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Study of Hazardous Air Pollutant and Mercury Emissions from Electric Utility Steam Generating Units Pursuant to Section 112(n) of the Clean Air Act Amendments of 1990 -- Interim Report to Congress



November 1993

Electric Utility Steam Generating Unit
Hazardous Air Pollutant and Mercury Emission Study

Interim Report to Congress
Pursuant to the
Clean Air Act Amendments of 1990

Prepared by
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UNITED STATES GOVERNMENT
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1. INTRODUCTION

This interim report to Congress is in response to section 112(n) of the 1990 Amendments to the Clean Air Act (the Act). Its purpose is to present to Congress a discussion of the activities to date and the planned activities that will lead to the submittal to Congress of the study of electric utility emissions.

Section 112(n)(1)(A) mandates that the EPA perform a study, to be presented in a Report to Congress, of the hazards to public health reasonably anticipated to occur as a result of emissions of the hazardous air pollutants (HAPs), listed under section 112(b), by fossil fuel-fired electric utility steam generating units, after imposition of the requirements of the 1990 Amendments. The EPA is to develop and describe alternative control strategies for HAPs which may warrant regulation under section 112. If the EPA finds that regulation is appropriate and necessary after considering the results of the study, it shall then proceed with rulemaking activities under authority of section 112. The EPA intends to announce its regulatory determination in the final report of the study. The section 112(n)(1)(A) study is referred to as the "utility HAP study."

In addition, section 112(n)(1)(B) requires the EPA to conduct, and transmit to the Congress, a study of mercury emissions from electric utility units (and other sources of mercury). The study shall consider the rate and mass of emissions, the health and environmental effects of emissions, technologies available to control emissions, and the costs of control. This study is referred to as the "mercury study." Since mercury is one of the HAPs listed in section 112(b), it and the utility industry are covered under both sections 112(n)(1)(A) and (B).

For the purposes of section 112, an electric utility steam generating unit is any coal-, oil-, or natural gas-fired combustion unit of more than 25 megawatts electrical output capacity that serves a generator that produces electricity for sale. A unit that cogenerates steam and electricity and supplies more than one-third of its potential electric output capacity and more than 25 megawatts electrical output to any utility power distribution system for sale is also considered to be an electric utility steam generating unit. Thus, the industry being studied includes both the traditional electric utility industry as well as certain industrial and third-party units that cogenerate steam and electricity.

The results of the study required under section 112(n)(1)(A) are directed to be presented to Congress by November 15, 1993, while the results of the study required under section

112(n) (1) (B) are directed to be presented by November 15, 1994. However, as discussed below, the results of the utility HAP study will be transmitted to Congress in November 1995 along with an update of the utility portion of the previously submitted mercury study. The delay is necessary to allow the Agency the time to acquire sufficient valid HAP emissions data upon which to base a credible health hazard assessment. This interim report explains the basis for the schedule delay for completion of the utility HAP study as well as describing the activities completed and underway to provide the final report of the study by November 15, 1995.

2. SCHEDULE

2.1 Utility HAP Study

In section 112(n)(1)(A), Congress directed that the utility HAP study be presented by November 15, 1993. Initial studies by the EPA indicated that very little documented data were available on HAP emissions from electric utility steam generating units, and measurement methods needed to be further developed or refined for characterizing many of the HAPs. In short, it did not appear that the available data were sufficient to provide the basis for a credible health hazard assessment of HAP emissions from electric utility steam generating units.

Much of the data on non-radionuclide HAPs available through the literature had been gathered over a broad time period using a wide variety of dated, and sometimes ill-defined, sampling and analytical techniques. Many of these techniques, including the method for mercury, have since been replaced with more accurate methods. The available data exhibit extensive variability in the reported concentrations of HAPs in emissions (sometimes varying by several orders of magnitude) which can, in turn, significantly skew the calculated emission rates. Often, there is insufficient description or documentation of the techniques and assumptions used to be able to sort the reliable from the unreliable data.

In addition, much of this available data was gathered at laboratory or pilot scale installations or from utility units that did not reflect the configuration of the current electric utility steam generating unit population. Again, there was often insufficient documentation of the design parameters or process operating conditions to assess the validity of the data or the impact of the process operating conditions on the non-radionuclide HAP emissions.

The requested timing of the study was believed to have been chosen assuming the existing information would be adequate rather than accounting for the time required for researching methods for measuring HAPs, generating new field data on the presence and quantities of HAPs in emissions from representative electric utility steam generating units, and further developing methodologies for assessing the hazards to public health. However, even with the full participation of the EPA, other Federal agencies such as the Department of Energy (DOE), State and local air pollution control agencies, and the industry, it became clear early in the study that preparation of a sufficiently definitive and scientifically defensible study, using the existing data base, could not be accomplished within the 3 years specified in the 1990 Amendments.

Thus, in October 1991, in response to a Congressional inquiry, the EPA indicated that the utility HAP study would be performed on the same schedule as the mercury study (i.e., submittal by November 15, 1994). To meet this revised schedule, all data on the emissions of HAPs and the characterization of the types of facilities in the utility industry would have had to be compiled by January 1993 for the health hazard assessment component of the study to be performed on schedule. In October 1991, the Agency believed this to be a realistic revision to the schedule.

However, through its review of the existing data base, the Agency became aware of major problem areas in the data and of the existence of an extensive HAP field sampling program underway by the industry. This effort was primarily through the Electric Power Research Institute (EPRI) and the Utility Air Regulatory Group (UARG), but also by individual electric utility companies. In addition, the DOE was about to embark on a similar program, albeit on a smaller scale. These programs include field sampling for 25 to 30 of the 189 HAPs at 25 to 30 fossil fuel-fired electric utility steam generating units using the best accepted sampling and analytical methods. In the absence of these data, the Agency would be basing its assessment on data that were much more limited in nature and quality. The Agency, therefore, determined that an additional 1-year delay would be necessary. These programs, and the impact of their timing on the schedule for the utility toxics study, will be discussed further below.

Table 2-1 presents a list of accomplished milestone dates for the utility HAP study. Table 2-2 presents a list of those milestones necessary to complete the study by November 1995.

2.2 Mercury Study

The mercury study required under section 112(n)(1)(B) is directed to be submitted to Congress in November 1994. The relationships between the two studies for the electric utility industry are discussed below.

Table 2-1. Schedule of Accomplished Tasks for Electric
Utility Air Toxics Report to Congress

EPA Initiates Utility HAP Study	<u>October 1, 1990</u>
General HAP Workshop with EPRI/DOE/UARG	<u>May 31, 1991</u>
General HAP Workshop with EPRI/DOE/UARG	<u>October 18, 1991</u>
Contractor Support Effort Initiated on Utility HAP Study	<u>November 27, 1991</u>
General HAP Workshop with EPRI/DOE/UARG	<u>February 19, 1992</u>
HAP Emission Testing Workshop with EPRI/DOE/UARG	<u>February 19, 1992</u>
Draft Outline for Report to Congress	<u>March 20, 1992</u>
Draft Matrix of Utility Industry	<u>March 20, 1992</u>
HAP Health Hazard Assessment Workshop with EPRI	<u>April 28, 1992</u>
General HAP Workshop with EPRI/DOE/UARG	<u>May 21, 1992</u>
Complete Data Base of Utility Plant Parameters	<u>May 29, 1992</u>
Meeting with National Coal Association	<u>June 8, 1992</u>
HAP Emission Source Test Requests (2) Completed for EPA FTIR Tests	<u>July 10, 1992</u>
Summary of Existing HAP Data Bases	<u>July 21, 1992</u>
EPA Work Group Meeting - Project Approach	<u>July 30, 1992</u>
HAP Emission Testing Workshop with EPRI/DOE	<u>August 18, 1992</u>
Non-EPRI Industry HAP Emission Test Reports (10) Received	<u>August 20, 1992</u>
Interim HAP Emission Test Reports (3) Received from EPRI/UARG	<u>October 20, 1992</u>
HAP Health Hazard Assessment Workshop with EPRI	<u>October 22, 1992</u>
General HAP Workshop with EPRI/DOE/UARG	<u>October 23, 1992</u>

HAP Emission Source Test Requests (3) Completed for EPA FTIR Tests	<u>November 13, 1992</u>
Site Visit to Potential EPA FTIR HAP Emission Test Site	<u>December 1, 1992</u>
Receive USGS Data Base of Coal HAP Concentrations	<u>December 11, 1992</u>
Interim HAP Emission Test Reports (2) Received from EPRI/UARG	<u>December 17, 1992</u>
Draft Analysis of USGS Coal Data for HAP Concentrations	<u>December 29, 1992</u>
Request for Additional Information on EPRI HAP Emission Test Reports	<u>February 11, 1993</u>
Preliminary HAP Data Summary Submitted for Health Hazard Assessment De-bugging	<u>February 19, 1993</u>
Interim HAP Emission Test Reports (2) Received from EPRI/UARG	<u>February 22, 1993</u>
General HAP Workshop With EPRI/DOE/UARG	<u>February 23, 1993</u>
Contractor Support Effort Initiated on Mercury Control Costs	<u>March 4, 1993</u>
Interim HAP Emission Test Reports (7) Received from EPRI/UARG	<u>March 12, 1993</u>
Draft Chapter 3	<u>March 30, 1993</u>
Site Visit to Three Potential EPA FTIR HAP Emission Test Sites	<u>April 8, 1993</u>
DOE HAP Emission Test Kick-off Meeting	<u>April 14, 1993</u>
Draft Analysis of Fuel Switching on Coal- based HAP Emissions	<u>April 20, 1993</u>
Draft Chapter 6	<u>April 29, 1993</u>
Receive Data Base of Cogeneration Plant Parameters	<u>April 30, 1993</u>
Interim HAP Emission Test Reports (2) Received from EPRI/UARG	<u>May 3, 1993</u>
EPA FTIR HAP Emission Tests (3)	<u>May 21, 1993</u>

Draft Chapter 2	<u>June 30, 1993</u>
EPA FTIR HAP Emission Tests (2)	<u>July 30, 1993</u>
Interim HAP Emission Test Report (1) Received from EPRI/UARG	<u>August 17, 1993</u>
General HAP Workshop with EPRI/DOE/UARG	<u>August 26, 1993</u>
Final Set, Interim HAP Emission Test Results from EPRI/UARG	<u>September 1, 1993</u>
Complete Control Costs and Impacts for Mercury Control	<u>September 30, 1993</u>
Submit Interim Report to Congress	<u>November 15, 1993</u>
General HAP Workshop with EPRI/DOE/UARG	<u>December 21, 1993</u>

Table 2-2. Schedule of Projected Tasks for Electric
Utility Air Toxics Report to Congress

Final HAP Emission Test Reports from EPRI/DOE	<u>January 3, 1994</u>
EPA Summary Emission Test Report (5 tests)	<u>January 3, 1994</u>
Initiate Health Hazard Assessment	<u>March 1, 1994</u>
EPA Final HAP Emission Test Reports	<u>May 2, 1994</u>
Draft Chapter 4	<u>May 16, 1994</u>
EPRI Synthesis Report	<u>June 1, 1994</u>
EPA Work Group Meeting - HAP Emission Test Results	<u>June 15, 1994</u>
Radionuclide Analyses Component of Health Hazard Assessment Complete	<u>July 1, 1994</u>
Revised Draft Chapter 6	<u>August 15, 1994</u>
Draft Chapter 7	<u>September 1, 1994</u>
Complete Final Draft Health Hazard Assessment	<u>October 3, 1994</u>
Draft Report (w/o Appendices) to EPA Internal Peer Review	<u>October 17, 1994</u>
EPA Work Group Meeting - Health Hazard Assessment	<u>November 1, 1994</u>
Draft Report (w/o Appendices) for Industry/Outside Review	<u>November 22, 1994</u>
Draft Appendices	<u>January 3, 1995</u>
Industry/Outside Review Complete	<u>January 17, 1995</u>
EPA Work Group Meeting - Review Comments	<u>February 15, 1995</u>
Draft Chapter 1	<u>March 1, 1995</u>
Appendices Complete	<u>March 15, 1995</u>
Report to Congress Revisions Complete	<u>March 15, 1995</u>
EPA Work Group Closure	<u>May 15, 1995</u>

OAR Report Clearance	<u>June 1, 1995</u>
Draft Final Report to EPA Office of Congressional and Legislative Affairs	<u>July 3, 1995</u>
Draft Final Report to OMB	<u>July 17, 1995</u>
OMB Review Complete	<u>October 16, 1995</u>
Final Report to Administrator	<u>November 1, 1995</u>
Final Report to Congress	<u>November 15, 1995</u>

3. STATUS AND ACTIVITIES

The activities being undertaken on the utility toxics study are related to the acquisition of sufficient information to allow the Agency to estimate HAP emissions from all electric utility steam generating units and on the methods to use those data in estimating the "hazards" to the public health. This section presents the Agency approach to the development of the necessary data and the coordination efforts that have been undertaken in gathering the data.

3.1 Coordination With Other Interested Parties

In fiscal year (FY) 1991, the EPA joined with the EPRI, the UARG, and the DOE in the first of a continuing series of workshops for the purpose of exchanging information related to air toxics activities, coordinating these activities, and possibly co-funding of data gathering for the study. These workshops have also recently included the Class of 85 Regulatory Response Group, a voluntary, non-profit, group representing the electric utility industry (similar to the UARG but representing generally smaller oil- and gas-fired utilities).

Additional meetings have been held, on a smaller scale, to discuss emission test and analysis methods, emission test method validations, and approaches to be taken for the health hazard assessment. An information meeting has also been held with the National Coal Association to apprise them of the study and to solicit information they may have regarding the trace metal contents of coals and the effectiveness of HAP removal by coal cleaning or washing.

3.2 Data Analysis

To determine the types of data that were needed, the Agency's Emission Standards Division (ESD) assessed the data necessary to perform the health hazard assessment and to develop the control strategies requested by Congress. The health hazard assessment will be performed based on analyses of the impact of estimated HAP emissions from each utility plant in the United States. Therefore, data on emissions and/or other parameters for each utility boiler was determined to be necessary. It was recognized that HAP emissions data would not be available for each facility. However, other plant-specific data were known to exist, including boiler type, fuel type and source, emission controls in place, and plant location and stack dimensions.

To utilize the data to be acquired, the EPA has developed a computer program that will analyze information on individual coal

HAP contents and HAP emissions data from the tested units to provide a calculated HAP emission factor for each utility boiler in the United States. The computer program will allow the coal characteristics for the specified utility to be input along with the removal abilities of the controls in use, based on emission test data, to arrive at an emission rate (factor) for each individual boiler. Changes in control methodologies can also be altered for each utility boiler, based on announced or projected Phase I and II compliance plans. This emission factor will then be used in the modeling for the health hazard assessment.

Electric utility plans for compliance with Phases I and II of title IV were also determined to be necessary. To determine the potential control strategies for HAP emissions control, the effectiveness of existing and near-term future controls was also determined to be necessary, based on actual HAP emissions data from the electric utility industry. It was established that these types of data were not available in the existing literature data base.

3.3 Data Acquisition

3.3.1 Literature Data

The ESD has conducted a literature search of available non-radionuclide HAP emission and control information and assessed the usefulness of these data. As noted above, essentially all of these data were found to be unusable for the necessary analyses, particularly due to deficiencies in emission test methodology, documentation of process operation, or other documentation. These deficiencies were such that the Agency would not be able to utilize the data in control strategy analysis or to project the data for nationwide application in the health hazard assessment.

Industry data on the types of boilers, fuels, and controls were obtained to ensure adequate coverage during the field sampling and the data analyses phases (i.e., HAP emissions data would be gathered in such a manner that the majority of boiler/fuel/control configurations could be addressed). This data base provides the necessary plant-specific information to conduct the health hazard assessment and the control strategy analyses.

3.3.2 Field Sampling

To obtain the necessary non-radionuclide HAP emission test data, two avenues were pursued. The first was to tap into the industry and DOE programs while the second involved Agency testing for HAP organics.

The EPRI has a program underway whereby they will sample air emissions at 20 to 25 of their member electric utility facilities for approximately 25 of the 189 HAPs listed in section 112(b). This program was initiated in mid-1990 but did not get into full operation until mid-1991, with most of the data expected to be available by January 1994. The Agency became aware of the extent of the program at the October 1991 workshop meeting and of the schedule at the February 1992 workshop meeting. The program was of such complexity that schedule acceleration by EPRI was not possible.

These tests will encompass firing of coal, oil, and natural gas with a variety of boiler firing types and particulate matter and sulfur dioxide (SO₂) emission control technologies. Emission test sites were selected based on a number of criteria (including the facilities willingness to cooperate). The various types of boilers, fuels, and controls were aggregated into a summary table (matrix). Site selection was based primarily on the unit's position in the overall matrix of utility boilers. The EPRI then selected categories of plants based on industry utilization (e.g., the largest percentage of coal-fired units are dry bottom, use bituminous coal, and have no emission controls except for electrostatic precipitators for particulate matter), followed by selection of individual sites within a given category. This approach allows for acquisition of data for the broadest spectrum of the utility industry in the most cost effective manner. Some of the EPRI emission test sites are DOE Clean Coal Technology (CCT) sites which provide for the acquisition of HAP data before and after installation of controls for nitrogen oxides (NO_x), another important element in the acid rain program. Samples are being collected before and after each emission control device where feasible.

The DOE, through its Pittsburgh Energy Technology Center (PETC), initiated contract activities in mid-1992 for a HAP emission sampling program at eight coal-fired electric utility steam generating units. The contracts were awarded in early 1993 and the sampling was completed over the period June to August 1993. The DOE program is similar in nature and scope to that of EPRI. Although the number of facilities being evaluated is much smaller under the DOE program, the timing was such that the data are to be available in the same time frame as those from the EPRI program, and, thus, will be included in the utility toxics study. The EPA is providing funding for quality assurance/quality control (QA/QC) activities on the DOE program.

For both of these field test programs, the EPA has been involved with the design of the program and in the selection of emission test and analysis methods. Several meetings have been held among the parties involved to discuss the appropriate methods and the impacts of any deviations or interferences. The

Agency has also co-funded with the EPRI a field validation of several mercury emission test methods at a coal-fired utility boiler, including those methods that can measure the various species of mercury that may be emitted from an electric utility boiler.

For the EPRI program, the Agency independently developed a matrix of the industry and established that the types of plants selected for the EPRI program were the same types that would have been selected for an EPA emission test program. For the DOE program, the Agency had the opportunity to provide input into the type of plant that should be selected.

Individual members of the electric utility industry are also involved in the acquisition of field HAP emission data. The EPA is actively obtaining these data for use in the study. For all emission test reports received (EPRI, DOE, and individual company submittals), the EPA is reviewing the reports for completeness, adherence to accepted sampling and analytical techniques, and proper unit operation (the very information that is missing from the existing literature-based data base). Where necessary, additional information has been requested from the tested site(s).

The EPA has also completed the initial development of the Fourier transform infrared spectrometry (FTIR) field testing system and system validation for real-time, simultaneous measurement of approximately 120 gaseous organic HAPs. Validation tests for the FTIR at a coal-fired unit were conducted in February 1993. The FTIR system is promising as a lower cost and much more flexible measurement technology than those currently available for both utility boilers and other sources of air toxics under section 112 of the Act.

The EPA has conducted field emission tests using the FTIR system at five electric utility steam generating units (one pulverized coal [PC]-fired boiler, one coal-fired fluidized bed combustion [FBC] boiler, one oil-fired boiler, one gas-fired boiler, and one gas-fired combined cycle combustion turbine). These tests will provide data on organic HAP emissions, augmenting the trace metal data being acquired by the industry. These tests were completed in July 1993 and the results are expected by the end of calendar year 1993.

3.3.3 Fuel Analyses

The EPA obtained from the U.S. Geological Survey (USGS) a study of the occurrence of trace metals in economically recoverable U.S. coals. The purpose of this study was two-fold. First, the issue of fuel switching (i.e., to a coal having a relatively lower sulfur content) as an acid rain compliance

strategy has already raised questions as to its impact on HAP emissions. The second purpose was to provide a data base of coal trace metal contents for input into the computer program noted earlier. Information of a similar nature has been requested from the NCA and individual companies, along with information relating to the impact on trace metal concentrations of coal washing or cleaning. A limited amount of information has been obtained.

Contact has also been made with the American Gas Association (AGA) and the Gas Research Institute (GRI) to obtain information as to the trace metal contents of the natural gas utilized in U.S. electric steam generating units. Attempts have also been made to obtain the trace metal content of fuel oils used by the utility industry.

3.3.4 Ongoing Activities

In addition to the data acquisition activities discussed above, it should be noted that considerable research into the generation and control of HAP emissions from electric utility steam generating units is being conducted by interested parties (including the Agency, the DOE, the coal companies, and the industry). This work has been initiated over the past few years and will continue for several years. For example, for Rounds IV and V of the DOE CCT program, HAP testing similar to that currently being done by EPRI and DOE/PETC will be performed. Testing of this nature will also be retroactively done on a few of the earlier CCT sites. The DOE/PETC will also undertake a Phase II testing program on additional coal-fired boilers similar to the work now underway. However, these data will not be available for several years.

Furthermore, pilot-scale work is being conducted on the impact of boiler process conditions on HAP emissions. Sorbents in combination with, or in addition to, carbon are being investigated for trace metal removal capabilities. Work is ongoing on how conventional coal cleaning may be modified to improve trace metal removals in addition to providing suitable ash and sulfur removals and acceptable coal quality. Advanced coal cleaning technologies are also being investigated for their ability to remove trace metals.

These activities will provide valuable information that will add to the knowledge related to utility boiler HAP emissions and controls. However, little, if any, of the data will be available for use in this study. While there may always be "one more piece of information" relating to HAP emissions from utility boiler, only that data available in time to meet the schedule noted in section 2 will be used in the current analyses.

3.4 Mercury Control

The EPA is following the work of EPRI and other industry and commercial organizations on the use of activated carbon injection for mercury control in utility boiler exhaust gas streams. This control method has been shown to be very effective in removing both mercury and dioxins/furans from municipal waste combustor (MWC) and medical waste incinerator (MWI) exhaust gas streams but has not been applied to electric utility steam generating units in the United States. A combination of technology transfer from MWCs and MWIs will be used along with input from the non-Agency work in addressing the effectiveness of activated carbon injection as a technology for reducing mercury emissions from utility boilers.

As noted above, there is overlap between the utility HAP study and the mercury study. The approach being taken on the mercury study with regard to the electric utility industry is to perform the analyses based on the assumption that all mercury contained in the fuel is likely to be emitted to the atmosphere. This assumption is grounded on the information in the available literature and will allow the study to proceed, albeit based on a potentially worst-case basis (i.e., no "credit" for mercury removal during coal cleaning or by existing emission control devices). The data being gathered as a part of the utility HAP study will be used to assess the actual mercury control being effected by coal cleaning and by current emission control technologies and, thus, the utility HAP study will update the mercury study with regard to these actual levels of control. The health hazard assessment will reflect any reductions in mercury emissions noted during the utility toxics study.

3.5 Utility Acid Rain Compliance Plans

The Agency is following announcements being made by the industry regarding acid rain control strategies. This information will be utilized to provide a "snapshot" of the industry after compliance with the acid rain portions of the 1990 Amendments to determine any impact on HAP emissions. Computer projections, based on economic models, of Phase II unit compliance plans may also be utilized.

3.6 Radionuclides

The EPA has undertaken a comprehensive approach to assessing the natural radionuclide content in coal, natural gas, and residual fuel oil. This approach integrates data obtained from (1) previous studies conducted by the EPA, (2) studies reported in the scientific literature, and (3) data bases maintained by the USGS and others.

A national data base of coal samples has been analyzed with regard to uranium and thorium content. The data base consists of the results of analysis performed on nearly 7,000 coal samples obtained over a period of 17 years from various mining regions of the United States that supply the major ranks of coal used by utilities. Additional radionuclide emissions data will be provided by the DOE HAP emissions test program. Data from these two sources will be used as input for the health hazard assessment for coal-fired boilers.

Radioactivity in natural gas is almost exclusively confined to radon-222. The radon content of natural gas at the well-head has been documented for thousands of wells over several decades. Due to the fact that radon concentrations are markedly reduced when natural gas is processed, other studies have focused on assessing radon concentrations in distribution lines. This existing data base will be utilized in the health hazard assessment for gas-fired units.

Documented studies employing non-radiometric analyses have shown that crude oil and its derivatives may contain uranium and thorium. To supplement the available data for residual fuel oil, the EPA requested that the EPRI/UARG solicit the voluntary participation of utilities in sampling residual oil supplies. The fuel stocks sampled were selected to be representative of the oil combusted for electrical power generation. To ensure that the samples provided by the utilities are representative of their station inventory of fuel oil, utilities were provided specific guidance for sample collection.

Accredited contract laboratories with the applicable experience have been identified. Final selection of a laboratory will be based on results reported in testing a "reference sample" of residual fuel oil provided by the National Institute of Standards and Technology (NIST). The EPA has entered into an agreement with NIST to analyze a composite sample derived from samples submitted by participating utilities.

4. PROJECTED ACTIVITIES

4.1 Data Acquisition

The HAP emissions data from EPRI and DOE will be provided to the Agency by January 1994. These data will be combined with those from the EPA FTIR HAP emissions test program and other industry organizations. The EPA will then perform the necessary analyses of the data so that the emission factors can be developed for each electric utility steam generating unit in the United States for input into the health hazard assessment.

A parallel effort will be undertaken to establish the various HAP emission control strategies available to the electric utility industry. This activity will involve analysis of the various combinations of HAP control measures available to the electric utility industry and assessing their effectiveness.

4.2 Health Hazard Assessment

The EPA has developed several exposure and risk tools (computer models) which are designed to quantify the potential public exposure and health risks associated with a given source or source category. Based on previous studies of the fossil-fuel-fired utility plants, the EPA has identified three areas of concern which these tools can address: 1) direct inhalation of emissions by people living near the plant; 2) indirect exposure (e.g., wet and dry deposition causing soil, water, and food contamination) to emissions by people living near the plant; and 3) direct and indirect exposure to emissions from many plants by people located at much greater distances from the plants (i.e., long-range transport).

The EPA plans to estimate direct inhalation exposure by people living near each utility plant in the U.S. For the indirect exposure analyses, the EPA plans a qualitative evaluation of a number of model plants, which are representative of this industry's plant characteristics, and use these results to describe national-level impacts. For the long-range transport and exposure calculations, the EPA plans to evaluate all the plants by aggregating emissions and exposure impacts into regional-sized cells. All of the above exposure evaluations will be based on the emissions estimates as described in Section 3.2.

Finally, the model plants will be subjected to an uncertainty analysis which will provide quantitative and qualitative descriptions of the potential variations in the final risk estimates. This analysis will be based on the known variations in the input data for the more significant factors (e.g., emissions).

At this time, the EPA is currently completing the details of the study design, collecting the required data for the various models, and conducting those parts of the utility-health-hazard-assessment study which do not require the final emission estimates, which will not be available until early 1994.

4.2.1 Exposure and Risk Assessment Tools

The EPA will use three computer models to conduct the above analyses. A human exposure model will be used to estimate direct inhalation exposure and risks to people living near each plant. The exposure model has a state-of-the-science air dispersion model, the best available meteorological data base, and the 1990 census data. The exposure model will evaluate all pollutants for which the EPA has both reliable emissions data and a health endpoint (e.g., cancer potency estimate). The indirect exposure model includes a wet and dry deposition model, food ingestion model, soil exposure model, and a water exposure model. Although quantitative in nature, the goal of this effort is to qualitatively describe the range of impacts that may occur from indirect exposure. The long-range transport model conducts an analysis based on a regional scale. For mercury, atmospheric chemistry will be included in the long-range transport analysis; for other pollutants, the EPA does not expect atmospheric transformation to be significant or does not have enough data to consider this effect. The indirect exposure and long-range transport models will be used to evaluate a subset of pollutants (approximately 6) which may create significant long-range impacts and indirect exposures through persistence or bioaccumulation (e.g., arsenic, lead, mercury, benzo-a-pyrene, dioxins, and cadmium).

For carcinogens, risks will be estimated by applying cancer potency estimates; in addition, for non-cancer effects, the EPA will compare calculated ambient concentrations to inhalation reference concentrations, which are estimates of a daily human exposure that are likely to be without an appreciable risk of deleterious effects during a lifetime.

The above models are not designed to evaluate radionuclide emissions. Estimates of radionuclide emissions are based on a model that accounts for site-to-site variability in emissions, plant design features, and operating parameters. The exposure and risk estimates will be added into the final risk assessment results.

4.2.2 Health Assessment Goals

By applying the computer tools described above, the EPA expects to estimate a number of exposure and risk parameters.

For exposure, the total number of people living near all the plants will be estimated. Also, the maximum long-term air concentrations to which someone is exposed will be calculated for all pollutants with available emissions data.

For carcinogens, the risk due to the plants' emissions for the most exposed individuals and the total number of average annual cancer cases will be estimated for the U.S. These risks will be based on evaluations of short- and long-range-direct inhalation exposure. The indirect exposure analysis will provide information from which the EPA can qualitatively describe the potential range of additional risks that occur from non-inhalation pathways. Unless there are data to indicate another approach, the EPA plans to add cancer risks from all pollutants, including radionuclides, to obtain the total risk estimates. For non-cancer health effects, the maximum concentration from direct inhalation and the number of people who are directly exposed to concentrations above the inhalation reference concentration will be estimated.

For those pollutants with no quantitative health benchmarks, the EPA is considering several options, but has not decided how to proceed. Most likely, the EPA will provide exposure and health data summaries based on the available data and attempt to determine qualitatively the likelihood of a potential health problem.

4.3 Report to Congress

Once the health hazard assessment and control strategies have been completed, they will be incorporated into the draft utility HAP study Report to Congress. A draft of the outline being used in preparing the Report is provided in Table 4.1. This draft will be Agency peer reviewed and technically reviewed by outside groups prior to being submitted for Agency approval. The approved Report will be submitted to the Office of Management and Budget (OMB) for review before being delivered to the Congress.

Table 4-1 Draft Outline for Electric Utility
Air Toxics Report to Congress

<u>Chapter</u>	<u>Topic</u>
I.	Major Findings of Electric Utility Hazardous Air Pollutant and Mercury Study
II.	Introduction
III.	Characterization of Electric Utility Steam Generating Units
IV.	Emissions Data Gathering and Analysis
V.	Health Hazard Assessment
VI.	Alternative Control Strategies for Hazardous Air Pollutant Emissions Reduction
VII.	Utility Update to Mercury Study
VIII.	Appendices

TECHNICAL REPORT DATA*(Please read Instructions on reverse before completing)*

1. REPORT NO. EPA-453/R-93-051a	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Study of Hazardous Air Pollutant and Mercury Emissions from Electric Utility Steam Generating Units Pursuant to Section 112(n) of the Clean Air Act Amendments of 1990 -- Interim Report to Congress		5. REPORT DATE November 1993
		6. PERFORMING ORGANIZATION CODE
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9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Environmental Protection Agency Emission Standards Division (MD-13) Office of Air Quality Planning and Standards Research Triangle Park, NC 27711		10. PROGRAM ELEMENT NO.
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16. ABSTRACT <p>This interim report to Congress is in response to section 112(n) of the 1990 Amendments to the Clean Air Act (the Act). Its purpose is to present to Congress a discussion of the activities to date and the planned activities that will lead to the submittal to Congress of the study of electric utility hazardous air pollutant (HAP) emissions. The results of the study required under section 112(n)(1)(A) are directed to be presented to Congress by November 15, 1993. However, the results of the utility HAP study will be transmitted to Congress in November 1995 along with an update of the utility portion of the previously submitted mercury study. The delay is necessary to allow the Agency the time to acquire sufficient valid HAP emissions data upon which to base a credible health hazard assessment. This interim report explains the basis for the schedule delay for completion of the utility HAP study as well as describing the activities completed and underway to provide the final report of the study to Congress by November 15, 1995.</p>		
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