UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

April 11, 1988

OFFICE OF
THE ADMINISTRATOR

The Honorable Lee M. Thomas
Administrator
U.S. Environmental Protection Agency
401 M. Street, S.W.
Washington, D.C. 20460

Dear Mr. Thomas:

The Municipal Waste Combustion Subcommittee of the Science Advisory Board's Environmental Effects, Transport and Fate Committee has completed its review of the Office of Research and Development's (ORD's) "Municipal Waste Combustion Research Plan". The review was initiated at your request, along with two other charges related to municipal waste combustion, and was reviewed concurrently with other issues on March 10, 1987.

The Subcommittee concludes that the research plan is well defined and reflects considerable thought, however, the proposed level of funding for the research appears grossly inadequate in view of the large number of scientific uncertainties associated with this technology, and EPA's responsibility to develop scientifically credible regulatory decisions. Important areas, such as ecological effects, are entirely left out or are addressed in a cursory fashion, which is understandable since allocated funds are inadequate for the areas that are addressed. Prioritization of research emphasizes avenues with short-term goals which may be necessary to meet the needs for technical guidance in permitting the many MWCs that are being planned or are already in operation.

The Subcommittee believes that emissions should be characterized as a first priority through analytical chemistry projects, methods development, and field testing. Risk assessment, health effects prediction and emission control cannot be adequately conducted without a thorough knowledge of the quality and quantity of the emissions, both gaseous and residual.

Following such characterization, environmental transport, fate and bioavailability should be determined, since they are key to assessing both risk and exposure to humans and the environment.

Monitoring is also considered by the Subcommittee to be an important research priority, and research directed towards monitoring goals will insure the development of tools to ensure compliance with guidelines or standards that may be set. In addition, monitoring is important for the validation of predictive models which have been developed for air transport of stack emissions.

The Subcommittee agrees that major areas of promising research have been proposed and developed to investigate important areas of uncertainty with respect to municipal waste combustion technology. However, budgetary constraints shed doubt, in the Subcommittee's opinion, on EPA's ability to reach the objectives defined in the program. Considerations of priority might be revisited to allow identification of research areas with high priority and attainable objectives.

The Subcommittee appreciates the opportunity to conduct this scientific review. We request that the Agency formally respond to the scientific advice transmitted in the attached report.

Sincerely,

Norton Nelson, Chairman
Executive Committee
Science Advisory Board

Rolf Hartung, Chairman
Municipal Waste
Combustion Subcommittee

Enclosure

cc: A. James Barnes
Vaun Newill
Alfred Lindsey
Larry Fradkin
Terry Yosie

United States Environmental Protection Agency | Office of the Administrator Science Advisory Board Washington, D.C. 20460 | SAB-EET&FC-88-023 April, 1988 Final Report

Report of the Environmental Effects, Transport and Fate Committee

Review of the Municipal Waste Combustion Research Plan

SAB-EET&FC-88-023

REVIEW OF THE MUNICIPAL WASTE COMBUSTION RESEARCH PLAN

REPORT OF THE MUNICIPAL WASTE COMBUSTION SUBCOMMITTEE

Environmental Effects, Transport and Fate Committee

SCIENCE ADVISORY BOARD

U.S. ENVIRONMENTAL PROTECTION AGENCY

Washington, D.C.

April 1988

U.S. ENVIRONMENTAL PROTECTION AGENCY

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*Dr. Kimbrough served on the Subcommittee until May 11, 1987.

REVIEW OF THE MUNICIPAL WASTE COMBUSTION RESEARCH PLAN

I. Introduction

On March 10, 1987, the Municipal Waste Combustion Subcommittee of the Environmental Effects, Transport and Fate Committee of EPA's Science Advisory Board reviewed a draft document entitled "Municipal Waste Combustion Research Plan" prepared by the Office of Research and Development (ORD). Specifically, the document was prepared by ORD's Municipal Waste Combustion Research Work Group, which was chaired by Alfred W. Lindsey; and the draft reviewed by the Subcommittee was dated February 1987. This document will be referred to hereafter as the "research plan."

The purpose of the research plan under review is threefold. First, the plan is designed to determine whether modern, well designed and operated municipal waste combustors can pose a substantial hazard to human health and the environment. Second, the plan is structured to provide a technical basis for regulatory programs developed to ensure that municipal waste combustion (MWC) facilities pose low risk levels to human health and the environment. Third, the proposed research plan is expected to provide the necessary information and tools for monitoring, controlling and evaluating individual MWC facilities. A summary of the research plan is presented in Appendix A. The Subcommittee was requested to evaluate the research plan with respect to the risk assessment, regulatory, and monitoring goals which were outlined above.

II. General Comments and Overview of the Plan

The Subcommittee agreed that the research plan is well designed and clearly presented, reflecting considerable thought and effort. However, in the judgment of the Subcommittee the proposed level of funding for that research appears to be grossly inadequate, particularly in view of the large number of scientific uncertainties associated with this technology and EPA's responsibility to develop scientifically credible regulatory decisions.

These budgetary concerns lead the Subcommittee to recommend that a thorough evaluation of research priorities be conducted. This evaluation should consider realistic product expectations based on available funding levels and the resulting probabilities of achieving the defined goals.

It appears that the prioritization process used for the draft proposal places emphasis upon those research avenues that will meet short-term goals. It also appears that an underlying priority was placed on development of best available technology guidelines or standards (a Technical Support Plan), as opposed to development of a true research plan. This result is understand-

able, given the need for technical guidance for permitting the many MWCs that are being planned, as well as those that are already in operation.

However, it is also possible to prioritize the research needs according to other strategies. For example, priority could be placed on research to explore the factors contributing the greatest amount of uncertainty in assessments, or on the areas that are least well understood. Another possible strategy relates to the various options for setting standards, whether they be based on engineering performance, or on criteria for the protection of human health and the environment. Yet another strategy might focus on evaluating those technologies with the least potential for emissions and the least hazardous residue, a strategy similar to that used for assessing the waste water treatment industry.

The Subcommittee also expressed concern with the scheduling or timing of some research projects. Funding levels are such that all problems cannot be solved at once; some must be delayed or placed at lower priority. The Subcommittee believes that emissions should be characterized as a first priority. Far too little effort is placed on chemical analysis in the research plan. Chemical analysis should include compounds other than PCDD/PCDF and metals. A broader spectrum of organic compounds should be identified and metal analyses should include data on valency and speciation. Analytical chemistry projects, including methods development and field testing, may be of paramount importance in the initial phases of the program. Emissions and residual testing will also help to establish best available technology. Risk assessment, health effects prediction and emission control projects cannot be adequately completed without a thorough knowledge of the quantity and quality of the emissions.

After emissions and residuals are characterized, their environmental transport, fate and bioavailability should be determined. Data on the availability of compounds to living organisms and on chemical transformations that may take place in the environment will aid in understanding overall exposure, a cornerstone to assessing risk to both humans and the environment. Some areas of fate and persistence that are poorly understood are key to understanding and modeling exposure potential.

Models designed to estimate soil deposition and persistence are more speculative than those concerned with air transport. Therefore, errors in prediction are more probable. As a secondary consideration, uptake into aquatic food webs is only partially understood, and our level of knowledge is insufficient to allow reliable predictions based on stack emissions alone. There is even less information to describe uptake into terrestrial food webs, making predictive models conjectural at best. Such areas, characterized by a high degree of uncertainty, should be recognized in the research plan.

The potential for risk from ash residues is largely unknown. Research in this area should have a particularly high priority, since such investigations may have a bearing on current waste disposal practices, as well as practices of the future.

For many of the chemicals emitted from incinerators, health effects information from laboratory or epidemiology studies is available, since these chemicals are by-products of other technologies and/or ubiquitous in the environment. Gaps in the data base include lack of knowledge on the chemicals that reach potentially exposed humans, the contribution that MWC sources make to overall exposure, and the potential for mixtures of these chemical components to cause or increase effects that are harmful.

Monitoring is also an important research priority, and research directed toward monitoring goals will insure the development of tools to ensure compliance with guidelines or standards. This research will allow results from different incinerators to be compared, and will allow comparisons over time. Issues of quality assurance, quality control, maintenance, and detection of upset conditions will be influenced and facilitated by monitoring research. Monitoring is also important for the validation of predictive transport and fate models. The research plan places surprisingly little emphasis on environmental monitoring (such as ambient air monitoring), other than stack monitoring. Air transport models have been validated to a greater extent than other environmental models; therefore, air concentration studies should receive a lower priority than soil studies.

Finally, the Subcommittee notes that there is little in the research plan that will allow determination of hazard posed to the environment by municipal waste combustors. Given the limitation of funds, it is quite understandable that there is no plan for evaluation of ecological effects. Nonetheless, the need for such research should be stated in the document.

Overall, attempts should be made to coordinate research efforts with those of other agencies such as Environment Canada, the European Economic Community, Department of Defense, State Agencies and the private sector. In addition, other program areas within EPA should be canvassed for relevant research initiatives to prevent duplication of effort (i.e., Hazardous Waste Incineration Research and Superfund initiatives). This coordination may result in a more comprehensive research plan and addressing of questions surrounded by the highest degree of uncertainty.

III. Field Testing

The field testing approach recommended by ORD involves collecting data for characterizing discharges and determining how feedstock, system design and operating conditions affect the polluting characteristics of discharge. This approach calls for

collecting data from full-scale MWC units. Since individual plants utilize specific furnace and control technology, data generated from plant analysis will perhaps be pertinent only for the specific technology analyzed.

Given the range of potential incinerator designs and the range of potential problems, a generalized knowledge base is also needed, so that principles common to a variety of combustor designs can be determined. Therefore, the Subcommittee recommends that pilot and/or laboratory scale studies also be conducted in-depth to investigate combustion mechanisms under ideally controlled conditions. Such studies will provide a basis for explaining the results obtained in full-scale tests, and may provide a theoretical value or generalized standard for comparison of technologies.

The research plan for mass burn incinerators makes reference to the prevention of dioxin and furan emissions, as a consideration in insuring complete combustion. Combustion engineers do have a fairly good idea at present of the conditions that will effectively control the release of organic and trace element emissions. Current engineering practice and technology can effectively minimize dioxin emissions, limiting the amount of these compounds that enters the environment. However, precise quantitative determinations of emissions levels are more difficult, and will require extensive financial expenditure and more emphasis on basic research.

Fly ash, as collected in air pollution control devices, is stated to contain substantial quantities of trace elements and, under poor combustion conditions, organic condensation products. The tone of this statement indicates that fly ash have been well characterized. In fact, only preliminary data have been collected, and the data base should be improved to clearly characterize the components of fly ash, especially as they relate to the technology that may generate them. The proposed research plan places considerable emphasis on plant testing to gather this data. The Subcommittee supports the collection and analysis of samples from selected plants as it can reveal the technologies that produce more or less of certain contaminants in ash.

Also regarding ash, the Subcommittee believes that there is a significant need for studies to determine environmentally safe practices for ash disposal. The leaching of trace elements from landfilled ash residues is thought to pose a potential risk and is targeted as an area requiring substantial additional research. Additional research should clarify which types of ash are most leachable, what components pose significant risk and what practices are needed for safe handling and disposal of ash.

The research plan refers to a study of incinerators equipped with electrostatic precipitators and provides data from this study. Although no citation is given, the Subcommittee believes this information originates from a report by Radian Corporation which was subsequently updated by MRI. The Subcommittee

considers this report to contain inaccuracies and data collected without observing common criteria, such as time frame for plant operation and plant design capacity.

Chapter 2 also states that there are few design and operating data pertinent to ESP from the test studies, and that the development of correlations between these factors and emission control performance is hampered by a lack of data. The Subcom mittee believes that ESP data can be correlated to ESP performance; however, ESP data may not correlate with data on furnace design and operating data. This difference should be clearly stated. The report makes other references to design and operating conditions. The distinction between furnace design and operating conditions and design of air pollution control equipment should be made.

The approach in this chapter should suggest testing of a plant with dry or semi-dry lime addition and an ESP, rather than an ESP alone. In addition, although it is desirable to sample and analyze solid waste input during plant tests, it may not be realistic to expect that such analyses will allow evaluation of the effects of waste properties on furnace emissions. At best, generalized correlations may be obtained.

IV. Health Effects

The rationale described for determining health effects of MWC emissions and ash residues makes reference to groundwater, and justifies this concern based on the fact that groundwater ultimately moves into surface waters. This rationale should also recognize that groundwater itself is of major concern because of its use for direct human consumption.

The toxicity evaluations rely heavily on a comparative potency approach which places particular emphasis on genotoxicity bioassays and skin painting studies, adapting the approaches pioneered by Albert et al. (1983), Lewtas et al. (1983), and Nesnow et al. (1982). This approach gained a degree of acceptance for the assessment of combustion products where the primary compounds of concern are polyaromatic hydrocarbons (PAH). However, it has not been possible to validate this approach with an independent set of data because such data have not yet been generated. In addition, if the approach is to be used with emissions and ash residues containing compounds other than PAH, then additional basic research should be conducted. Three factors give rise to the Subcommittee's reservations with the approach and dictate the need for additional research.

First, there appears to be no general relationship between mutagenic potency and carcinogenic potency. PAH elicit mutagenic responses in many systems, while dioxins generally fail to elicit positive mutagenic responses. A useful approach might be to investigate the mutagenic potential of dioxins as they interact

in mixtures. Quantitative interpretation may be difficult; however, new types of data should be developed rather than repeating assays where results are established.

Second, there are insufficient data to demonstrate a quantitative relationship between the effects seen after skin painting and inhalation. The use of intra-tracheal instillation as an exposure method provides major simplifications with regard to protocol design. However, from a pharmacokinetic point of view, it is much less realistic than the inhalation route and is useful only for limited comparisons of effects. Administration of a single instillation will produce drastic differences in the time course and the concentrations of the chemical during absorption, distribution, metabolism, receptor binding, and excretion processes. All of these processes usually have major influences on toxicological response.

During inhalation exposures, in which animals are chronically exposed to slip-streams from municipal waste combustors, carbon monoxide concentrations are likely to determine the upper limit of exposures. This factor was demonstrated when laboratory animals were exposed to the combustion products from diesel engines. In addition to inhalation exposures, dermal exposure and dietary ingestion should be addressed

The third factor involves extension of the comparative potency approach to compounds sorbed to ash. Complicating issues, such as accounting for the strength of sorption of compounds to the ash, require investigation since the sorption strength has an impact on the absorbed dose for an organism in contact with the ash.

The major strength of the health effects program is its focus on investigating the problems posed by mixtures. The Subcommittee perceives this line of investigation as a priority; however, delays in initiating research and low levels of funding may prevent proper emphasis. The investigation of the additivity assumption and the question of bioavailability of sorbed substances should be given higher priority since they are important to MWC technology assessment as well as other areas of concern to the Agency.

V. Site-Specific Assessment

The sampling schedule referred in the research plan for site-specific risk assessment may be unrealistic. Background ambient sampling should take place before any portion of the unit is placed in operation. At least six months should be allowed after the unit begins operation to prove all systems, to run acceptance tests, and to assure adequate training of plant personnel. A reasonable period of time, such as 3-6 months, of normal plant operation should ensue to allow attainment of steady

state conditions. At that time, adequate information pertaining to the impact of facility emissions on the ambient environment can be obtained for use in site-specific assessments.

VI. Sampling, Analysis and Quality Assurance

Volatile organic compounds are targeted as a major assessment project in the research plan. However, the analytical methodologies to be employed consist solely of gas chromatography (GC) and gas chromatography-mass spectrometry (GC-MS) for qualitative and quantitative determination. Research on polar organic compounds is specifically described, yet many polar compounds will not pass through a GC. Additional use of high performance liquid chromatography-mass spectrometry (HPLC-MS) should be considered.

Another approach recommended by the Subcommittee is estimation of the total semi-volatile organic content in extracts by evaporation and weighing. This analysis should be followed by estimating the fraction of organic compounds that were not determined by GC and GC-MS analyses. The use of relative retention indices (RRIs) for GC analysis is encouraged and should be obtained and stored for each peak, along with mass spectra. These data may be useful in guiding further sampling and analytical efforts.

It may be important to achieve a reasonable mass balance of carbon in order to assess the relative contribution of the few compounds being sought. Information on the amount of carbon emitted and the quantity of discrete compounds measured provides a basis for assessing the relative percentage of the total that is represented by the compounds characterized.

VII. Emissions Characterization and Control

In the Agency's research plan, the objectives for research on emissions characterization and determining effectiveness for air pollution control devices are supported by a rationale. The discussion of the historical development of pollution control devices misses the point to some degree. Trace metals that are in solid form, rather than gaseous, at the temperatures required for flue gas treatment can be removed by high efficiency devices for control of solids, such as electrostatic precipitators (ESP), that are designed to remove fine, sub-micron size particulates. This fact is supported by available test data. However, organic compounds, both volatile and semi-volatile, will not be removed by an ESP to any great extent, except for those adsorbed onto particulate matter.

Thus, if organic content is to be reduced by control techniques, the use of dry or semi-dry lime addition in conjunction with high efficiency particulate control devices is recommended. There is some uncertainty at present as to whether dry or semi-dry lime injection is more effective in removing organic compounds. The exact mechanism of the removal of organic compounds

by lime addition is not well understood. Therefore, further research into this mechanism may be useful.

VIII. Residue Characterization and Disposal

The objectives of this aspect of the research plan are to characterize the quantity and mobility of hazardous ash constituents, and to determine the treatment techniques that are applicable to reduce any hazard posed by land disposal. The Subcommittee recommends that the objectives be expanded to investigate these factors under the different conditions that occur in the natural environment, specifically those conditions that prevail at points of planned ash and residue disposal.

In addition, the scope of characterization should be defined. It is important to stress that the identity of most organic compounds in residues is unknown. It is also important to obtain detailed operating data on the incinerator and the operating air pollution control devices as ash samples are taken, since these data can be correlated to the chemical properties of the ash and its components, including metal speciation. The Subcommittee is uncertain whether the research plan is intended to address only inorganic compounds, dioxins, and furans, or whether a wider spectrum of organic compounds will be examined.

Beyond considerations of mobility and identity, the environmental persistence of the compounds should be explored. Persistence is easily as important to fate prediction as is mobility, since a compound that has the potential to migrate but is not persistent poses little hazard. Conversely, a compound that does not migrate but does persist can pose a serious problem through mechanisms other than leaching. Transformation of chemicals in the environment is important to investigate, since transformation mechanisms can change potential hazard and exposure scenarios.

The Subcommittee has reservations concerning the use of simple aqueous solvents for the extraction of materials from residues. Attention should be given to the potential for interaction with solvents likely to be present at disposal sites in addition to water, and it may be necessary to identify such solvents.

These reservations extend to the proposed usage of the Toxicity Characteristic Leaching Procedure (TCLP). This laboratory procedure was designed to estimate the leachability of constituents from industrial wastes that might be co-disposed with municipal wastes in landfills. The procedure is probably not optimized for assessing the leachability of materials from bottom ash or fly ash, especially as these may occur under actual exposure conditions.

Another major project within the residue section of the research plan addresses migration through solids and clays. The approach stipulates use of partition coefficients in this

research. The Subcommittee considers the determination of partition coefficients to be important, and encourages this determination. Partition coefficients derived from assays with only water will need to be modified if the characteristics of the solvent system change under natural conditions. Therefore this research should be linked to the basic research on the influence of solvent characteristics on partitioning.

IX. Summary

The Subcommittee agrees that major areas of research have been proposed and developed to investigate important areas of uncertainty with respect to municipal waste combustion technology. However, budgetary constraints and limited funding commitments shed doubt, in the Subcommittees opinion, on EPA's ability to reach the objectives defined. Considerations of priority might be revisited to allow identification of research areas with high priority and attainable objectives.

APPENDIX A

Summary of ORD's Municipal Waste Combustion Research Plan

DRAFT

MUNICIPAL WASTE COMBUSTION

RESEARCH PLAN

Prepared by the

EPA/ORD MUNICIPAL WASTE COMBUSTION RESEARCH WORK GROUP

A. W. Lindsey, Chairman

February 1987

(This document will serve as a chapter or volume in EPA'S Comprehensive Report on Municipal Waste Combustion being prepared for Congress in the Spring of 1987).

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CHAPTER I

INTRODUCTION

BACKGROUND

EPA and its predecessor organizations have been involved in activities related to municipal solid waste (MSW) combustion since the 1960's. These activities were in response to Congressional mandates incorporated in three major acts and their amendments: the Clean Air Act (CAA), the Solid Waste Act (SWA), and the Toxic Substances Control Act (TOSCA). Agency activities whether regulatory, technology development or environmental research have been determined by these Acts and the EPA organizations responsible for their execution.

EPA was created in 1970. Prior to that time, the predecessor organizations which were eventually incorporated into EPA were concerned with the development and demonstration of technologies for solid waste management and disposal. They were also concerned with the control of air and water pollution from solid waste disposal practices--primarily land filling and incineration. Although the major focus of incineration was improved burning of waste and the control of particulate emission, pioneering work identifying the formation of hazardous air pollution during incineration was performed.

In 1970 EPA was formed and Congress passed the Resource Recovery Act and amendments to the Clean Air Act. The EPA Office of Air Quality Planning and Standards (OAQPS) promulgated air pollution regulations for the control of particulate emission from municipal waste incinerators in 1971. The Office of Solid Waste, along with the Office of Research and Development, began a series of research, development and demonstration

projects to prove the practicality of improved technologies for municipal waste disposal. A portion of these activities was concerned with an evaluation of the environmental impacts of these improved waste disposal practices and the identification of appropriate pollution control technologies. Although the control of traditional pollutants such as particulate air emission was of primary concern, research was also conducted to evaluate emission levels of potentially hazardous pollutants--primarily trace elements. However, in concert with the Resource Recovery Act mandate and spurred on by the first Arab oil embargo and the subsequent energy crises, a major portion of EPA research and development activities related to solid waste disposal were directed towards the development of technologies for recovery of energy from wastes.

In 1976 with the passage of the Resource Conservation and Recovery Act (RCRA), the focus of EPA's Office of Solid Waste (OSW) shifted toward hazardous waste management. After developing several regulations covering land disposal, OSW concluded its regulatory program in municipal wastes and phased out the supporting research program. The phase-out was largely complete by 1980.

Concurrent with these actions, the waste-to-energy program which had been conducted by the Office of Research and Development (ORD) was transferred to the Department of Energy (DOE). This action terminated activities within those EPA organizations which traditionally had been the most involved with MSW disposal.

With passage of TOSCA in 1976 and the CAA Amendments of 1978, EPA began to assess the need to control the release of toxic and hazardous materials from a wide variety of sources. One source category of concern

was municipal waste combustion (MWC), i.e. incinerators and MW energy recovery facilities. A number of field tests were sponsored by the Office of Toxic Substances (OTS), OAQPS and ORD to assess the emission of toxic and hazardous air pollutants from MWC. By the early 1980's stack emission tests at Hempstead, Long Island, Hampton, Virginia, Chicago, Illinois and elsewhere provided conclusive evidence of hazardous pollutants in the air emission from MWC. These pollutants included hazardous organic compounds such as polychlorinated dibenzo-P-dioxins (PCDDs), polychlorinated dibenzo furans (PCDFs), polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs). Significant levels of toxic metals such as arsenic, lead, mercury and cadmium were also found.

Work by other organizations in Europe, North America and Japan confirmed these findings and focused public concern on the emission of dioxin from MWC. This concern was heightened by public concerns in the many communities which sought to construct new MWC facilities as a solution to acute waste management problems associated with dwindling landfill capacity.

By 1985 EPA managers and scientists concluded that a concerted Agency effort would be required to address the human health and environmental hazard associated with MWC. There was no clear evidence concerning the extent and severity of the health and environmental risks posed by MWC. Nor was there scientifically valid data on the effectiveness of various MWC technologies in controlling emission of the wide range of pollutants of concern. In early 1986, the EPA administrator directed the formation of a MWC Work Group. This work group was directed to complete a compre-

hensive assessment of MWC technology, perform preliminary risk assessments of MWC, develop regulatory options for dealing with existing and new MWC facilities, and develop a MWC research program. The outcome of these activities would be used to provide a report to Congress under Section 102 of RCRA, provide a report to the Natural Resources Defense Council on the status of MWC pollution control technology and provide direction for the Agency's regulatory and research activities.

The results of the technology and risk assessment studies lead most Agency scientists and engineers to the belief that air pollution emissions from well-designed, well-operated and well-controlled MWC facilities probably do not pose substantial health risks. However it is readily acknowledged that information needed to document this conclusion and to convincingly communicate it to the scientific community and the public is not currently available. Also it is probable that at least some MWCs, particularly older, poorly-designed and operated units, do pose unacceptable risks to local populations.

Insufficient information is currently available to draw conclusions concerning the health and ecological risks posed by the disposal of residue from existing and new MWC facilities.

State and local officials and the general public are looking to EPA for answers to questions on health and environmental hazards associated with municipal waste incinerators and for guidance on how to control these hazards.

GOALS AND OBJECTIVES

To address the concerns raised above, the Agency has developed an intermediate term Research Plan (five years) based on three goals:

GOAL A. To determine whether modern, well designed, well operated and controlled municipal waste combustors pose a substantial hazard to human health and the environment. To address the concerns of environmentalists, State and local officials, and the general public, the data base developed to make this demonstration must be scientifically credible and cover all potential avenues of exposure.

GOAL B. Provide technical basis for regulatory or other Agency programs designed to ensure that these facilities pose low levels of risks to human health on the environment.

As one would expect, the technical information necessary and the techniques that are appropriate to gather necessary information are much the same to establish acceptability of municipal waste combustion as a technology and to provide the basis for future Agency programs. Research objectives for this work are as follows:

(1) Characterize emissions from MWC. Emissions data can be used to estimate impacts on human health and the environment.

(2) Provide improved estimates of the impacts of MWC emissions and residuals (ash, scrubber water, etc.) on health effects. Improved health effects estimates will provide evidence concerning the adequacy of pollution control technologies and provide basic information for guidance or regulatory development.

(3) Develop and validate combustion criteria to minimize pollutant formation. This information would support the implementation of regulatory controls or operating guidelines to minimize pollutant emissions.

(4) Determine the effectiveness of various types of air pollution control devices to remove pollutants of concern. This information would be used for regulatory development of existing MWC facilities to reduce potential adverse health and environmental impacts. This information would also provide important information in support of establishing design guidelines or regulations for new MWCs.

(5) Characterize quality and mobility of hazardous constituents in fly ash, bottom ash, and other residuals from various types of combustors. This information can be used to estimate potential human health and environmental impacts of handling and disposal and to establish guidelines and regulations for management of such residues.

(6) Determine the effectiveness of treatment techniques to reduce the hazards of land disposing of ash and other residuals. This objective will be pursued in depth only if substantive levels of hazardous constituents are found in the residuals and if these constituents are mobile (e.g., they leach).

GOAL C. Provide information and tools necessary to monitor, evaluate, and control individual municipal waste combustors. The same information and tools are often needed by regulatory officials (permit writers, etc.), equipment and processes designers, and those selecting equipment (city managers and other officials). The tools needed to implement guidelines or regulations that are not now fully available fall in four categories that establish the objectives for this research goal:

(1) Improve and validate the multipollutant, multimedia risk assessment protocol currently in use by EPA to evaluate the potential public health and environmental impacts of atmospheric emissions from MWCs. Further development of models and protocols is needed to identify areas of uncertainty associated with multipollutant, multimedia risk assessments and to improve the assumptions and imput parameters used in modeling the movement of pollutants through the environment.

(2) Validate existing sampling, analytical, and quality assurance protocols for application to municipal waste combustion. The existing protocols were almost all developed for application to other technologies (e.g., hazardous waste incineration or fuel combustion - power plants, etc.). They need to be adapted for standardized use by those monitoring and evaluating municipal waste combustors.

users of this work include a variety of groups, the technology transfer methods that are most effective will vary. Potential interested parties include regulatory and enforcement personnel in EPA and the States; equipment designers, equipment suppliers, and MWC system equipment users; and public interest groups and local residents concerned with use of MWC technology. Each project will include a specific technology transfer plan identifying activities which will be undertaken to ensure the transfer of project results to appropriate parties.

As with most research programs, the aforementioned objectives can be addressed with varying levels of completeness and rigor. And, as is usually the case, what will be done to satisfy the objectives is partially a function of the available funds. The 2.075 million dollars available in FY 87 and the slightly higher amounts being sought in FY 88 and succeeding years will provide resources to address the most immediate of the objectives in the near term. Some of the objectives, particularly those associated with implementation (GOAL C), will likely have to wait until the outyears (FY 89 and beyond).

The following sections describe specifically what will be done to achieve the objectives and how and when that work will be carried out.