Impact Assessment Report for the Reproposed Stack Heights Regulations

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Control Programs Development Division
Office of Air Quality Planning and Standards
Office of Air, Noise, and Radiation

This report presents the costs and emission reductions that we expect the reproposed Stack Heights Regulation will produce. It is based on our April, 1981, Impact Assessment Report for Stack Heights Regulations but includes analysis of changes in the regulation which we are reproposing and includes some cost recalculations in response to public comments solicited in the May 1, 1981, Federal Register Notice.

The major findings of this study are:

1. Eleven power plants will have to reduce the sulfur content of the coal they burn in order to meet a new GEP calculated SIP. All of these plants are located in Federal Regions III, IV, and V.
2. The annual cost of these regulations will be $43.8 million.
3. National electricity rate increase will be negligible. However, consumers served by utilities owning these particular plants will see rate increases from 0.2 percent to 1.9 percent.
4. Actual sulfur dioxide emissions will decline by 286,900 tons per year.
5. The regulation will produce no capital costs since no source will have to install flue gas desulfurization equipment.

METHODOLOGY

The methodology used un this analysis is essentially the same as that detailed in our April, 1981, "Impact Assessment Report for the Stack Heights Regulations", and the reader should refer to that document. In the current analysis we have incorporated comments regarding technical data, such as construction dates, stack height, and emission rates, where appropriate. We have also inflated the 1979 coal prices we used before by 20 percent to reflect 1981 prices, and we have recalculated the fuel costs using the average plant costs instead of the average regional costs.

In summary, we first developed an inventory of the fossil-fuel fired power plants that could be affected by the proposed regulations. The only criteria for a plant to be on this list was that at least one stack taller than 65 meters was constructed or permitted after 1970. In total, 148 power plants were identified in this category. Emissions data, 1979 coal consumption, quality of the 1979 coal purchases and information on boilers and their related stacks were compiled on these plants.

We next established a GEP stack height based on the formula $(H + 1.5L)$[1] for each of the 102 plants where information on structure dimensions existed. For the remaining 46 plants where no such information existed, we assumed GEP stack height to be the average of the computed formula heights in the same Region.

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1 See 44 FR 2614.

We compared the calculated GEP stack heights with the actual stack heights for all 148 plants. For those plants with stacks in existence after 1970 which exceeded their GEP stack heights, we calculated a revised emission limitation according to the ratio developed by Cramer.[2] We recognized this generally overestimates the amount of reductions required, but felt it would provide a good worst-cost estimate. By comparing the sulfur content of fuel currently used at the plant (1979 consumption)[3] with the revised emission limitation, we identified the plants which may have to reduce actual emissions. Where existing fuel sulfur contents exceeded the plant's current SIP emission limitation, we assumed that the plant would be brought into compliance with its present SIP. We then calculated its cost based on the reduction from its SIP emission limitation. Some plants had actual emission levels low enough to meet the revised limitation and therefore would not be affected by the regulation, except for a numerical change in their SIP emission limitation.

In the next step we calculated the sulfur content of the coal needed to meet any revised emission limitation that was more restrictive than current emission levels. If the sulfur content of the new coal for Eastern plants were less than 0.7 percent, we would assume the plant required flue gas desulfurization equipment.

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2. See "Identifying and Assessing the Technical Bases for The Stack Height Regulatory Analysis," H.E. Cramer Co., Inc., Dec. 1979.

3. See "Cost and Quality of Fuels for Electric Utility Plants - 1979" DOE/EIA - 0191(79).

There is little coal with less than 0.7 percent sulfur content produced in the East.

The difference in the price of new coal with lower sulfur content was taken from costs reported in the Department of Energy's "Costs and Quality of Fuels for Electric Utility Plants - 1979" (DOE/EIA019(79)). Table 1 contains fuel prices for each state with affected plants by sulfur content, inflated to 1981 dollars. The increased cost for each plant was calculated as the difference between the plant's current average delivered price and the state average delivered price for the lower sulfur fuel. If the state price for lower sulfur fuel was less than the plant's current average price, we used the price of coal delivered to other plants in the same utility system which met the GEP requirements to calculate increased costs.

Next we calculated how much high sulfur coal would be replaced by low sulfur coal, assuming a shift across 1.7 percent sulfur content would be the best indicator of an absolute shift in coal markets, (1.7 percent is the mean sulfur content of coal produced in the U.S.). Shifts in higher percentages would be traded off among current producers of coal shipping to different users. Shifts to coal with sulfur content below 1.7 percent would mean an increase in production of lower sulfur coal at the expenses of production of higher sulfur levels.

POLICY CHANGES

Two major policy changes which affect the economic costs of the regulations have been included in the Agency's reproposal of the regulations. The reproposal changes the definition of

"in existence" and introduces a method for modeling sources in complex terrain.

The term "in existence" was originally proposed to mean the physical stack height on December 31, 1970. Arguments presented in the public comments and use of the term in other sections of the Act, persuaded us to define the term "in existence" the same as "commenced construction." The Congressional intent of these terms seems to be the same. A further discussion of this issue may be found in the reproposal Federal Register package. The result of this change enables any stack for which all permits were obtained and contracts enacted by December 31, 1970, to be grandfathered from the provisions of the regulations. This action reduces the cost to the power industry by exempting more stacks from the provisions of the regulation. The changes in costs and emissions from this policy change are included in this analysis.

The second change in the reproposed regulations establishes a procedure for determining the emission limitation for sources located in complex terrain. Comments received stated that substantial economic impact may result if a source must model its air quality impact with a GEP stack height below its actual stack height and plume impaction is predicted on an elevated terrain feature. The April 1981 economic assessment did not consider this cost of further reducing emission limitations in the event of predicted plume impaction because to do so would have required modeling individual plants. Since the newly proposed regulation allows the use of stack height to avoid plume impaction situations,

no special analysis is necessary in this review. The procedures for allowing stack height for impact modeling are discussed in the reproposal of the regulations in the FEDERAL REGISTER.

RESULTS

Our study shows that under the Stack Heights Regulation, SO_2 emissions will decline by 286,900 tons per year at an annual cost of $43.8 million to the utility industry.

Table 2 lists the eleven affected plants and their predicted fuel shifts under this regulation. Table 3 presents a regional breakdown of these costs and the associated reduction in SO_2 emissions.

The cost-effectiveness of this regulation is $153 per ton of SO_2 removed. This can be compared with a $1200 per ton of SO_2 cost-effectiveness associated with the 1979 New Source Performance Standards for power plants.

All costs result from price rises associated with lower sulfur coal. On a national basis, this rise in fuel cost is negligible. For the individual plants affected in Region III, the increase in fuel cost is estimated to range between 1.0 and 14.0 percent. In Region IV, the range is estimated to be 1.0 to 12.0 percent and for Region V the range is estimated to be 1.0 to 6.0 percent.

The increase in fuel costs for the power plants will be passed on to the consumers in higher electric rates. These rates are based upon fuel costs and operating costs of the electric system. Most of the affected plants are part of a larger system which means that actual percent increase in a system's electric

rates will be less than the percent increase in fuel cost for the single plant. In addition fuel costs are only a portion of the costs of producing and transporting electricity. The increase in consumer electric rates was taken as the ratio of increased fuel costs to utility revenues. This increase is negligible at the national level. For the individual affected utilities, the increase ranges from less than 0.2 percent to 1.9 percent.

Since compliance with this regulation will require utilities to switch to a lower sulfur coal, the regulation will produce a small affect on the coal market. The shift from high sulfur content coal to low sulfur content coal will be less than 11.5 million tons per year. This represents approximately 3.2 percent of the 354 million tons of coal produced in the East. In our analysis, the Gavin plant is the only one that we assumed would buy low sulfur coal from the West. We assumed this because Gavin already has a longterm contract to buy Wyoming coal at the rate of 3.6 million tons per year and the additional low sulfur coal they need would equal about one-third of this amount.

The magnitude of both the costs and the coal shifts could be less if coal washing, coal blending, or other control techniques were used to achieve the emissions reductions. Coal washing could be used for small shifts in percent sulfur where the total costs are less than costs of interrupting current coal supplies. Although coal washing or other control systems could be used to reduce the economic impacts of these regulations, they were not considered in this worst-case study because information was not available on the

washability of the specific coal used. Coal washing or other control systems would only be used if they were less costly than purchasing lower sulfur coal.

An evaluation of other source categories that may be affected by the regulation, was conducted by Cramer. That report identified the non-ferrous smelters, the pulp and paper industry, the steel industry and the oil, gas, and chemical industry as having potential impacts under the regulations. The majority of these plants would have stacks in the 65 to 90 meter range. Cramer estimated GEP heights for these source categories. In this review, Cramer identifies one smelter, no pulp and paper plant stacks, no steel plant stacks, and with the exclusion of flares, no oil, chemical gas plant stacks that are affected by the regulation. Smelters are treated separately under Section 119 of the 1977 Clean Air Act Amendments.

One commenter pointed out that because of the variability of sulfur content of coal a plant would have to purchase coal with an approximate average sulfur content 20 percent below the predicted SIP requirement in order to meet that requirement on a continuous basis.

The Agency agrees that in order to meet a short-term sulfur emission limitation, the long-term average sulfur content must be below that necessary to just meet the emission limitation. The conservative ratio developed by H. E. Cramer, Inc., tends to over-predict the sulfur reductions necessary. We feel this will compensate for sulfur variability. In addition, assuming that the

current SIP limitation will just result in attainment of the standard on PSD increment it is also restrictive. However, as a sensitivity analysis we developed a range of economic impacts with and without the 20 percent factor. Tables 4 and 5 present the results of that analysis.

Some commenters indicated that the required reduction in sulfur content could reduce the efficiency of electrostatic precipitators. This, in turn, could lead to expenditures for upgrading electrostatic precipitators in order to maintain current TSP emission levels. We feel that electrostatic precipitator efficiency losses will not affect most of the plants. For those plants that may be affected, techniques such as pulse power supply systems and chemical additives are available and would not increase the costs of this regulation significantly.

The agency is reproposing its definition of "in existence" for this regulation. Under the new definition several additional sources will be exempted from coverage. We reviewed all plants which had predicted emissions limitations in our April, 1981, study and in our sulfur variability sensitivity analysis. We eliminated the following plants from consideration because their stacks were judged "in existence" prior to December 31, 1970: Conemaugh, Harllee Branch, Homer City, Sammis, and Mitchell (GA). Several other plants may have "in existence" dates before December 31, 1970, however, they were left in the study because no construction dates were available. These plants are Yates and Hammond.

References

1. "Impact Assessment Report for the Stack Heights Regulations," Control Programs Development Division, Office of Air Quality Planning and Standards, Office of Air, Noise and Radiation, U.S. Environmental Protection Agency, April, 1981. (Docket No. A-79-01, IV-A-6).

2. H. E. Cramer Co., Inc., "Identifying and Assessing the Technical Bases for the Stack Height Regulatory Analysis," Final Report, prepared for the U.S. EPA, December 1979.

3. Conversations with Lou Nagler, Archie Lee (U.S. EPA Region IV) and Bill Mitchell (State of Georgia) concerning commenced construction dates for plants in Region IV.

4. Conversation with Tim Method (U.S. EPA Region V) concerning commenced construction dates for plants in Region V.

5. Conversation with Richard P. Burkhart (Pennsylvania Electric) concerning commenced construction dates at Pennsylvania Electric plants.

6. "Economic Impact of Tall Stack Regulations," ICF Incorporated, June 1981 (Docket No. A-79-01, IV-H-21, Attachment 2).

7. "Cost and Quality of Fuels for Electric Utility Plants - 1979," June 1980 (DOE/EIA-0191(79)).

Table 1
Delivered Coal Prices (1981 $/ton) by Sulfur Content

	0.51% S to 1.00% S	1.01% S to 1.50% S	1.51% S to 2.00% S	2.01% S to 3.00% S	>3.00% S
MD	49.04	39.91	39.98	40.17	-
PA	31.26	37.81	33.65	35.32	37.12
WV	41.95	41.38	36.95	32.89	27.16
AL	44.52	40.93	42.19	39.17	45.53
GA	47.99	36.29	41.26	38.20	31.90
OH	40.91	37.63	37.66	33.41	33.23
IL	43.74	38.90	35.84	31.40	28.52
KY	43.94	38.74	39.02	38.40	27.94

Source: DOE/EIA - 0191(79). 1979 prices inflated by 20 percent.

Table 2
Plants Affected by Stack Heights Regulations
Data and Calculations

Region	Plant	Affected MW	Actual Stack Height (m)	GEP Formula Height (m)	% Boiler Capacity Affected	Current SIP Limit % S	Actual Emissions % S	GEP* SIP Limit % S
III								
Penn.	Seward	216	184	109	100	2.44	2.30	1.04
Penn.	Shawville	254	183	114	41	2.44	2.07	1.14
W. Va.	Willow Island	246	304	[177]	100	2.29	1.31	0.87
IV								
Ala.	Gaston	1,109	229	[142]	67	2.4	1.9	1.1
Ala.	Gorgas	800	229	143	80	2.4	1.3	1.1
Ga.	Hammond	722	229	141	100	3.0	1.7	1.4
Ga.	Yates	1,336	252	148	100	3.0	1.8	1.3
V								
Oh.	Miami Fort	1,000	244	185	33	2.4	1.9	1.5
Oh.	Conesville	738	244	[157]	40	3.5	4.0	1.5
Ill.	Dallman	180	152	121	52	3.7	3.7	2.5
Oh.	Gavin	2,600	335	207	100	4.9	2.4	2.1

* Based on Cramer (1979) Appendix C Methodology

[ ] Average Regional GEP

TABLE 3

Costs and Emission Reductions for Meeting GEP Requirements

	Costs ($1981 million)	SO_2 Reductions ('000 tons per year)
Region III	9.0	32.2
Region IV	20.5	98.8
Region V	14.3	155.9
Total	43.8	286.9

TABLE 4

Assessment of Plants Affected by the GEP Stack Height Rules

	Without 20% Adjustment	With 20% Adjustment
Region III	Seward	Seward*
	Shawville	Shawville*
	Willow Island	Willow Island
		Morganton
Region IV	Gaston	Gaston
	Gorgas	Gorgas
	Hammond	Hammond
	Yates	Yates
		Smith
		Harllee Branch
		Mitchell
		Brown
		Big Sandy
Region V	Miami Fort	Miami Fort
	Conesville	Conesville
	Dallman	Dallman
	Gavin	Gavin
Total	11	17

* Plants in Pennsylvania not adjusted because emission limitations are set as an annual average.

TABLE 5

Cost Estimation for Meeting GEP Requirements
(million dollars per year, 1981)

	Without 20% Adjustment	With 20% Adjustment
Region III	9.0	10.5
Region IV	20.5	48.5
Region V	14.3	17.5
Total	43.8	76.5