]

Furthermore, the EPA is sending a mixed message by exempting all beneficial uses from hazardous-waste regulation, and yet also questioning the safety of certain unconsolidated uses.[321] One study of stigma confirmed that "the ambiguity and uncertainty of experts, government officials, and the media…leads to doubt and skepticism on behalf of the public,"[322] which then heightens the perception of risk.[323] Much of the speculation about a stigma effect could have been avoided if the EPA had clearly evaluated the risks and uncertainties of various beneficial uses at the outset, instead of leaving them a mystery and guessing how the public will respond to an information vacuum.

So, even though the public cautiousness that arises in the absence of scientific certainty can hardly be called irrational, the RIA not only dismisses the validity of this public fear

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[315] *Id.* at 5-6 (citations omitted).
[316] *See* Katelyn Amen, *Columbia's Cinder Use Raises the Toxicity Question*, THE COLUMBIA MISSOURIAN, Mar. 24, 2010, *available at* http://www.columbiamissourian.com/stories/2010/03/24/toxic-or-not-columbias-cinders-its-hard-say.
[317] Matthew Cimitile, *Is Coal Ash in Soil a Good Idea?*, SCIENTIFIC AMERICAN, Feb. 6., 2009, http://www.scientificamerican.com/article.cfm?id=coal-ash-in-soil.
[318] Vern R. Walker, *Defining and Identifying "Stigma"*, *in* RISK, MEDIA, AND STIGMA 353, 357 (James Flynn et. al. eds., 2001).
[319] *Id.*
[320] *Id.*
[321] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,160-61.
[322] SCHULZE ET AL., *supra* note 299, at 21.
[323] Douglas Powell, *Mad Cow Disease and the Stigmatization of British Beef*, *in* RISK, MEDIA AND STIGMA 219, 222 (James Flynn et. al. eds., 2001) ("The public expresses a much broader notion of risk, one concerned with, among other characteristics, accountability, economics, values, and trust").

outright, but also uses this fear to undermine the benefits of the strong option by predicting disaster for the beneficial-use industry.

Threatening the Role of Public Participation in the Regulatory Process

Once public fears are characterized as irrational, out of control, and potentially disastrous, the desire to keep the public in the dark about health and safety risks cannot be far behind. For example, how easily would the government decide to disclose new evidence about the risks of beneficial use, when any suggestion of a danger could lead to excessive market stigma and the loss of environmental benefits valued in the hundreds-of-billions of dollars? Sunstein himself makes the connection: "If bad news is more salient than good news, and if people are intuitive toxicologists, there is a risk than high levels of public participation in highly technical domains will [simply] increase public fear, with unfortunate consequences for policy."[324] By contrast, the "rival rationality" approach preserves a crucial role for public participation in the regulatory process.

Dwelling on the Economic Costs of Public Fear While Disregarding Its Social Costs

The RIA's stigma analysis treats fear only as a means to an end—it is a subject of concern only because people may behave differently as a result of it. Thus, the industry's fear of liability and the public's fear of contamination are quantified only through their predicted effects on the beneficial-use market. Meanwhile, the "dread" experienced by those who live near unregulated CCR disposal units—whether they are perpetually anxious about insidious groundwater contamination or they live in fear of an impoundment spill—is unaccounted for. Lisa Heinzerling has detailed the significant physical, psychological, sociological, and even political costs of long-term dread.[325] And yet the social benefit of avoiding this public fear is not considered in the RIA, while the costly market effects of public fears about beneficial use are given great respect. RIAs are intended to capture both the economic *and* social effects of regulation, but this narrow consideration of fear betrays a systematic bias toward the economic effects.

Not that the public's fears should be quantified and monetized along with their effects on economic variables. Putting a dollar value on dread, with all the dubious assumptions and moral issues that would accompany such a calculation, is certainly not the solution.[326] Instead, neither

[324] Sunstein, *supra* note 305, at 1161.
[325] *See* Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025 (1999).
[326] The FDA's rulemaking on the acceptable defect rate of medical gloves provides an illustration of how uniquely problematic the pricing of fear can be. The FDA attempted to quantify and monetize the anxiety experienced by medical workers while waiting for the results of a blood screening test after perceiving a glove defect. The FDA took the value of a Quality-Adjusted Life Year (QALY), divided it by 365 to obtain the value of a quality-adjusted day of life, and then assumed that stress and anxiety from possible exposure to pathogens would reduce one's sense of well-being by 1.3 percent. The resulting value of the anxiety-reduction benefit turned out to be only $13 per screening test. Matthew D. Adler, *Fear Assessment: Cost-Benefit Analysis and the Pricing of Fear and Anxiety*, 79 CHI.-KENT L. REV. 977, 979-80 (2004) (quoting Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. 15,404, 15,413 (proposed Mar. 31, 2003) (to be codified at 21 C.F.R. pt. 800)). Despite this real-world example, Adler in fact argues that fear assessment *should* be incorporated into CBA and proposes several ways to monetize it. *Id*.

fear nor its anticipated economic effects should be quantified; both should be analyzed qualitatively.

Introducing Countless Speculative and Incalculable Factors into CBA

In quantifying the effect of stigma on beneficial use, the RIA ignores the incalculable and unpredictable nuances that shape the growth of public fear. For instance, the magnitude of the stigma would depend on perceptual cues, governmental communication, and the extent of media coverage on the risks of beneficial use[327]—factors that could never be predicted in and of themselves with any accuracy, much less the subtle effects that they could have on public fear, and the resulting effects of that fear on market variables.

In sum, the RIA's stigma analysis brings new factors and principles into the practice of regulatory analysis that could threaten effective risk regulation, introduce intractable uncertainties into the estimations, and clash with the theoretical underpinnings of traditional CBA. Indeed, the implications of these developments for future regulatory efforts are unforeseeable. But considering the controversies that already surround CBA, the addition of more complications and imbalances will only exacerbate its inadequacy and widen the gap between the public conception and the reality of the regulatory process.

Comparison of Regulatory Options and Distributional Effects

Most of the discussion thus far has focused on the costs and benefits of the strong option, mainly because those are the only figures that the RIA estimates "from scratch." The RIA then simply derives the figures for the weak and weakest options by estimating what portion of the "full" costs and benefits would be realized under them. However, in these derivations, the RIA not only overestimates the effectiveness of these options, but also ignores the *distributional* effects of its own prediction: first, by failing to disclose a clear breakdown of its expected pattern of state implementation; and second, by disregarding the environmental-justice implications of that pattern. Ultimately, the speculative and underdeveloped comparison of regulatory options further cements the RIA's bias in favor of the weak option.

How the RIA Derives the Costs and Benefits of the Weak Option

The strong option would require all states to adopt cradle-to-grave requirements for coal ash that are no less stringent than the federal program.[328] Because a subtitle-C listing would establish consistent, federally enforceable standards, the RIA assumes that 100 percent of the estimated compliance costs and avoided-risk benefits would be realized under the strong option.[329]

By contrast, under the weak option (subtitle D), the implementation of requirements for coal-ash disposal would be left entirely in the hands of state and local governments, with the

[327] SCHULZE ET AL., supra note 299, at 21-23.
[328] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. 35,128, 35,136, 35,157-58 (proposed June 21, 2010) (to be codified at 40 C.F.R. pts. 257, 261, 264, 265, 268, 271, 302), *available at* http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480b06eac.
[329] Final Draft RIA, *supra* note 8, at 198-203.

federally promulgated guidelines serving only to "establish the overall regulatory direction."[330] In states that choose not to adopt the federal requirements, compliance with subtitle-D standards can be enforced only sporadically by expensive citizen suits.[331] Thus, even though many of the disposal requirements are substantially similar under both regulatory options, the RIA scales down the costs and the benefits that would be realized under the weak option because the EPA expects much lower *compliance* with its largely unenforceable standards.[332]

In order to estimate the level of compliance under the weak option, the RIA predicts that states with an existing framework for regulating coal ash—specifically, states that already impose any groundwater monitoring requirements on surface impoundments—will upgrade their programs to reflect the new subtitle-D standards.[333] Of the approximately 149 million tons of coal ash disposed every year, 48 percent is disposed of in this subset of states.[334] Thus, because the RIA assumes that these 71.5 million tons will then be subject to stringent requirements preventing groundwater contamination, the RIA applies this "scaling factor" and concludes that 48 percent of the full costs and benefits, for most categories, will be realized under the weak option.[335]

Overestimating the Level of Compliance under the Weak Option

First of all, it is far too generous to assume that all these states will automatically adopt a whole host of engineering controls, including liner requirements, rainwater run-off controls, and

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[330] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,136.
[331] *Id.* at 35,136.
[332] Final Draft RIA, *supra* note 8, at 198-203.
[333] *Id.* at 124.
[334] *Id.* at 123-24; RIA Appendix, *supra* note 64, 294-96.
[335] Final Draft RIA, *supra* note 8, at 198-99. For the benefits of avoiding impoundment spills under the weak option, the RIA actually applies a 45-percent scaling factor. However, it provides two fundamentally inconsistent explanations for this value. First, it uses the quantity of coal ash that is disposed of in states with some groundwater monitoring requirements (48 percent) as "a proxy for the phase-out of existing impoundments." *Id.* at 145. Then, because 5.5 percent of impoundments already have composite liners, they would not have to close, even in states that implement the subtitle-D phase-out. *Id.* at 147. Taking 48 percent of the 94.5 percent of impoundments that would have to be closed yields a scaling factor of 45 percent. *Id.* However, the RIA later invents a completely different and confusing rationale—one that not only contradicts the reasoning of the first explanation, but also seems to be discussing the avoided costs of *closing* impoundments instead of the avoided cleanup costs of impoundment failures:

> This factor is not based on estimates of ages of states likely to implement the new requirements (which for subtitle D would require liners for existing surface impoundments); it is unlikely that many states will choose to implement this requirement. Instead, compliance will not be enforceable, and will be left up to self-imposed schedules of industry or citizens suits. While most impoundments may eventually close, it will be a lengthy process. As a general estimate, through delaying closures and lengthening the process, industry may be able to reduce costs by 50 percent. In addition, since 5.5 percent of surface impoundments have composite liners already, they would remain in place, and therefore would not incur costs. Taking these figures together, this RIA applies a 45 percent scaling factor for this benefit.

Id. at 203. Because only the first explanation makes any sense, it seems clear that the scaling factor for avoided-spills benefits has its origins in the same predicted pattern of state implementation that determines the 48-percent scaling factor for the other benefits and costs.

disposal unit location restrictions,[336] simply because they currently impose even the most basic groundwater monitoring requirements on surface impoundments. According to the RIA, the subset of states with groundwater monitoring programs is a "reasonable surrogate indicator" of the amount of coal ash that might be managed under new standards because it "indicates which states will generally address specific units."[337] But a state's willingness to address specific units for one purpose (groundwater monitoring) in no way implies a willingness to further impose a comprehensive set of requirements that touch on countless other aspects of coal-ash disposal.

Moreover, by selecting the most inclusive statistic for states with groundwater monitoring requirements, the RIA likely overestimates the number of states that would adopt even the far more stringent monitoring requirements (aside from the other engineering controls) suggested by the weak option. Indeed, while 48 percent of coal ash is disposed of in states that require some degree of groundwater monitoring, only 12 percent is disposed of in states that require monitoring for both new *and* existing surface impoundments. The rest of the 48 percent (36 percent) is disposed of in states that require monitoring only for *new* surface impoundments.[338] To expect states that currently impose no requirements at all on existing facilities to so readily adopt new standards for them is to rely on wishful thinking. Why would these states be expected to so readily amend their status-quo regulatory compromises "simply because EPA issued national rules"?[339]

Ignoring the Distributional Effects of the Predictions under the Weak Option

Even if the 48-percent scaling factor were a reasonable estimate of the *level* of compliance under the weak option, the RIA fails to consider how that compliance is *distributed* throughout the nation. As a result, the RIA also ignores how that distribution would disproportionately burden low-income, minority, and child populations—in other words, the *environmental-justice* (EJ) implications of the expected pattern of compliance.

Obscuring the Predicted Pattern of State Implementation

By emphasizing only the quantity of coal ash that is expected to be managed under the new standards, the RIA conveniently avoids presenting a clear breakdown of which states are expected to adopt, or not adopt, the subtitle-D requirements—save for a confusing table in the Appendix that reports groundwater-monitoring requirements by state.[340] However, that table provides the data necessary to compile lists of both groups of states, as displayed in Table 4 below. Even a brief consideration of the expected state-wise distribution below reveals insights that are lacking from the simple 48-percent scaling factor.

[336] *See id.* at 68-69 (listing all the engineering controls included in the rule's provisions).
[337] *Id.* at 199.
[338] *Id.* at 123-24.
[339] *Id.* at 124.
[340] RIA Appendix, *supra* note 64, 294-96.

Table 4: The RIA's Expected Distribution of State Implementation under the Weak Option

Subset A States Expected to Implement Subtitle-D Requirements (17 states) (48 percent of disposed tonnage)	**Subset B** States *Not* Expected to Implement Subtitle-D Requirements (30 states) (52 percent of disposed tonnage)
Colorado	Alabama
Florida	Alaska
Kentucky	Arizona
Louisiana	Arkansas
Michigan	California
Minnesota	Connecticut
Missouri	Delaware
North Carolina	Georgia
North Dakota	Hawaii
Nevada	Illinois
New York	Indiana
Oklahoma	Iowa
Pennsylvania	Kansas
South Carolina	Maine
Utah	Maryland
West Virginia	Massachusetts
Wisconsin	Mississippi
	Montana
	Nebraska
	New Hampshire
	New Jersey
	New Mexico
	Ohio
	Oregon
	South Dakota
	Tennessee
	Texas
	Virginia
	Washington
	Wyoming
Note: Because there are no coal-fired electric utility plants in Idaho, Rhode Island, Vermont, and Washington, D.C., these areas are not listed in either subset above.	

While the scaling factor seems to imply that the weak option would provide up to half of the benefits of the strong option, on the basis of tonnage alone, these avoided-risk benefits would be realized only in the 17 states that are expected to adopt the requirements ("Subset A"). In the 30 other states that have coal-fired electric utility plants, but which are not expected to adopt the requirements ("Subset B"), the risks posed by coal ash are expected to remain unchanged.[341] It is also somewhat ironic that Tennessee, the site of the devastating Kingston spill that kick-started this rulemaking in the first place, is included in Subset B. But these distributional effects are not merely geographical: they also signify the disproportionate impacts that the weak option could have on various demographic groups.

Cutting Costs by Leaving Low-Income, Minority, and Child Populations in Danger

To be sure, in an effort to evaluate the EJ implications of coal-ash regulation, the RIA goes to great lengths to quantify the proportions of certain demographic groups that live in the areas surrounding coal-fired power plants. However, it performs these calculations only for the country as a whole (all 47 states that have coal-fired power plants).[342] While this provides a reasonable approximation of distributional effects under the strong option, which would guarantee compliance in every state, it is of little assistance in evaluating the impact of spotty compliance under the weak option. This is in direct conflict with the best practices guidance of OMB's Circular A-4, which advises, "You should be alert for situations in which regulatory *alternatives* result in significant changes in treatment or outcomes for different groups" (emphasis added).[343] Ultimately, the RIA's expected breakdown of state implementation under the weak option, so central to its estimation of costs and benefits, is nowhere reflected in its distributional analysis.

Fortunately, the RIA's analysis provides all the population data needed to compute the concentrations of low-income, minority, and child populations that live around coal utility plants in Subset A and Subset B.[344] These results are presented below in Table 5, in terms of the same ratios and percentages that the RIA employs for the country as a whole. The figures for each subset were computed by following the RIA's calculation steps, but including only the data for the states in that particular subset (rather than for all the states in the nation).

Keeping in mind that the RIA expects the weak option's protective guidelines to be implemented only in Subset A, one can discover the EJ implications of this distribution—

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[341] In an attempt to soften this sharply drawn distinction, the RIA points out that some of the Subset-B states may nevertheless choose to implement the subtitle-D requirements, or even that some *facilities* in states without regulatory programs might voluntarily comply with the federal guidelines, and that some of the Subset-A states might not upgrade their regulatory programs all the way. Final Draft RIA, *supra* note 8, at 199-200. But aside from this qualification, the RIA's calculations consistently rely on the strict assumption that only states with some groundwater monitoring requirements (Subset-A states) will implement subtitle-D requirements. Thus, it is justifiable to rely on the same assumption in teasing out the distributional effects implied by the RIA's expectations.

[342] *See* Final Draft RIA, *supra* note 8, at 216-36.

[343] OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 14 (2003), *available at* http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

[344] *See* Final Draft RIA, *supra* note 8, at 216-36; *see generally* The Sierra Club, Map Displaying Poverty Levels Around EPA High Hazard Coal Ash Waste Sites, Google Maps, https://secure2.convio.net/sierra/site/Advocacy?cmd=display&page=UserAction&id=2513 (follow hyperlink below small map) (Feb. 1, 2010).

whether these demographic groups would receive more or less of the regulatory health and safety benefits than the population at large—by determining whether these groups fall disproportionately into one subset or the other.

Table 5: Demographic Groups Surrounding Coal-Fired Electric Utility Plants[345]

Demo-graphic Group	Demographic Statistics Comparison Method		Subset A States Expected to Implement Subtitle-D Requirements (17 states)	Subset B States *Not* Expected to Implement Subtitle-D Requirements (30 states)
Low-Income		Plant-by-plant ratio	1.01	1.13
	Subset-wide	Population percentage	12.1%	13.5%
		To national average	1.02	1.14
		To expected state avg.	+8.5%	+28.0%
Minority		Plant-by-plant ratio	0.30	0.49
	Subset-wide	Population percentage	16.2%	26.2%
		To national average	0.65	1.05
		To expected state avg.	-16.4%	+23.0%
Child		Plant-by-plant ratio	1.57	1.81
	Subset-wide	Population percentage	24.3%	27.0%
		To national average	0.98	1.09
		To expected state avg.	+1.2%	+9.2%

Notes (using "low-income" and "Subset A" for purposes of illustration):

- Plant-by-plant ratio: An indication of how many *plants* within Subset A have disproportionate surrounding low-income populations. Specifically, the ratio is X/Y, where:
  - X = The number of plants in Subset A with surrounding low-income populations that *exceed* the statewide low-income benchmark percentage
  - Y = The number of plants in Subset A with surrounding low-income populations that are *below* the statewide low-income benchmark percentage
- Subset-wide:
  - Population percentage: The percentage of the plant-surrounding *population* within Subset A that is low-income.
  - To national average: The ratio of the above "population percentage" to the national low-income benchmark average across all states.
  - To expected state avg.: The ratio of the low-income population that surrounds plants within Subset A to the *expected* low-income population based on statewide averages. For example, there are +8.5 percent more low-income residents near the plants in Subset A than would be expected according to statewide low-income population averages.

[345] A spreadsheet demonstrating how these figures were calculated is on file with the authors.

While the metrics used in Table 5 are technically dense, one trend is clear: for virtually every comparison method, the Subset-B states contain disproportionately higher concentrations of each demographic group in the areas surrounding coal-fired power plants, as compared to the Subset-A states. For example, within Subset A, minorities are actually *under-represented* around coal utility plants, as compared to their statewide ages (by 16.4 percent). By contrast, within Subset B, minorities are significantly *over-represented* around plants (by 23.0 percent). The other demographic groups are somewhat over-represented around plants in both subsets, but to a far greater degree in Subset B than in Subset A.

In addition, for each of the three demographic groups, the RIA lists the five states with the largest difference in the group's population density around the plants compared to the group's statewide percentage. These states are arguably the ones where low-income, minority, and child populations are the most disproportionately likely to live around the plants.[346] And it just so happens that Subset B includes all of these "top five" states for each of the demographic groups.

Thus, if the EPA's expectations about the patterns of state implementation are to be taken seriously, the weak option would leave low-income, minority, and child populations disproportionately vulnerable to the health and safety risks posed by coal-ash disposal units. Of course, this outcome is hardly surprising. After all, the RIA openly expects the weak option to improve the level of regulation in states that are already addressing the risks of coal ash in some way; and it further admits that it is unlikely to have much effect in states with no regulatory framework for this issue.[347] In other words, populations in states with some regulatory controls would be more protected than before, while populations in states with no regulatory controls would still be completely unprotected. The RIA essentially implies that the weak option would exacerbate the already-inequitable patterns of protective regulation among the states. Already, low-income, minority, and child populations are more likely to suffer from those existing inequities, probably due to their relative lack of political power and socioeconomic influence, as compared to more advantaged groups. So, a regulatory option that would intensify such a pattern would naturally amplify this disproportionate impact.

From the outset, it is somewhat disturbing that the weak option should be made to seem more attractive than the strong option, simply by virtue of the cost-savings that result from incomplete compliance. There is something inherently inconsistent about devising minimum requirements that will adequately protect human health and the environment, and then determining that a partial, arbitrary implementation of such requirements is not only sufficient, but perhaps even optimal from a cost-benefit standpoint. But far more troubling is the way that those quantitative cost-savings obscure the expected distributional effects of the weak option.[348]

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[346] For low-income populations, the five states with the largest disparities are (1) Mississippi, (2) Alabama, (3) Illinois, (4) New Jersey, and (5) Connecticut. For minority populations, the five states are (1) Connecticut, (2) Arizona, (3) Oregon, (4) Tennessee, and (5) Kansas. For child populations, the five states are (1) Oregon, (2) Hawaii, (3) New Mexico, (4) Arizona, and (5) California. Final Draft RIA, *supra* note 8, at 224-25, 235-36.

[347] Final Draft RIA, *supra* note 8, at 124, 203.

[348] *See* Wendy E. Wagner, *The CAIR RIA: Advocacy Dressed Up as Policy Analysis*, *in* REFORMING REGULATORY IMPACT ANALYSIS 56, 78 (Winston Harrington et al. ed., 2009) ("[T]he distributional implications of alternatives are critical to policy analysis and are missing in the standard methodology of aggregating costs and benefits.").

Are those cost-savings still desirable, even if they are the result of leaving low-income, minority, and child populations disproportionately at risk from the dangers of unregulated coal ash?

How the RIA Derives the Costs and Benefits of the Weakest Option

Finally, just as the RIA obtains the costs and benefits for the weak option by scaling down the estimates for the strong option by a certain amount, it obtains the benefits for the weakest option (subtitle "D prime") by scaling down the estimates for the weak option. The weakest option is just like the weak option, except it would not require existing surface impoundments to close or install composite liners, instead allowing them to operate for the rest of their useful lives.[349] The RIA assumes that the benefits of the weakest option will fall somewhere in between the benefits of the weak option and the baseline scenario.

In lieu of any sophisticated estimation, the RIA simply calculates the benefits of the weakest option as the *midpoint* values between the weak option and the baseline.[350] Thus, the RIA concludes that the weakest option will avoid 30 percent of cancers and 23 percent of impoundment-failure cleanup costs.[351] It justifies this conclusion by predicting that states will in fact impose requirements on existing impoundments that go beyond the scope of the federal standards, due to the mere "presence of a new national rule accompanied by EPA support."[352] The absurdity of such an assumption speaks for itself.

But more importantly, the simple midpoint calculation for the weakest option, combined with the lack of attention given to the option throughout the proposed rule and the analysis, confirms that the weakest option is presented only to make the weak option look like the moderate choice. Not only does the weak option avoid the disastrous stigma on beneficial use that plagues the strong option, and thus provide a much safer and more predictable range of net benefits, but it also provides substantially greater benefits than the barely-discussed weakest option. Thus, the scaling and comparison of the regulatory options puts the finishing touches on the RIA's relentless campaign to drive the decision toward the weak option.

Conclusion

Far from providing an impartial assessment of regulatory alternatives, the RIA exhibits a pervasive bias toward the weak option favored by industry. As it systematically underestimates the benefits of the strong option (subtitle C) and saddles it with an unprecedented stigma prediction, it also exaggerates the effectiveness of the weak option (subtitle D) and presents it as a safer compromise. Moreover, the esoteric CBA obscures the value judgments underlying every step of the analysis and imparts a false sense of objectivity to the results.

This rulemaking provides the first opportunity to eliminate the glaring health and environmental risks posed by coal ash. The EPA must not allow this RIA, the product of OIRA's intervention and industry pressure, to squander that opportunity.

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[349] Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule, 75 Fed. Reg. at 35,134.
[350] Final Draft RIA, *supra* note 8, at 124, 141, 198-203.
[351] *Id.* at 199.
[352] *Id.* at 124.

Appendix: Magnitude of the RIA's Errors in Avoided-Spill Benefits

The tables on the following pages demonstrate how to calculate the amounts of benefits ($881 million and $19.6 million) lost due to errors in the analysis of spills:

Table 6: This table replicates the RIA's calculation of the avoided costs from spills—using the erroneous 15-year period and only 5 significant spills. The fact that it arrives at the same result as the RIA confirms that the table's methods of calculation are accurate.[353]

Present value of avoided costs (PV1) = $1,761,630,067

Table 7: This table displays the same calculations as Table 6, still with only 5 significant spills, but uses the corrected 10-year period reflected in the survey question sent to utility companies.

Present value of avoided costs (PV2) = $2,642,445,101
PV2 – PV1 = $880,815,034 = **$881 million**

Table 8: This table displays the same calculations as Table 7, with the corrected 10-year period, but also updates the number of significant spills to 6, incorporating the 2-million-gallon spill at Bowen Power Station.

Present value of avoided costs (PV3) = $2,662,037,616
PV3 – PV2 = $19,592,515 = **$19.6 million**

The first step of the calculation involves computing an average spill rate (column C) by dividing the number of spills observed (column B) by the number of years in the relevant time period. The RIA uses a Poisson distribution to estimate the frequency of future spills, and the lambda-value (λ) of this distribution represents the average spill rate—or the average number of spills expected per year (column E).[354] Then, for each kind of spill (catastrophic and significant), multiplying the expected number of spills per year (column E) by the cost associated with that kind of spill (column F)[355] yields the expected cost of spills per year (column G). Adding together the costs for catastrophic and significant spills, one can obtain the *total cost of spills per year* (T).

Then, the RIA adjusts the expected costs downward to account for the surface impoundments that would be phased out by the utility industry voluntarily, even in the absence

[353] Actually, in the interest of full disclosure, the result of Table 1 is $1,761,630,06**7**, while the RIA's result is $1,761,630,06**4.** RIA Appendix, *supra* note 64, at 312-13. The 3-dollar discrepancy is likely attributable to rounding differences.
[354] Final Draft RIA, *supra* note 8, at 136-39.
[355] *Id.* at 139.

of regulation, because they would represent avoided spills that could not be attributed to regulation. The RIA assumes an annual phase-out rate of approximately 1.3 percent and illustrates for each year the percentage of coal ash that is still expected to be disposed wet (column I).[356] The total cost of spills per year (T) is multiplied by each of these ages (column I)[357] to obtain the *adjusted cost of spills* (column J).

Finally, the adjusted costs must be discounted using an annual 7-percent social discount rate—the base-case discount rate used by the RIA to compute its final accounting of costs and benefits.[358] The formula for calculating the discount-rate multiplier for each year is:

$$\frac{1}{(1+r)^t}$$

where *r* is the annual discount rate (7 percent) and *t* is the number of years from the present. Because the RIA applies a 50-year future period of analysis (2012-2061),[359] the base year is 2012. Thus, the multipliers for each year (column K) can be computed by the following:

$$\frac{1}{1.07^{Year-2012}}$$

Multiplying the adjusted cost of spills by the 7-percent discount multiplier yields the *present value* (column L). Summing the present values for each year, one can obtain the present value (PV) of the expected costs of spills predicted to occur over the next 50 years—costs that could be avoided by regulation. The highlighted value, in each table displayed below, represents the estimated benefit of avoiding surface-impoundment spills.

[356] *Id.* at 140. The exact phase-out rate is difficult to infer from the RIA, and Exhibit 5B-5 does not display the unrounded percentages. So, in order to obtain the most reasonably accurate percentages of wet-disposed coal ash, I back-calculated the percentages from the RIA's yearly present values (column L), Table L.2, RIA Appendix K11, at 312-313, by dividing them by their respective 7-percent discount multiplier (column K) and then dividing again by the total cost of spills per year (T). When rounded, these percentages match those listed in Exhibit 5B-5. *See id.*

[357] The years begin at 2015 because, according to the RIA, "no costs are attributed to 2012-2014 as the rule will not be adopted and implemented until 2015." Final Draft RIA, *supra* note 8, at 140.

[358] *See id.* at 10-12.

[359] *Id.* at 8.

Table 6: The RIA's Calculation of Avoided Costs from Spills Using Erroneous 15-year Period and 5 Significant Spills

A	B	C (B/15)	D (Cx50)	E (D/50 years)	F	G (ExF)
Type of Spill	Num. Observed over "15 years"	Avg. Spill Rate (λ)	Num. of Spills over 50 yrs.	Num. Spills per Year = λ	Cost per Spill	Cost of Spills per Year
Catastrophic	1	0.0666667	3.333333	0.0666667	$3,000,000,000	$200,000,000
Significant	5	0.3333333	16.666667	0.3333333	$23,100,000	$7,700,000
				Total Cost of Spills per Year (T)		**$207,700,000**

H	I	J (IxT)	K	L (JxK)
Year	% Ash Disposed Wet	Adjusted Cost of Spills	7% Discount Multiplier	Present Value
2015	86.9292654%	$180,552,084	0.816297877	$147,384,283
2016	85.6222916%	$177,837,500	0.762895212	$135,671,377
2017	84.3153184%	$175,122,916	0.712986179	$124,860,219
2018	83.0083452%	$172,408,333	0.666342224	$114,882,952
2019	81.7013714%	$169,693,748	0.622749742	$105,676,738
2020	80.3943979%	$166,979,164	0.582009105	$97,183,394
2021	79.0874244%	$164,264,580	0.543933743	$89,349,048
2022	77.7804515%	$161,549,998	0.508349292	$82,123,827
2023	76.4734781%	$158,835,414	0.475092796	$75,461,561
2024	75.1665039%	$156,120,829	0.444011959	$69,319,515
2025	73.8595309%	$153,406,246	0.414964448	$63,658,138
2026	72.5525568%	$150,691,660	0.387817241	$58,440,824
2027	71.2455841%	$147,977,078	0.36244602	$53,633,703
2028	69.9386098%	$145,262,493	0.338734598	$49,205,432
2029	68.6316374%	$142,547,911	0.31657439	$45,127,018
2030	67.3246627%	$139,833,324	0.295863916	$41,371,635
2031	66.0176903%	$137,118,743	0.276508333	$37,914,475
2032	64.7107155%	$134,404,156	0.258419003	$34,732,588
2033	63.4037439%	$131,689,576	0.241513087	$31,804,756
2034	62.0967689%	$128,974,989	0.225713165	$29,111,353
2035	60.7897955%	$126,260,405	0.210946883	$26,634,239
2036	59.4828218%	$123,545,821	0.19714662	$24,356,641
2037	58.1758482%	$120,831,237	0.184249178	$22,263,056
2038	56.8688768%	$118,116,657	0.172195493	$20,339,156
2039	55.5619032%	$115,402,073	0.160930367	$18,571,698
2040	54.2549276%	$112,687,485	0.150402212	$16,948,447
2041	52.9479557%	$109,972,904	0.140562815	$15,458,101
2042	51.6409811%	$107,258,318	0.131367117	$14,090,216
2043	50.3340095%	$104,543,738	0.122773007	$12,835,149
2044	49.0270362%	$101,829,154	0.114741128	$11,683,992
2045	47.7200623%	$99,114,569	0.107234699	$10,628,521
2046	46.4130870%	$96,399,982	0.100219345	$9,661,143
2047	45.1061151%	$93,685,401	0.093662939	$8,774,850
2048	43.7991413%	$90,970,817	0.087535457	$7,963,172
2049	42.4921687%	$88,256,234	0.081808838	$7,220,140
2050	41.1851962%	$85,541,653	0.076456858	$6,540,246
2051	39.8782239%	$82,827,071	0.071455008	$5,918,409
2052	38.5712474%	$80,112,481	0.066780381	$5,349,942
2053	37.2642713%	$77,397,891	0.062411571	$4,830,524
2054	35.9573010%	$74,683,314	0.058328571	$4,356,171
2055	34.6503311%	$71,968,738	0.054512683	$3,923,209
2056	33.3433567%	$69,254,152	0.050946433	$3,528,252
2057	32.0363835%	$66,539,569	0.047613489	$3,168,181
2058	30.7294028%	$63,824,970	0.044498588	$2,840,121
2059	29.4224290%	$61,110,385	0.041587465	$2,541,426
2060	28.1154639%	$58,395,818	0.03886679	$2,269,658
2061	26.8084920%	$55,681,238	0.036324103	$2,022,571
		Present Value of Avoided Costs (PV1)		**$1,761,630,067**

Table 7: Modified Calculation of Avoided Costs from Spills Using Corrected 10-year Period (still only 5 significant spills)

A	B	C (B/10)	D (Cx50)	E (D/50 years)	F	G (ExF)
Type of Spill	Num. Observed over 10 years	Avg. Spill Rate (λ)	Num. of Spills over 50 yrs.	Num. Spills per Year = λ	Cost per Spill	Cost of Spills per Year
Catastrophic	1	0.1	5	0.1	$3,000,000,000	$300,000,000
Significant	5	0.5	25	0.5	$23,100,000	$11,550,000
				Total Cost of Spills per Year (T)		**$311,550,000**

H	I	J (IxT)	K	L (JxK)
Year	% Ash Disposed Wet	Adjusted Cost of Spills	7% Discount Multiplier	Present Value
2015	86.9292654%	$270,828,126	0.816297877	$221,076,425
2016	85.6222916%	$266,756,249	0.762895212	$203,507,066
2017	84.3153184%	$262,684,374	0.712986179	$187,290,329
2018	83.0083452%	$258,612,499	0.666342224	$172,324,428
2019	81.7013714%	$254,540,623	0.622749742	$158,515,107
2020	80.3943979%	$250,468,747	0.582009105	$145,775,091
2021	79.0874244%	$246,396,871	0.543933743	$134,023,572
2022	77.7804515%	$242,324,997	0.508349292	$123,185,741
2023	76.4734781%	$238,253,121	0.475092796	$113,192,342
2024	75.1665039%	$234,181,243	0.444011959	$103,979,273
2025	73.8595309%	$230,109,368	0.414964448	$95,487,207
2026	72.5525568%	$226,037,491	0.387817241	$87,661,236
2027	71.2455841%	$221,965,617	0.36244602	$80,450,555
2028	69.9386098%	$217,893,739	0.338734598	$73,808,148
2029	68.6316374%	$213,821,866	0.31657439	$67,690,527
2030	67.3246627%	$209,749,987	0.295863916	$62,057,453
2031	66.0176903%	$205,678,114	0.276508333	$56,871,713
2032	64.7107155%	$201,606,234	0.258419003	$52,098,882
2033	63.4037439%	$197,534,364	0.241513087	$47,707,134
2034	62.0967689%	$193,462,484	0.225713165	$43,667,030
2035	60.7897955%	$189,390,608	0.210946883	$39,951,359
2036	59.4828218%	$185,318,731	0.19714662	$36,534,962
2037	58.1758482%	$181,246,855	0.184249178	$33,394,584
2038	56.8688768%	$177,174,986	0.172195493	$30,508,734
2039	55.5619032%	$173,103,110	0.160930367	$27,857,547
2040	54.2549276%	$169,031,227	0.150402212	$25,422,671
2041	52.9479557%	$164,959,356	0.140562815	$23,187,152
2042	51.6409811%	$160,887,477	0.131367117	$21,135,324
2043	50.3340095%	$156,815,606	0.122773007	$19,252,724
2044	49.0270362%	$152,743,731	0.114741128	$17,525,988
2045	47.7200623%	$148,671,854	0.107234699	$15,942,782
2046	46.4130870%	$144,599,973	0.100219345	$14,491,715
2047	45.1061151%	$140,528,102	0.093662939	$13,162,275
2048	43.7991413%	$136,456,225	0.087535457	$11,944,758
2049	42.4921687%	$132,384,351	0.081808838	$10,830,210
2050	41.1851962%	$128,312,479	0.076456858	$9,810,369
2051	39.8782239%	$124,240,607	0.071455008	$8,877,614
2052	38.5712474%	$120,168,721	0.066780381	$8,024,913
2053	37.2642713%	$116,096,837	0.062411571	$7,245,786
2054	35.9573010%	$112,024,971	0.058328571	$6,534,257
2055	34.6503311%	$107,953,107	0.054512683	$5,884,814
2056	33.3433567%	$103,881,228	0.050946433	$5,292,378
2057	32.0363835%	$99,809,353	0.047613489	$4,752,272
2058	30.7294028%	$95,737,454	0.044498588	$4,260,182
2059	29.4224290%	$91,665,578	0.041587465	$3,812,139
2060	28.1154639%	$87,593,728	0.03886679	$3,404,487
2061	26.8084920%	$83,521,857	0.036324103	$3,033,857
			Present Value of Avoided Costs (PV2)	**$2,642,445,101**

Table 8: Modified Calculation of Avoided Costs from Spills Using Corrected 10-year Period and 6 Significant Spills

A	B	C (B/10)	D (Cx50)	E (D/50 years)	F	G (ExF)
Type of Spill	Num. Observed over 10 years	Avg. Spill Rate (λ)	Num. of Spills over 50 yrs.	Num. Spills per Year = λ	Cost per Spill	Cost of Spills per Year
Catastrophic	1	0.1	5	0.1	$3,000,000,000	$300,000,000
Significant	6	0.6	30	0.6	$23,100,000	$13,860,000
				Total Cost of Spills per Year (T)		**$313,860,000**

H	I	J (IxT)	K	L (JxK)
Year	% Ash Disposed Wet	Adjusted Cost of Spills	7% Discount Multiplier	Present Value
2015	86.9292654%	$272,836,192	0.816297877	$222,715,605
2016	85.6222916%	$268,734,124	0.762895212	$205,015,977
2017	84.3153184%	$264,632,058	0.712986179	$188,679,000
2018	83.0083452%	$260,529,992	0.666342224	$173,602,134
2019	81.7013714%	$256,427,924	0.622749742	$159,690,424
2020	80.3943979%	$252,325,857	0.582009105	$146,855,946
2021	79.0874244%	$248,223,790	0.543933743	$135,017,295
2022	77.7804515%	$244,121,725	0.508349292	$124,099,106
2023	76.4734781%	$240,019,658	0.475092796	$114,031,611
2024	75.1665039%	$235,917,589	0.444011959	$104,750,231
2025	73.8595309%	$231,815,524	0.414964448	$96,195,201
2026	72.5525568%	$227,713,455	0.387817241	$88,311,204
2027	71.2455841%	$223,611,390	0.36244602	$81,047,058
2028	69.9386098%	$219,509,321	0.338734598	$74,355,401
2029	68.6316374%	$215,407,257	0.31657439	$68,192,421
2030	67.3246627%	$211,305,186	0.295863916	$62,517,580
2031	66.0176903%	$207,203,123	0.276508333	$57,293,390
2032	64.7107155%	$203,101,052	0.258419003	$52,485,171
2033	63.4037439%	$198,998,991	0.241513087	$48,060,860
2034	62.0967689%	$194,896,919	0.225713165	$43,990,800
2035	60.7897955%	$190,794,852	0.210946883	$40,247,579
2036	59.4828218%	$186,692,785	0.19714662	$36,805,851
2037	58.1758482%	$182,590,717	0.184249178	$33,642,189
2038	56.8688768%	$178,488,657	0.172195493	$30,734,942
2039	55.5619032%	$174,386,590	0.160930367	$28,064,098
2040	54.2549276%	$170,284,516	0.150402212	$25,611,168
2041	52.9479557%	$166,182,454	0.140562815	$23,359,074
2042	51.6409811%	$162,080,383	0.131367117	$21,292,033
2043	50.3340095%	$157,978,322	0.122773007	$19,395,474
2044	49.0270362%	$153,876,256	0.114741128	$17,655,935
2045	47.7200623%	$149,774,188	0.107234699	$16,060,990
2046	46.4130870%	$145,672,115	0.100219345	$14,599,164
2047	45.1061151%	$141,570,053	0.093662939	$13,259,867
2048	43.7991413%	$137,467,985	0.087535457	$12,033,323
2049	42.4921687%	$133,365,921	0.081808838	$10,910,511
2050	41.1851962%	$129,263,857	0.076456858	$9,883,108
2051	39.8782239%	$125,161,794	0.071455008	$8,943,437
2052	38.5712474%	$121,059,717	0.066780381	$8,084,414
2053	37.2642713%	$116,957,642	0.062411571	$7,299,510
2054	35.9573010%	$112,855,585	0.058328571	$6,582,705
2055	34.6503311%	$108,753,529	0.054512683	$5,928,447
2056	33.3433567%	$104,651,459	0.050946433	$5,331,619
2057	32.0363835%	$100,549,393	0.047613489	$4,787,507
2058	30.7294028%	$96,447,304	0.044498588	$4,291,769
2059	29.4224290%	$92,345,236	0.041587465	$3,840,404
2060	28.1154639%	$88,243,195	0.03886679	$3,429,730
2061	26.8084920%	$84,141,133	0.036324103	$3,056,351
		Present Value of Avoided Costs (PV3)		**$2,662,037,616**