

Employment effects of coal ash regulation



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OCTOBER 2011

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SEI-US is an independent research affiliate of Tufts University.

ACKNOWLEDGEMENTS:

This study was funded by Earthjustice, the Sierra Club, and the Natural Resources Defense Council. Thanks to Ramón Bueno for the IMPLAN modeling described here.



SUMMARY

The U.S. Environmental Protection Agency is considering regulation to protect the public from the health hazards of coal ash disposal. In response, an industry group has claimed that strict regulation of ash disposal could lead to the loss of more than 300,000 jobs.

That number is simply unbelievable, on several grounds:

- The study presenting it provides no explanation for more than 50,000 of the supposedly lost jobs; they result either from unreported assumptions or from errors in calculation.
- Most of the huge job loss is said to be the result of a one percent increase in electricity prices. The implausibly super-sized response to that small price change rests on a single numerical estimate in an unpublished academic paper, ignoring the cautions and qualifications from the paper's author about how to interpret his findings.
- Another group of jobs are said to be "at risk" due to the guess that regulation of ash *disposal* would stigmatize and discourage ash *recycling* (which is exempt from the proposed regulation). Yet products ranging from gasoline to nail polish would be hazardous if disposed of in bulk, but are widely used without stigma.

This report presents a new analysis of employment effects, based on an industry estimate of the costs of regulation that is much higher than the EPA's cost calculation. The cost estimate I use was, in fact, developed for another industry group by the same consultants who claimed that more than 300,000 jobs would be lost.

Using that industry estimate for the cost of regulation and the well-known IMPLAN model of the U.S. economy, I show that the effect of the new spending required by strict regulation of coal ash, including expenditures for waste management, wastewater treatment, and construction and operation of facilities and equipment, combined with the impact of the resulting electricity rate increases on consumers, would be a net gain of 28,000 jobs.

Job impacts are not the only basis on which to judge new regulatory proposals. The debate should center on the magnitude and importance of the health and environmental benefits that would result, and the reasonableness of the costs of achieving those benefits. The fact that strict regulation of coal ash disposal would create a net increase of 28,000 jobs doesn't, by itself, clinch the argument for such regulation. But it does free us of the unfounded fear of massive job loss, allowing us to evaluate the regulation on its merits.

INTRODUCTION: THE COAL ASH PROBLEM

Every year, the United States produces more than a billion tons of coal.¹ Virtually all of it is burned in power plants to produce electricity.² Most of the coal goes straight up the smokestack; but a significant chunk of the coal – an estimated 140 million tons per year, more than one-eighth of the original weight – is left behind, as coal ash.

The U.S. Environmental Protection Agency is considering proposals to regulate the disposal of coal ash. Advocates of regulation point to health risks associated with coal ash disposal sites, and to the threat of accidents such as the massive spill of coal ash slurry at Kingston, Tennessee, in 2008. The industry has countered with arguments that regulation will cause unacceptable economic harm. Most recently, an industry-sponsored study claimed that regulation of ash disposal would cause enormous job losses.

This report offers a critical examination of that industry study, followed by a better calculation of the job impacts of regulation. The bottom-line result is that strict regulation of coal ash would cause a net *gain* of 28,000 jobs per year.

THE INDUSTRY STUDY: UNBELIEVABLE NUMBERS OF JOBS AT RISK?

According to a study commissioned by the Utility Solid Waste Action Group (USWAG), regulation of coal ash under Subtitle C of the Resource Conservation and Recovery Act (i.e., treating it as a hazardous waste) would lead to loss of 183,900 to 316,000 jobs nationwide.³

If these numbers seem too large to believe, that's because they are unbelievable. They are implausibly large, in proportion to the costs involved; they include at least two apparent arithmetic errors; they depend almost entirely on a wild extrapolation from a single, unpublished academic paper – ignoring the author's own cautions about the use of his estimates; and they repeat a groundless claim about potential losses due to the stigma of regulation.

After reviewing the estimates of the costs of regulation, I will explain the flaws in the USWAG report, and then develop a more accurate estimate of the job impacts of coal ash regulation.

How much does regulation cost?

In the recent hearings on proposed regulations for coal ash, the EPA estimated the cost of Subtitle C regulation at \$20.3 billion over 50 years, discounted at 7 percent; in testimony evaluating the EPA's estimates, a colleague and I made minor corrections, concluding that the

¹ Production was 1.07 billion short tons in 2009 (Energy Information Administration).

² Several government data sources imply that 95 to 98 percent of coal has been used for electricity generation in recent years; the steel industry is the only other important market for coal.

³ Veritas Economic Consulting, "An Economic Assessment of Net Employment Impacts from Regulating Coal Combustion Residuals," report to USWAG, June 2011.

cost should have been \$20.6 billion.⁴ Our revised estimate implies an average annual cost of \$1.49 billion.⁵

In a report for the Electric Power Research Institute (EPRI), the same consultants who did the USWAG report estimated the cost of Subtitle C regulation at \$5.32 billion to \$7.62 billion annually.⁶ I will take the midpoint of this range, \$6.47 billion, as the EPRI estimate; it is 4.3 times as large as the corrected EPA estimate. The EPRI study identifies a number of engineering requirements that it says were excluded from the EPA analysis; in addition, it assumes only 31 percent recycling of coal ash, lower than the EPA's estimate. For this report, I will use the EPRI cost estimate; all results presented here can be divided by 4.3 to obtain the equivalent results based on the EPA cost estimate.

How many jobs are normally associated with \$6.47 billion of spending? In 2010, the United States produced a GDP of \$14.5 trillion with employment of 139 million people. That's an average of \$104,000 per job – or equivalently, 9.6 jobs per \$1 million. At that rate, it would take about 62,000 workers to produce \$6.47 billion, the EPRI estimate of the cost of Subtitle C regulation. The USWAG estimate of job losses is three to five times larger than this.

In other words, the USWAG estimate implies that spending on coal ash regulation destroys an extraordinary number of jobs per dollar. Even if \$6.47 billion of spending were to vanish from the economy without a trace – which is not what would happen under any imaginable regulatory strategy – the USWAG estimate of job losses would still be far too high. On any sensible use of the money, such as hiring construction workers to build new Subtitle C-compliant facilities, the job impacts would be even better, as seen in the employment estimates presented below.

The numbers don't add up

The USWAG report is long on glossy presentation and sound bites, but short on numerical details. Its bottom-line estimate of total job loss from Subtitle C – 183,900 to 316,000 jobs – seems to be a total of the report's detailed categories:

- Net job losses in electric utilities, coal mining, and waste management: 10,700 to 15,500
- Job losses caused by electricity price increases: 163,700 to 261,900
- Jobs “at risk” in construction, due to reduced recycling of ash: 22,900
- Jobs “at risk” in gypsum wallboard manufacturing, due to reduced recycling of ash: 1,750

Including all of the jobs “at risk” in construction and wallboard manufacturing, the worst-case losses add up to just over 302,000, or 14,000 less than the total USWAG worst-case estimate. There is no visible explanation for these additional 14,000 job losses. (Comparable calculation

⁴ We found more extensive errors in the EPA's benefit estimates. See the comments by Frank Ackerman and Elizabeth A. Stanton on the EPA's proposed regulation of coal combustion residuals, November 19, 2010, available at www.regulations.gov, Docket No. EPA-HQ-RCRA-2009-0640, or http://sei-us.org/Publications_PDF/SEI-EPA-testimony-coal-ash-Nov2010.pdf.

⁵ This is the 50-year cost divided by 13.8. If equal amounts for 50 years are discounted at 7 percent, the present value is 13.8 times the annual amount. The analogous calculation using the figures at a 3 percent discount rate yields the same result.

⁶ Electric Power Research Institute, “Cost Analysis of Proposed National Regulation of Coal Combustion Residuals from the Electric Generating Industry,” November 2010. The report was done for EPRI by Veritas Economic Consulting, with principal investigators D. Santoianni, J. Whaley, and M. Bingham. The USWAG study does not identify individual authors at Veritas, but lists Santoianni and Bingham as the people to contact for more information.

for the lower end of the range is not possible, since a lower estimate is not reported for construction and wallboard jobs.)

The largest part, by far, of the USWAG estimate is the impact of electricity price increases. The report models electricity price impacts of Subtitle C costs for one region of the country, and then simply asserts that 1 percent is a reasonable estimate of the increase in national average electricity prices. That is, the bulk of the USWAG estimate is the job loss supposedly caused by a 1 percent increase in electricity rates.

To calculate the job loss, the USWAG study relies exclusively on a single estimate from an unpublished (and not yet peer-reviewed) working paper by an economist, Olivier Deschênes.⁷ In that paper, Deschênes tests several ways of modeling the relationship between energy prices, climate policy, and jobs; he finds that a 1 percent increase in electricity prices has historically been associated with a 0.10 – 0.16 percent decrease in employment.

Again, the numbers don't add up. That range of percentage decreases, in an economy with 139 million people employed, would be 139,000 – 222,400 jobs, well below the USWAG estimates. At the high end of the range, this is almost 40,000 less than the job loss number USWAG used.

Thus the high end of the range of USWAG estimates includes 54,000 unexplained jobs: 40,000 in the electricity impact calculation, and 14,000 in the final addition of the separate categories. Fully one-sixth of the high-end estimate is due to unexplained or incorrect calculations.

Next time, read the fine print

Olivier Deschênes is much more cautious than the USWAG report about the use of his own estimates. He says: “The main finding is that employment effects are **weakly** related to electricity prices” [emphasis added]. His final paragraph begins with the sentence: “There are many limitations to this research and its results need to be interpreted with caution.”⁸

One of his cautions could undermine the entire USWAG use of his results. As Deschênes points out, under traditional utility regulation, causation could run in the opposite direction: lower employment could cause higher electricity prices. Traditional regulation allows utilities to set rates to recover their costs. Lower employment means lower demand for electricity; utilities will then raise rates to recover their large fixed costs from a smaller volume of sales. If employment changes cause changes in electricity rates, rather than the reverse, then there is no basis in the use of Deschênes' work for the USWAG calculation.⁹

Deschênes also observes that his work ignores general equilibrium effects and responses to electricity price changes that would be expected in other sectors. For instance, higher electricity prices could lead to new investments in energy efficiency in other sectors, creating additional employment. Deschênes describes the omission of general equilibrium effects as “the most significant limitation” of his own work.¹⁰

⁷ Olivier Deschênes, “Climate Policy and Labor Markets,” 2010, <http://www.nber.org/papers/w16111>.

⁸ Deschênes, pp. 1, 10.

⁹ Deschênes, p. 9.

¹⁰ Deschênes, pp. 2, 10.

The myth of regulatory stigma

Another industry argument against regulation makes a brief appearance in the USWAG study. A substantial fraction of coal ash is currently reused in industries such as concrete and asphalt, wallboard and other building products, and road construction. Such reuse of ash is not covered by Subtitle C; the regulations apply only to ash disposal, not reuse. Nonetheless, industry lobbyists have maintained that regulation of ash *disposal* would attach a stigma to ash *reuse*. If this stigma led to the collapse of markets for ash reuse, then the quantities for disposal, and the total costs of disposal, would be much greater.

The USWAG study repeats the claims of stigma from regulation, and then speculates about the economic impact of replacing coal ash with more expensive inputs in construction. This is projected to cause a 1 percent increase in the price of new homes (and a 1.2 percent decrease in sales), and unspecified impacts in other construction, placing 22,900 jobs “at risk.”

This groundless calculation should simply be rejected.¹¹ There are many products in widespread use that would be hazardous waste if disposed of in industrial quantities, including gasoline, motor oil, many drain cleaners and household cleaners, nail polish, nail polish remover, and others. None of these markets are crippled by stigma. Recycling of such materials is common; for instance, used oil is widely recycled, both by individuals and by large commercial users – even though, unlike coal ash, it is still subject to Subtitle C regulation when it is recycled. Academic studies of environmental stigma have failed to find large, long-lasting effects of the sort feared by the critics of Subtitle C regulation for coal ash.¹²

THE REAL JOB IMPACTS OF COAL ASH REGULATION

A better estimate of the employment impacts of coal ash regulation can be developed using the well-known IMPLAN model of the U.S. economy. I first calculate the effects of the new spending by utilities to comply with Subtitle C, which creates jobs; then I estimate the effects of passing on these costs to electricity users, which reduces other spending and hence reduces employment. The net effect is an increase of 28,000 jobs.

Employment effects of new utility expenditures

The EPRI study, discussed above, describes several categories of expenditures that would be required under Subtitle C regulation. EPRI presents the costs as 20-year present value totals; I have converted them to percentages and applied them to the annual average cost of compliance in Table 1.

To calculate the employment effects of these expenditures, I assume that electric utilities increase their spending by these amounts. In order to apply the model, the spending must be described in terms of IMPLAN’s standard industries. The first two lines in Table 1 correspond directly to such industries – waste management, and water and sewage treatment and delivery,

¹¹ See the Ackerman and Stanton comments on the proposed regulation (footnote 4), which discuss the stigma issue at greater length; the discussion here is based on those comments.

¹² For a review of this literature, see the Ackerman and Stanton comments on the proposed regulation (footnote 4).

respectively. Thus I assume that Subtitle C compliance requires \$2.42 billion of waste disposal and \$0.63 billion of water and sewage treatment each year, accounting for almost half of compliance costs.

The remaining expenditure categories in Table 1, totaling \$3.42 billion per year, represent a combination of construction, engineering, technical services, and administration. Therefore, I model all of the remaining \$3.42 billion of Subtitle C costs, excluding disposal costs and wastewater treatment, as consisting of:

- 50 percent other new nonresidential construction (total \$1.71 billion)
- 30 percent architecture, engineering, and design services (\$1.03 billion)
- 10 percent environmental and technical consulting (\$0.34 billion)
- 10 percent office administrative services (\$0.34 billion)

Table 1: Costs of compliance with Subtitle C regulation of coal ash

Expenditure category	Percentage	Annual cost (billions)
Disposal costs	37.4%	\$2.42
Wastewater treatment	9.8%	\$0.63
Conversion to dry handling of ash	19.8%	\$1.28
Bottom ash management systems	0.8%	\$0.05
Fly ash management systems	3.2%	\$0.21
FGD management systems	2.0%	\$0.13
Dry materials management	0.6%	\$0.04
Subtitle C administrative costs	16.9%	\$1.09
Stranded costs for early pond closure	4.7%	\$0.30
Incremental pond closure costs	4.8%	\$0.31
Total	100.0%	\$6.47

Source: Percentages from EPRI, Cost Analysis of Proposed National Regulation of Coal Combustion Residuals from the Electric Generating Industry, Table 4.1.

The employment effects of these increased expenditures, as calculated by IMPLAN, total 117,000 jobs, as shown in Table 2. IMPLAN distinguishes three types of employment effects:

- *direct employment* occurs in the industries directly affected by the increased spending (such as waste management, wastewater treatment, construction, etc. in this case);
- *indirect employment* is the jobs created in the industries that supply the directly affected sectors (such as making pipes and pumps for wastewater treatment, trucks for waste management, or construction equipment); and
- *induced employment* results when increased consumer spending by the directly and indirectly employed workers creates more jobs throughout the economy.

Table 2: Job impacts of Schedule C compliance

Direct employment	41,173
Indirect employment	27,836
Induced employment	48,244
Total employment	117,253

Source: Author's calculations.

Employment effects of electricity price increases

While utility spending on Subtitle C compliance will create jobs, the resulting electricity price increases will decrease employment. The net employment impact depends on the balance between these two opposing effects.

The treatment of increased utility costs depends on the system of electricity regulation in place in each state. Under traditional rate regulation, utilities can pass on the full increase in costs to their customers. In deregulated states, however, pass-through of costs is not guaranteed. In a deregulated market, electricity is always supplied by the combination of power plants with the lowest marginal costs; the price at any point in time is set by the highest-cost plant that is needed to satisfy demand at that time. If that highest-cost plant – which is often referred to as being “on the margin” – is a natural gas-fueled power plant, then the price of electricity is not affected by increased costs for coal-burning plants. If a coal-burning plant is on the margin, then it is possible to raise prices to recover part or all of the Subtitle C cost increases.¹³

Energy Information Administration data show that 33 percent of coal-fired electricity was generated in deregulated states in 2009.¹⁴ Thus the costs of Subtitle C passed through to electricity consumers can be estimated as 67 percent of the total, in traditionally regulated states, plus some fraction of the remaining 33 percent, in deregulated states.

The deregulated states differ widely in the relative importance of coal, natural gas, and other sources of electricity. In Texas, which accounts for one-fourth of the coal burned in deregulated states, more electricity is produced from natural gas than from coal; it is likely that gas plants are often on the margin in Texas. In the absence of a detailed state-by-state analysis, I assume that coal is on the margin half of the time in the deregulated states as a whole, so that half of the costs of Subtitle C in these states can be passed on to utility customers.

This implies that a total of 83.5 percent of the nationwide costs of Subtitle C, or \$5.40 billion per year, are passed on to electricity users. If all businesses raise prices to pass on the increased electricity costs to their customers – which is far from certain in the current economic climate –

¹³ If coal is on the margin but a non-coal plant is only slightly more expensive, then a price increase to recover increased coal costs could be capped at the price at which the next plant can supply electricity.

¹⁴ For deregulated states, see Energy Information Administration (EIA), “Status of Electricity Restructuring by State,” http://205.254.135.24/cneaf/electricity/page/restructuring/restructure_elect.html. For data on electricity generation by fuel and state, see EIA, <http://www.eia.gov/electricity/data.cfm#generation>.

then the full \$5.40 billion will ultimately be paid by households, government, and business investors, reducing the amount they can spend on everything else.

To model the impact of the electricity price increase, therefore, I assume that final demand for other goods and services is reduced by \$5.40 billion. This demand reduction is modeled in two parts. In the IMPLAN data set, 40.5 percent of electricity is bought by final consumers such as households and government, while 59.5 percent of electricity is an intermediate good, used by businesses to produce other goods and services. Therefore, 40.5 percent of the \$5.40 billion demand reduction is allocated to households, government, and investors in proportion to their own direct consumption of electricity. The remaining 59.5 percent of the demand reduction is allocated to the same sectors, in proportion to their final demand for all goods and services.¹⁵

The result is a loss of 89,000 jobs, as seen in Table 3.

Table 3: Job impacts of electric rate increases

Direct employment	-39,369
Indirect employment	-17,672
Induced employment	-32,169
Total employment	-89,210

Source: Author's calculations.

Net employment effects of coal ash regulation

The combined employment effect of Schedule C regulation of coal ash is the sum of the job gains from new spending on regulatory compliance (Table 2), and the job losses from electric rate increases (Table 3). The net effect is a gain of 28,000 jobs, as seen in Table 4 (next page). Each line in Table 4 combines the corresponding lines in Tables 2 and 3.

Table 4: Net job impacts of coal ash regulation

Direct employment	1,804
Indirect employment	10,164
Induced employment	16,075
Total employment	28,043

Source: Author's calculations.

¹⁵ IMPLAN distinguishes multiple categories within households and government; both categories of demand reduction are allocated across these categories, in the manner described in the text.

CONCLUSION

Effects on employment are not the only basis on which to judge proposed regulations – perhaps not even the most important. The stated purpose of EPA regulations is to protect human health and the natural environment. EPA and independent researchers have identified many health hazards associated with coal ash disposal sites; drinking water from wells near one type of ash disposal facility can create a 1 in 50 chance of getting cancer from arsenic in the water.¹⁶ A biologist has identified \$2.3 billion of fish and wildlife losses due to releases of pollutants at 22 coal ash disposal sites.¹⁷ Critics of regulation might dispute the magnitude, the importance, or the chances of preventing such effects, or point to other undesirable consequences. These are the issues that should be central to the debate on new regulatory proposals.

Nonetheless, the claim that hundreds of thousands of jobs would be lost, especially in such troubled economic times, would seem to suggest that whatever its other merits, we just can't afford to regulate coal ash. This report has shown that, on the contrary, we can't afford to rely on such careless and exaggerated calculations of job impacts.

Strict regulation of coal ash disposal, under Subtitle C of RCRA, would create a net increase of 28,000 jobs. This conclusion doesn't, by itself, clinch the argument for such regulation. But it does free us of the unfounded fear of massive job loss, allowing us to evaluate the regulation on its merits.

¹⁶ EPA, "Human and Ecological Risk Assessment of Coal Combustion Wastes," 2010, Table 4-3.

¹⁷ A. Dennis Lemly, "A White Paper on Environmental Damage from Coal Combustion Waste: The Cost of Poisoned Fish and Wildlife," 2010, available in EPA Docket ID No. EPA-HQ-RCRA-2009-0640.