Appendix E

METHODOLOGY FOR EMPLOYMENT IMPACTS ANALYSIS

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INTRODUCTION

The HWC MACT standards are likely to cause sectoral shifts in employment. As specific combustion facilities find it no longer economic to keep all of their systems running or to stay in operation at all, workers at these locations may be displaced. While the wastes diverted to other facilities may create a need for additional staff, economies of scale and current capacity utilization in the hazardous waste combustion market suggest that, within the combustion sector, these additions will not offset the dislocations. Employment gains from the rule, however, are likely in the pollution control equipment sector, as new purchases of equipment to comply with the MACT standards stimulate additional hiring.

In this appendix we present the methodology for calculating the employment impacts likely to result from implementation of the MACT standards. In the first section, we discuss the overall framework of the methodology and highlight a number of important simplifications we made in analyzing the employment impacts. We then provide detailed discussions regarding the methodologies used for the calculation of job dislocation and job gain estimates.

GENERAL FRAMEWORK FOR ANALYZING EMPLOYMENT IMPACTS

In the employment impact analysis, we evaluate national, primary impacts of the HWC MACT standards within the hazardous waste combustion and pollution control equipment manufacturing industries. This approach is based on a number of assumptions and simplifications that are detailed below. One of the most significant simplifications is that the methodology ignores potential secondary spill-over effects. For example, as increased demand stimulates additional hiring at pollution control equipment manufacturers, the employees may contribute more resources to the local economy through the purchase of goods and services. Such purchases may, in turn, generate additional jobs. At the same time, an opposite effect may occur in conjunction with job dislocations at combustion facilities, as displaced workers have less money to spend within the local economy. It is important to note that many of these potential secondary impacts will likely be transitory; for example, the secondary impacts of employment dislocations at combustion facilities will decrease as workers find other jobs.

Focusing on the pollution control equipment and combustion industries, we do not calculate employment impacts within the fuel blending sector. We do not expect the total quantity of hazardous waste that is blended to change substantially due to the MACT rulemaking. As a result, we anticipate that job dislocations and gains in the fuel blending sector will roughly offset each other as facilities divert wastes to other combustion facilities and to other waste management alternatives.

Another simplification in the analysis involves the geographic dimension of the employment impacts. Because we estimate national values for employment changes, our analysis cannot predict the geographic distribution of employment impacts. It is probable, however, that the job gains will not occur in the same localities as do the job dislocations. The MACT standards will likely affect regions of the country in different ways not only due to the potentially unequal distribution of job gains and dislocations but also as a result of regional secondary impacts as displaced workers move to find work in other locations. Additionally, some portion of jobs created from the increased demand for pollution control equipment may occur outside of the United States entirely.

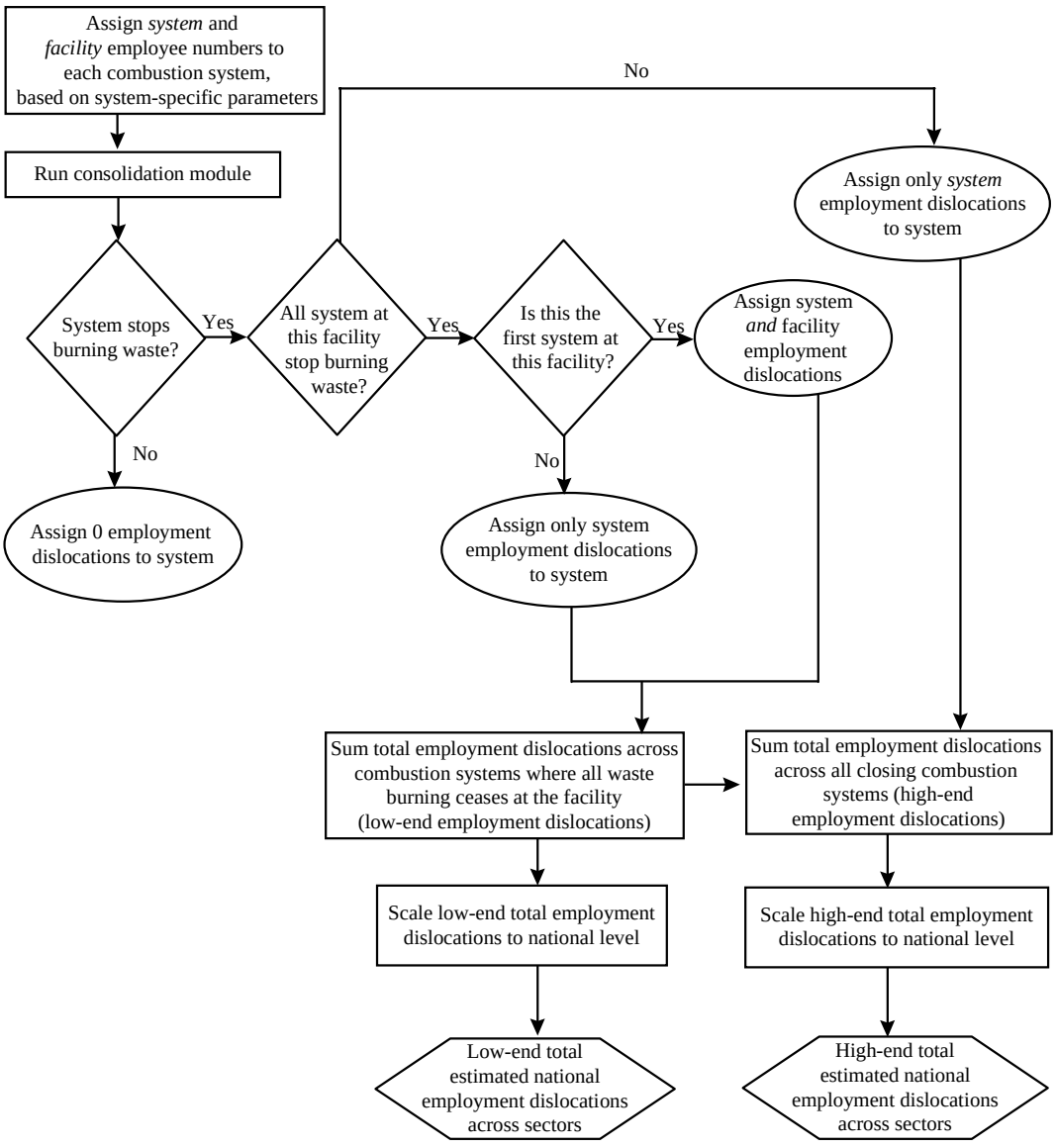
Finally, the analysis does not attempt to include a precise time component for the employment estimates. Employment impacts may not all occur immediately, and job gains and dislocations may not occur concurrently. For example, short-term employment surges may occur in the pollution control equipment industry as combustion facilities make their initial equipment purchases. In addition, job dislocations in the combustion industry may initially be lower than we estimate, as some combustion systems will continue burning until they need to reinvest in capital equipment. The estimates we present are based on long-term averages because these provide an upper-bound estimate of primary employment dislocations and gains associated with the rule.

ESTIMATING JOB DISLOCATIONS

Primary employment dislocations in the combustion industry are likely to occur when combustion systems consolidate waste burning or when a facility exits the hazardous waste combustion market entirely. Described on the next page is the methodology we used to estimate employment dislocations within the combustion industry. Exhibit E-1 also provides an illustration of the approach.

Exhibit E-1

PROCEDURE USED TO ESTIMATE EMPLOYMENT DISLOCATIONS



Methodology

Employees Involved with Hazardous Waste Burning Operations in the Baseline

The first step in estimating employment dislocations is to assign baseline employment estimates to each system.[1] Employment estimates include only the employees involved with hazardous waste burning operations; we exclude employees in affiliated activities (e.g., cement production personnel at waste-burning cement kilns). Two major employment groupings are associated with the burning of hazardous waste: system requirements and facility requirements. Employees who operate the equipment at individual combustion systems are classified under system requirements, while employees who fulfill facility-wide duties, such as clerical support and safety coordination, are categorized under facility requirements.[2] Average system and facility employment requirements are shown in Exhibit E-2 by type of sector and system size classification. It is important to note that these estimates assume full capacity utilization (i.e., three eight-hour shifts per day) and will therefore steer the analysis towards more conservative or upper-bound job loss estimates.

Calculating the Job Dislocation Estimates

Once baseline employment estimates are assigned to each combustion system, we run the consolidation routine within the economic impact model to determine which systems stop burning waste under each regulatory option. For each system that stops burning, we assign employment dislocations corresponding with its system requirements. For each facility where *all* systems stop burning, we also assign facility employment requirements.[3] Using these numbers, we bound the employment dislocation estimates by calculating low-end and high-end employment dislocation estimates:

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[1] Baseline employment estimates are assigned to individual modeled systems and were provided by Bruce Springsteen, Energy and Environment Research Corporation, June 1998.

[2] Facility employment requirements are assigned to each combustion system based on type and other system-specific parameters, but we assume that these employees are shared across multiple systems within a particular facility.

[3] We assign the facility employment dislocations *once* for each facility where all systems close. As we mentioned previously, we assume that these employees are shared across any multiple combustion systems at a particular facility.

Exhibit E-2

AVERAGE ESTIMATES OF EMPLOYEES ASSOCIATED WITH HAZARDOUS WASTE COMBUSTION OPERATIONS (System and Facility Employment Requirements)

Combustion Sector	System Requirements (Average # of Employees)	Facility Requirements (Average # of Employees)
Commercial Incinerators	22.5	5.8
On-Site Incinerators	6.6	1.4
Cement Kilns	7.2	2.7
LWAKs	3.3	2.4

Notes:
1. Estimates prepared by Bruce Springsteen, Energy and Environment Research Corporation, June 1998.
2. Employment requirement estimates assume full capacity utilization (three eight-hour shifts per day).
3. Employment requirements are assigned based on system-specific parameters (e.g., sector type, size).
4. Employees who operate individual combustion systems are classified under system requirements, while employees who fulfill facility-wide duties (e.g., clerical support, safety coordination) are categorized under facility requirements.
5. We assume facility employees to be shared across multiple systems within a particular facility.

- **Low-end estimate**. The low-end estimate includes employment dislocations only for those facilities where all systems stop burning waste. This estimate assumes that employees associated with closing systems will be reassigned within a facility that has other systems remaining open.

- **High-end estimate**. The high-end estimate includes employment dislocations for all systems that stop burning. This estimate assumes that employees associated with closing systems will not be shifted to other responsibilities within the facility.

We scale both low-end and high-end total estimates to reflect national employment dislocations for each of the combustion sectors. Finally, we calculate total national employment dislocations by summing across the four combustion sectors.[4]

[4] Scaling factors assume a total of 18 cement kiln facilities (33 systems), 20 commercial incinerator facilities (26 systems), 111 private on-site incinerator facilities (138 systems), and five lightweight aggregate kiln facilities (10 systems). Because government on-site incinerator systems are not permitted to close within the cost model consolidation routine, we omit this sector from the employment dislocation analysis.

Caveats and Limitations

As discussed earlier in the general methodology framework section, the employment dislocation impacts analysis is subject to several key caveats and limitations:

- First, as previously mentioned, the approach does not address potential secondary employment effects, either within the local economies of communities with closing combustion facilities (as earnings decline) or within the generators' operations (as combustion prices increase).

- Second, employment dislocation estimates are sensitive to waste quantity data assumptions. Substantial changes in waste quantities would alter employment dislocation estimates because market exit patterns would change.

- Third, as facilities exit the waste burning market, wastes are likely to be diverted to other combustion systems. Depending on the utilization of labor at these systems, additional staff could be required to handle the incremental quantities. However, as mentioned earlier, we do not anticipate significant offsets to job dislocations from this waste diversion given the economies of scale in the hazardous waste combustion market, the existence of slack capacity across all combustion sectors, and the relatively small quantities of waste expected to be diverted.

- Finally, many combustion facilities (excluding commercial incinerators that will shut down if they stop burning wastes) may be able to transfer waste handling employees to other areas of the business. While this scenario could prevent specific individuals from being displaced, it would not change employment impacts within the hazardous waste burning industry attributable to the MACT standards.

ESTIMATING EMPLOYMENT GAINS

In addition to employment dislocations, the final rule will also lead to job gains as firms invest to comply with the various requirements of the MACT standards. Employment increases are expected in the following areas:[5]

[5] Small incremental gains associated with transporting wastes from on-site incinerators to commercial facilities are also possible; we do not evaluate these gains in this screening analysis.

- Pollution control equipment industry -- purchase and installation of new pollution control devices.

- Continuous emissions monitoring (CEM) systems manufacturers -- purchase and installation of CEM equipment.

- Labor within the combustion facility:

  -- Operation and maintenance of the new pollution control equipment and the CEM systems.

  -- Permitting requirements.

Described below is the methodology we used to estimate these types of employment gains. Exhibit E-3 also illustrates the approach.

Methodology

Employment gains are determined by estimating the labor requirement for each of the categories described above. The labor requirement is calculated as follows:

$$NewEmployees = \frac{cost\ of\ the\ requirement\ (annualized) * \%\ of\ costs\ spent\ on\ labor}{average\ hourly\ wage\ rate * hours\ worked\ per\ year}$$

To perform the calculation shown above, we need the following data associated with each compliance requirement:

- Percentage of total compliance costs expected to be spent on labor

- Average wage rate associated with performing the given compliance task or producing the piece of equipment

The assumptions we use for these data inputs are shown in Exhibit E-4. We assume, for instance, that a full-time employee works 2,080 hours per year.[6]

[6] This number of hours per year assumes 52 weeks per year, five days per week, and eight hour days. We do not subtract any vacation time nor do we add any additional hours to account for overtime.

For each combustion sector, we calculate employment gains associated with each of the four types of compliance requirements -- pollution control equipment, operation and maintenance, CEMs, and incremental permitting costs. We do not need to calculate employment gains associated with the compliance requirements for *each* combustion system that continues burning. Rather, we use *total* annualized costs of the requirement[7] because a significant portion of the employment gain estimates are provided for the pollution control equipment industry and need not be associated with specific combustion systems. For example, to calculate total employment gains associated with purchase of the pollution control equipment for the cement kiln sector, we first determine the total annualized compliance costs after system consolidations. We then multiply this figure by the percentage of compliance costs expected to be spent on labor (50 percent). Next, we divide by the average hourly wage rate ($21.41/hour) and the total hours a worker in the pollution control industry is expected to work in a typical year (2,080 hours/year). From these calculations, we estimate the number of full-time employees that will be hired in the pollution control equipment industry to accommodate the additional purchases by cement kilns continuing to burn hazardous waste. Employment gain estimates are similarly calculated for the other compliance requirements and combustion sectors.

Caveats and Limitations

- We assume that pollution control equipment is purchased only from domestic producers. This assumption provides a fair estimation of employment impacts because while many foreign firms produce pollution control equipment, the bulk of their production capacity is in the United States, using domestic labor.[8]

- As with job dislocations, job gains are driven by the number of systems that remain in the combustion market. As a result, substantial shifts in waste burned quantities would alter market exit patterns and therefore, primary job gains.

- Estimates of employment gains do not include secondary employment effects.

[7] Total annual costs are calculated after system consolidation.

[8] ICF Resources, Incorporated, 1992.

Exhibit E-3

PROCEDURE USED TO ESTIMATE EMPLOYMENT GAINS

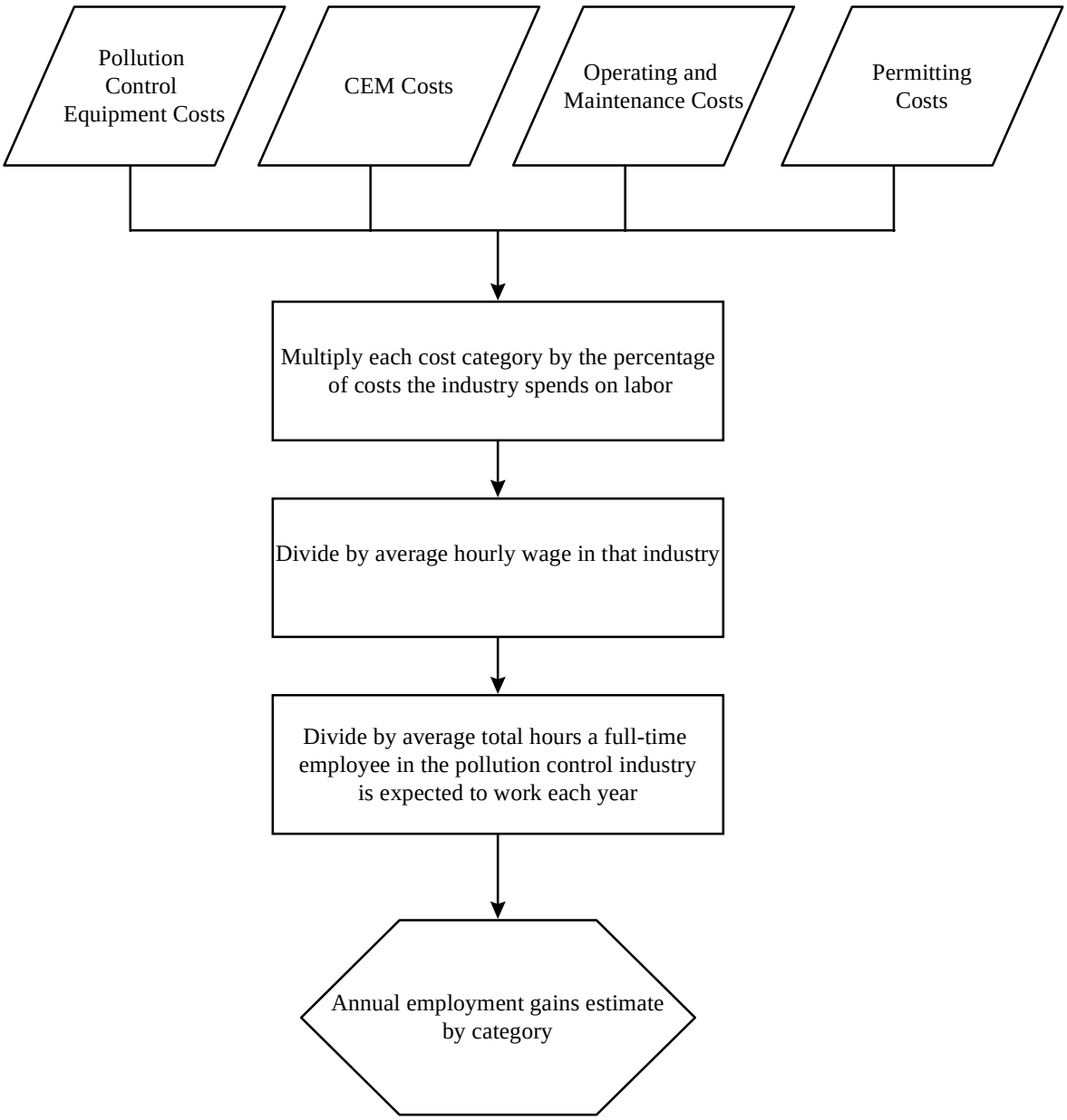

Exhibit E-4

ASSUMPTIONS USED TO ESTIMATE EMPLOYMENT GAINS

Category of Employment Gains	Average Wage Rate- includes benefits (1996$)	Percent of Compliance Costs Spent on Labor
Pollution Control Equipment (purchase and installation)	$21.41 per hour †	50%
CEMs (purchase and installation)	$21.41 per hour †	50%
Operating and Maintenance	$22.64 per hour ‡	42%
Permitting Requirements	$38.29 per hour ♦	90%

Notes:

1. The percentage of pollution control equipment and CEM expenditures spent on labor is based on analysis in *Business Opportunities of the New Clean Air Act: The Impact of the CAAA of 1990 on the Air Pollution Control Industry*, prepared by ICF Resources Incorporated and Smith Barney, Harris Upham and Company Incorporated, for the Office of Air and Radiation, U.S. Environmental Protection Agency, August 1992. Includes labor associated with both the equipment manufacture and other work that typically falls under subcontracts, e.g., work on foundations, electrical, fabrication and installation, piping and fitting.

2. The ICR for the hazardous waste combustion rulemaking assumes that 100 percent of the permitting expenditures are spent on labor. Since materials (postage and paper) and equipment (phones and computers) are also necessary to perform the requirements, we decreased this figure to 90 percent.

3. We anticipate that the labor content of operation and maintenance will be higher than that assumed for manufacture of pollution control equipment and CEMs. Lacking specific data on this subject, we invited industry to provide comments on our assumption but did not receive any.

4. Wage rates determined as follows:

   † Total employer costs for employee compensation, specific to the manufacturing sector. Costs are fully burdened and include employee benefits and other legally required costs. Source: U.S. Bureau of Labor Statistics, "Table 10. Private Industry by Occupational and Industrial Categories: March 1997." (http://stats.bls/gov/news.release/ecec.t10.htm - May 1, 1998.)

   ‡ Wage rate of $18 per hour burdened at 23 percent rate to account for taxes, insurance, benefits, etc. results in an average wage rate of $22.14. Estimate from Gardner, Pearson, and Moyeda, *Development of Baseline Costs for Hazardous Waste Incineration*, prepared by Energy and Environmental Research Corporation, April 18, 1995. (We then converted wage rate to 1996 dollars.)

   ♦ Estimate calculated from results in ICF Kaiser, *Supporting Statement for EPA Information Collection Request #XXXX [sic] "Reporting and Recordkeeping Requirements for National Emissions Standards for Hazardous Air Pollutants from Hazardous Waste Combustors,"* October 4, 1995. In the ICF report, average hourly labor rates for respondents are $91.23 for legal staff, $69.47 for managerial staff, $45.47 for technical staff, and $23.78 for clerical staff. The figure shown in the table is a weighted average of these wage rates, calculated by dividing the total annual cost of permitting requirements by the total hours per year spent complying with these requirements.

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