7115

ITED STATES ENVIRONMENTAL PROTECTION AGE

Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

26 JUN 1987

J. KERTCHER

9 mey
Q
2634

MEMORANDUM

SUBJECT: Operational Guidance on Control Technology for New and Modified Municipal Waste Combustors (MWCs)

FROM: Gerald A. Emison, Director
Office of Air Quality Planning and Standards (MD-10)

TO: Air Management Division Directors
Regions I, III, V and IX

Air and Waste Management Division Director
Region II

Air, Pesticides, and Toxics Management Division Directors
Regions IV and VI

Air and Toxics Division Directors
Regions VII, VIII and X

As you know, numerous questions regarding the selection of appropriate pollution control requirements for MWCs have arisen during recent years in major source permitting proceedings under the prevention of significant deterioration (PSD) provisions of Part C of the Clean Air Act and the nonattainment new source review (NSR) provisions of Part D of the Act. Accordingly, the attached operational guidance is being issued to promote consistency in making best available control technology (BACT) determinations under PSD and lowest achievable emission rate (LAER) determinations under nonattainment NSR, and to reduce delay and confusion in the permitting process. This guidance requires reviewing authorities, in considering the range of potential control options during the BACT determination process for MWCs, to consider a dry scrubber and a fabric filter or electrostatic precipitator as BACT for sulfur dioxide (SO_2) and particulate matter (PM), and combustion controls as BACT for carbon monoxide (CO).

The Administrator remanded to Region IX on June 22, 1987, their previous concurrence on a PSD permit for the H-Power MWC to be constructed in Honolulu, Hawaii. Petitioners had argued that, (a) BACT for this facility did not adequately justify the failure to require the use of an acid gas scrubber, and (b) the permitting authority did not evaluate the effectiveness of acid gas scrubbers in reducing emissions of unregulated pollutants, as required by the June 1986 North County Resource Recovery Associates PSD Appeal decision (or North County remand). In remanding the H-Power permit application to Region IX for further proceedings, the Administrator made it clear that the Agency considers acid gas scrubbers to be an available technology for excess air MWCs that fire refuse-derived fuel (RDF) such as the H-power facility. The attached operational guidance states that this type of post-combustion control is one component of available technology for modular, starved air MWCs and massburn, excess air MWCs, in addition to RDF-fired, excess air MWCs.

As stated above, the operational guidance includes a second component of available technology, which is combustion control for the criteria pollutant CO. Since the effectiveness of the two components of available technology in controlling unregulated pollutants is an important consideration in individual BACT determinations (per the North County remand), the attached guidance states that (a) acid gas scrubbers followed by fabric filters or electrostatic precipitators are effective in controlling potentially toxic organic and metal pollutants, as well as acid gases other than sulfur dioxide, and (b) combustion controls are effective in controlling potentially toxic organic pollutants.

The technical basis for the operational guidance is documented in five reports which are a part of the Agency's comprehensive study of MWC. These volumes are listed in the References section of the guidance. You will note that the guidance indicates "specified values" should be selected on a site specific basis for several design and operating parameters of the facility and for emissions of criteria pollutants. A thorough discussion of the factors to be considered in choosing the "selected values" is included in the five reports from the comprehensive MWC study.

As noted under Section V, this guidance should be transmitted to all State and local agencies to which PSD permitting authority has been delegated under 40 CFR Section 52.21(u). The transmittal letter should specify that the delegation agreement is amended to include this guidance. States which have received SIP approval of a PSD program under 40 CFR Section 51.166 (formerly Section 51.24) should also be informed of this guidance and of EPA's expectation that it be followed.

Attachment

cc: James DeMocker (ANR-443)
Gregory Foote (LE-132A)
Steve Greene (WH-565)
Joseph E. Lees (ANR-443)
J. Craig Potter (ANR-443)
John C. Ulfelder (A-101)
Marcia Williams (WH-562)

6/26/87

OPERATIONAL GUIDANCE ON CONTROL TECHNOLOGY FOR NEW AND MODIFIED MUNICIPAL WASTE COMBUSTORS

I. The Need for Guidance.

The combustion of municipal waste represents an increasingly important element of the solid waste disposal problem in the U.S. However, the operation of municipal waste combustors (MWCs) releases potentially harmful pollutants to the air. Human exposure can occur directly or indirectly, and there is also concern that the environment could be vulnerable to long-term accumulation of emitted pollutants. EPA is addressing these issues in a comprehensive, integrated Municipal Waste Combustion Study and with this operational guidance.

Numerous questions regarding the selection of appropriate pollution control requirements have arisen during recent years in major source permitting proceedings under the prevention of significant deterioration (PSD) provisions of Part C of the Act and the nonattainment new source review (NSR) provisions of Part D of the Act. Uncertainty over these questions has led to conflict over minimum legal requirements and consequent delay in the permitting and construction of MWCs. Hence, there is a need for guidance to resolve controversies which may arise as to facilities seeking permits. Accordingly, EPA is issuing this operational guidance for use in making best available control technology (BACT) determinations under PSD and lowest achievable emission rate (LAER) determinations under nonattainment NSR. EPA believes that this guidance will promote consistency in control requirements, and reduce delay and confusion in the permitting process. At the same time it will allow permitting authorities to give appropriate consideration to local factors in making case-by-case BACT determinations as required under law.

II. Administrative History.

Section 169(3) of the Act provides that BACT determinations in PSD permits must be "based on the maximum degree of reduction of each pollutant subject to regulation under this [Act] . . . which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable." EPA's regulations track this language. See 40 C.F.R. 52.21(b)(12), 40 C.F.R. 51.166(b)(12). In addition, in two administrative appeals involving resource recovery facilities, EPA has further refined the analysis which permitting authorities must conduct in making BACT determinations.

In North County Resource Recovery Associates, PSD Appeal No. 85-2 (June 3, 1986), the Administrator issued a Remand Order which held that, in making BACT determinations for a regulated air pollutant, the permitting authority must consider the effect of that decision on emissions of pollutants not regulated under the Clean Air Act. North County provided that the final BACT decision should address these environmental impacts, and that the permitting authority may ultimately choose more stringent emissions limitations for the regulated pollutant than it would otherwise have chosen if it would have the collateral benefit of restricting emissions of the unregulated pollutant. In the North County case, the permitting authority had required the use of a dry scrubber and fabric filter as BACT for sulfur dioxide, but had failed to consider the effect of that decision on emissions of certain unregulated pollutants -- dioxins and furans, heavy metals, and acid gases -- on the grounds that it lacked authority to do so. Various persons petitioned the Administrator under 40 C.F.R. Part 124. In response to the Administrator's subsequent remand order, the permitting authority analyzed the effect of various control options on these three classes of pollutants, and found that no other controls on regulated pollutants would be more effective in reducing emissions of the unregulated pollutants. The Administrator then ruled that the permitting authority had satisfied the requirements of the remand order, and denied the petitions. See North County Resource Recovery Associates, PSD Appeal No. 85-2, Order Denying Review (September 4, 1986).

The Administrator ruled in Honolulu Resource Recovery Facility ("H-Power"), PSD Appeal No. 86-6, Remand Order (June 22, 1987), that a PSD permitting authority has the burden of demonstrating that adverse economic impacts justify the failure to require as BACT the most effective control technology which is available. He also found that acid gas scrubbers are an available control technology for sulfur dioxide (SO_2). The H-Power decision also provided that the economic impacts must be specific to the source in question and substantial. Thus, because the Administrator agreed with EPA Region IX that Hawaii had not adequately demonstrated the basis for its conclusion that economic factors justified the absence of flue gas treatment as BACT for SO_2, he remanded the matter for further proceedings.

EPA today also draws upon the technical data referenced below, and its experience in issuing, reviewing, and enforcing PSD permits for MWCs. Recent emission test data have demonstrated that particulate matter (PM), SO_2, and other air pollutants (including organics, heavy metals, and acid gases) can be controlled effectively by acid gas scrubbing devices (dry scrubbers) equipped with efficient particulate collectors. Over 20 MWC facilities in Europe are known to be operating with dry scrubbers and particulate collectors, and at least 37 such facilities are known to exist in Japan. In the United States, three facilities currrently are in operation and at least 15 have been permitted to construct with dry scrubbing and particulate control devices as the specified technology. Thirteen of these facilities are expected to be operating by December 1988.

Based on this information, it is clear that a dry scrubber followed by either a fabric filter or electrostatic precipitator are "available" technologies for effective control of the SO_2 and PM emitted by MWCs, and that these technologies also are effective in controlling emissions of potentially toxic organic and heavy metal pollutants, and acid gases other than SO_2. In addition, the data show that these technologies are reliable and reasonably affordable. Similarly, combustion controls are an available technology for the control of carbon monoxide (CO) emitted by MWCs, and are effective in controlling that criteria pollutant and potentially toxic organic pollutants. EPA's information indicates that this technology also is reliable and reasonably affordable.

III. BACT Guidance for SO_2, PM, and CO.

Accordingly, in considering the range of potential control options during the BACT determination process for MWCs, the reviewing authority must consider a dry scrubber and a fabric filter or electrostatic precipitator as BACT for SO_2 and PM, and combustion controls as BACT for CO. In order to justify a BACT determination calling for a lesser degree of emissions control than can be achieved using these technologies, the permitting authority must demonstrate, based on information contained in the permit file, that significant technical defects, or substantial adverse economic, energy, or environmental impacts or other costs would arise that are specific to the MWC in question. Permitting authorities remain free to make case-by-case judgments in accordance with today's guidance. However, based on the above-referenced information regarding legal requirements and the availability, effectiveness, and cost of these technologies, EPA expects that proper application of this guidance will result in few, if any, BACT determinations entailing application of pollution control technologies less effective than those called for herein.

Today's guidance is general; it is limited to describing types of post-combustion control equipment and to establishing general criteria for combustor design, combustor operating practices, emission monitoring, and operator training. It does not set specific emission limits. Detailed information regarding the maximum degree of emissions control achievable with these technologies is available in the referenced technical documents, the BACT/LAER Clearinghouse, or from EPA. Such information should be used by applicants and permitting authorities setting specific emissions limits for PSD permits. In addition, today's guidance only addresses control technologies currently in widespread use for MWCs, and establishes minimum criteria for BACT determinations. Permitting authorities are not relieved of their responsibility to consider, on a case-by-case basis, whatever available technologies may be anticipated to provide a greater degree of control than those addressed today. Similarly, because control technologies and the other factors in forming BACT determinations are constantly evolving, the technology providing the greatest degree of emissions control taking economic, energy, and environmental impacts into account may likewise change over time. As one example, flue gas treatment technology for the criteria pollutant nitrogen oxides (NO_x) is in operation at one MWC in the U.S., and this technology should be considered by permitting authorities in making BACT determinations. In addition, emerging technologies in flue gas cleaning may develop which can attain the level of multipollutant control currently demonstrated by dry scrubbing/particulate matter controls, and technologies such as these should be considered in future BACT determinations. Permitting authorities and applicants must keep abreast of new developments. Of course, EPA will assist in this endeavor.

IV. LAER Guidance for Nonattainment Areas.

The technologies discussed herein for control of SO_2 PM, CO, and NO_x have all been successfully implemented, and thus have been "achieved in practice" by MWCs within the meaning of section 171(3) of the Act. Hence, in nonattainment areas where NSR requirements apply and major new sources and modifications must apply LAER, no less effective pollution control technologies may be imposed as LAER.

V. Implementation.

Today's guidance applies to all ongoing PSD and NSR proceedings, as well as to all new permit applications. In consideration of the needs for program stability and equity to sources which have in good faith relied on pre-existing permitting guidelines, this guidance does not apply to PSD and NSR permit proceedings for which, as of June 26, 1987, final permits have already been issued and, with respect to PSD permits issued by EPA, agency review procedures under 40 C.F.R. Part 124 have been exhausted.

This operational guidance applies to PSD permits issued by EPA directly through its Regional offices and indirectly through State and local agencies pursuant to delegation agreements made under 40 C.F.R. 52.21(u). Such agencies will be notified by letter of this guidance. It will constitute an amendment to the pre-existing delegation agreements. EPA Regional offices will review all draft permits for MWCs issued by delegate agencies during the public comment period to insure proper application. Further program evaluation will take place under the National Air Audit System (NAAS). If delegate agencies should fail to adhere to this guidance, EPA staff may initiate administrative appeal proceedings under 40 C.F.R. Part 124 in appropriate cases. Such action would be appropriate where, for example, failure to follow the guidance results in a finding of fact or conclusion of law which is clearly erroneous, or involves an exercise of discretion or an important policy consideration which the Administrator should review. See 40 C.F.R. 124.19(a). Action would also be appropriate where failure to follow the guidance resulted in an inability to determine, based on the record, whether a clear error occurred. If necessary, EPA may also revoke the delegation of PSD authority to the State or local agency.

With respect to State PSD permits issued pursuant to a State implementation plan (SIP) program approved by EPA under 40 C.F.R. 51.166 (formerly 51.24), and State NSR programs approved under Part D of the Act and 40 C.F.R. 51.165 (formerly 51.18(j)), EPA expects States to follow today's guidance in generally the same fashion as delegate agencies. EPA will use the guidance as a reference point in its oversight of State MWC permit actions. As with delegated permits EPA will participate in permit proceedings and conduct NAAS evaluations. If agencies processing NSR permits or PSD permits under approved State programs should fail to adhere to this guidance, EPA may initiate administrative and/or judicial action under sections 113 and/or 167 of the Act in appropriate cases. Such action would be appropriate where, for example, failure to follow the guidance results in a finding of fact or conclusion of law which is clearly erroneous, or in an inability to determine whether a clear error occurred. If necessary, EPA may also call for SIP revisions under section 110(a)(2)(H).

Insofar as today's guidance addresses minimum legal requirements for BACT determinations, it simply implements existing regulations and policy, including Agency actions already made by the Administrator in the North County and H-Power cases. To the extent the guidance addresses the technical issues of availability, effectiveness, and cost of control technologies for MWCs, it expresses EPA's view regarding the proper usage, in permit proceedings under existing EPA regulations and SIP programs, of the factual data contained in the five documents referenced below. Those documents present information on the alternative controls available for MWCs, the performance capabilities and costs of those controls, and the methods for monitoring and measuring emissions from MWCs. Factors to be considered in choosing the "specified values" to be included in permits, as noted in the guidance, such as maximum concentration of CO in emissions and minimum value of furnace temperature, are contained in these references. Thus, the guidance does not constitute rulemaking within the meaning of section 307(d) of the Act or under the Administrative Procedure Act. Accordingly, it is not necessary to implement this guidance, as to EPA permits issued by Regional offices or State and local agencies, through changes in the PSD regulations at 40 C.F.R. 52.21. Likewise, regarding approved State PSD programs, it is not necessary to revise 40 C.F.R. 51.166 and require corresponding SIP revisions.

VI. Technical Guidance.

Today's operational guidance applies to three types of MWCs: massburn, excess air MWCs; excess air MWCs that fire refuse-derived fuel; and modular, starved air MWCs. It applies to those MWCs that operate with energy recovery and those that operate without energy recovery. It applies to both major new and major modified facilities of these types. The guidance requires that values for emission limits and operating parameters be specified in MWC permitting decisions.

One component of control technology for MWCs is the application of the appropriate post-combustion control equipment. The EPA has identified this equipment as a dry scrubber with fabric filter or with electrostatic precipitator. The concentration of particulate emissions in the exhaust gases from the post-combustion control equipment shall not exceed a specified maximum value; and the SO_2 emissions in the exhaust gases shall not exceed a specified maximum concentration value or the percent reduction in SO_2 emissions across the post-combustion control equipment shall not be less than a specified value. Performance of the dry scrubber and fabric filter or electrostatic precipitator in controlling acid gases, potentially toxic metals, and potentially toxic organic pollutants is affected sigificantly by the reduction in flue gas temperature which occurs in the dry scrubber. The control system shall be designed and operated such that the flue gas temperature at the outlet from the dry scrubber does not exceed a specified value.

A second component of control technology for MWCs is proper design and operation of the combustion system, which controls CO and potentially toxic organic pollutants. Minimum concentrations of CO in emissions from MWCs are associated with the implementation of several good combustion practices. These practices are also related to the effective destruction of potential emissions of toxic organic pollutants, including dioxins and furans. Concentrations of CO in furnace exhaust gases shall not exceed a specified maximum value, and CO and O_2 concentrations in the exhaust gases shall be monitored continuously. In addition, furnace operating temperatures shall be no lower than a specified minimum value, and a procedure for continuous monitoring shall be established to ensure that the specified temperature is maintained.

The capabilities to control flow rates and distributions of underfire (primary) and overfire (secondary) air, to monitor continuously CO concentration and furnace temperature, to maintain thermal load within a specified range, and to control the process to maintain CO and temperature of the furnace at appropriate levels are all important to good combustion. Detailed information regarding the numerical values to be assigned to the emission levels and equipment design and operating parameters associated with good combustion are provided in the documents cited under References.

<u>References</u>:

Municipal Waste Combustion Study: Emission Data Base for Municipal Waste Combustors.
EPA/530-SW-87-021B

Municipal Waste Combustion Study: Combustion Control of Organic Emissions.
EPA/530-SW-87-021C

Municipal Waste Combustion Study: Flue Gas Cleaning Technology.
EPA/530-SW-87-021D

Municipal Waste Combustion Study: Cost of Flue Gas Cleaning Technologies.
EPA/530-SW-87-021E

Municipal Waste Combustion Study: Sampling and Analysis.
EPA/530-SW-87-021F

From: D.COHEN (EPA1704) Delivered: Wed 1-July-87 15:02 EDT Sys 163 (187)
Subject: press release - municipal waste combustors
Mail Id: IPM-163-870701-135340904

MWC press release, July/87

FOR RELEASE: WEDNESDAY, JULY 1, 1987 Robin Woods (202) 382-4377

EPA TO REGULATE EMISSIONS FROM MUNICIPAL WASTE INCINERATORS

The U.S. Environmental Protection Agency today announced that it is requiring controls on air emissions from municipal waste incinerators in light of findings which show that available technologies can substantially reduce risks associated with such emissions.

The agency reported that existing facilities can emit dioxins and other organic chemicals, metals and acid gases, which, if left unregulated, could pose health and environmental risks, based on lifetime exposures. New, state-of-the-art facilities which follow certain performance procedures, such as providing optimal high-temperature combustion and using various kinds of pollution-control equipment, can substantially reduce these emissions.

J. Winston Porter, Assistant Administrator for Solid Waste and Emergency Response, said, "Municipal incinerators represent an important option for solving America's waste problems. EPA is now requiring controls that will assure the safe operation of this technology."

Don Clay, Deputy Assistant Administrator for Air and Radiation, said "EPA's conservative risk assessment shows that the potential health risks to the public are generally small, but of enough concern to justify regulation. The controls we are calling for today will substantially reduce the potential risks associated with such emissions."

The findings came in a report to Congress on municipal waste combustion and in an advance notice of proposed rulemaking for new facilities under the federal Clean Air Act. Last week, EPA issued guidance to its regional offices and to states to ensure that the best control technologies are required in the permitting of new incinerators to control emissions. This guidance will have the immediate effect of ensuring that these technologies are used on new facilities even before the development of the upcoming regulations. All facilities must receive permits under the Clean Air Act.

Concurrent with proposal of regulations for new sources, the agency will propose guidelines to states for use in developing performance standards for all existing facilities, calling for the use of best available technologies. The state implementation of these guidelines is subject to EPA approval, and the agency can issue regulations for existing facilities in the event states fail to do so. In 1974 and 1986, EPA regulated dust (called particulate matter) from these facilities.

As a result of its findings that facility design and operation are major factors in the control of emissions, EPA has developed a set of "good combustion practices," which lead to complete combustion through high temperatures and good air distribution to minimize harmful emissions.

There are currently 111 municipal waste incinerators in the United States, with a capacity to incinerate 49,000 tons of solid (non-hazardous) waste per day. An estimated 210 facilities are known to be planned or under construction, which would add approximately 190,000-tons-per-day capacity by the year 2000. Incineration of municipal waste is an increasingly attractive waste-management option to local governments in the face of shrinking landfill availability, because it reduces the volume of the waste by 70 to 90 percent. Some incinerators also offer the ability to recover energy from the combustion process that can be used to offset the energy requirements of the facility or sold to local industries or utilities. These are often referred to as resource-recovery or waste-to-energy plants.

There are three types of municipal waste incinerators: 1) mass-burn, which burns unprocessed waste and is the most prevalent (68 percent of existing facilities); 2) modular, which also burns unprocessed waste but is generally smaller than the mass-burn facility; and 3) refuse-derived-fuel, which burns processed wastes, in some cases in conjunction with coal.

EPA is currently studying the characteristics of municipal-wasteincinerator ash produced in the combustion process. The results are expected to be available in the early fall.

EPA evaluated six organic chemical constituents in the emissions of municipal waste incinerators: dioxins, chlorobenzenes, chloriphenols, formaldehyde, polycyclic aromatic hydrocarbons, polychlorinated biphenyls (PCBs); and six metals: arsenic, beryllium, cadmium, chromium, lead and mercury. EPA also evaluated particulate (dust) emissions, sulfur dioxide, hydrogen chloride, carbon monoxide and nitrogen oxides.

Control technologies can remove a wide range of pollutants from the combustion gases. A combination of proper combustion conditions, an acid gas scrubber and a particulate-matter-collection device can reduce: dioxins and furans by greater than 99 percent; other organics by greater R-93 than 95 percent; hydrogen chloride by 90 percent; and metals by 97 to 99 percent.

In its health-risk analysis, the agency found that lifetime exposure to unregulated stack emissions could contribute potential long-term health effects. EPA believes that its estimated risk is higher than actual risk and that actual risk may be considerably lower. Using mathmatical models to project possible exposure to local populations, the agency found that most of the estimated long-term cancer risk is attributable to dioxins. Under reasonable worst-case assumptions, unregulated dioxins from existing facilities could potentially produce, on a national level, from three to 38 cancer cases a year through inhalation.

EPA believes additional controls could significantly reduce the risks from all pollutants, including dioxins, to 0.2 to 3.0 cancer cases a year for all existing facilities, and 0.3 to 1.0 cases for all new facilities.

Several carcinogenic (cancer-causing) metals, arsenic, beryllium, cadmium and chromium, are emitted in trace quantities. Under worst-case assumptions, without additional controls the overall national cancer risk associated with inhalation of these unregulated emissions is estimated to range up to 0.5 cases per year for existing sources and 0.4 cases for new facilities.

Other carcinogenic organic compounds, chlorobenzenes, chlorophenols, formaldehyde, polycyclic aromatic hydrocarbons and PCBs, are estimated to pose similar risks without additional controls, ranging from 0.05 to 0.7 cases a year for existing facilities and from 0.2 to 0.3 cases for new facilities.

Of the two non-carcinogenic substances studied, lead and mercury, neither is produced in levels that would exceed current ambient-air standards or guidelines.

EPA also is studying exposure through indirect sources such as absorption through the skin and from deposits on soil, water and food. Preliminary results indicate that exposures through indirect mechanisms may be comparable to exposures through direct inhalation for dioxins, PCBs, chlorobenzenes and mercury. Mercury may be further absorbed through food; lead through soil. Indirect exposure does not appear to be of concern for chromium, beryllium and formaldehyde.

At about one-half of the facilities, hydrogen chloride is produced in quantities which may lead to corrosion of ferrous metals.

The advance notice of proposed rulemaking will be published in the Federal Register within the next two weeks. The notice allows a 60-day public-comment period. The Federal Register can be found at most libraries. Copies of the "Report to Congress on Municipal Waste Combustion" and supporting documents will be available for purchase within the next week from the National Technical Information Service, Springfield, Va. 22161; (703) 487-4600. The Federal Register notice will provide additional required ordering information.

R-93 # # #

Telefax to Reg I - X Public Affairs Directors. Hard copy being sent in overnight mail.

June 1987

MUNICIPAL WASTE COMBUSTION STUDY: REPORT TO CONGRESS

Prepared by
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
401 M Street S.W.
Washington, D.C. 20460

EXECUTIVE SUMMARY

INTRODUCTION

This report to Congress is in response to Section 102 of the Hazardous and Solid Waste Amendments (HSWA) of 1984. Section 102 of HSWA requires that the EPA provide a report to Congress describing:

"(i) the current data and information available on emissions of polychlorinated dibenzo-p-dioxins from resource recovery facilities burning municipal solid waste;

(ii) any significant risks to human health posed by these emissions; and

(iii) operating practices appropriate for controlling these emissions."

The EPA has enlarged the scope of the Section 102 report to include additional information generated during an integrated study of Municipal Waste Combustion. The integrated study resulted in this Report to Congress and eight technical reports. Much of the information contained in this report has been extracted from the technical reports.

MUNICIPAL WASTE COMBUSTION IN THE UNITED STATES

Combustion of municipal waste is an attractive waste management option because it reduces the volume of the waste by 70 to 90 percent. In the face of shrinking landfill availability, municipal waste combustion capacity in the United States is expected to grow rapidly, from the current U.S. capacity of 45,000 tons per day to 117,000 to 252,000 tons per day by the year 2000. This added capacity is expected to be added with nearly 200 new municipal waste combustion facilities.

There are currently 111 municipal waste combustion facilities in the United States. Figure 1 shows their geographic distribution. Figure 2 shows geographic locations of 210 facilities known by the EPA to be planned or under construction. The maps show that municipal waste combustion facilities are concentrated on the East Coast with many facilities also planned for California.

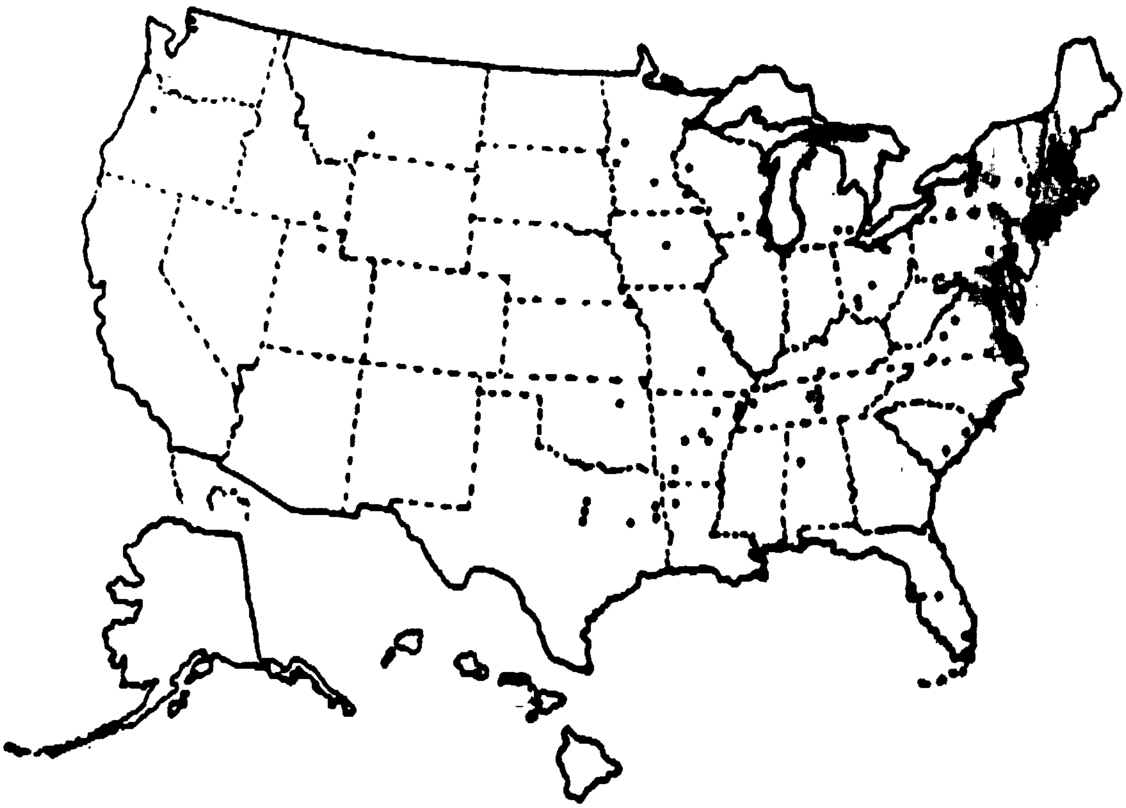


Figure 1. Regional Distribution of Existing Municipal Waste Combustion Facilities

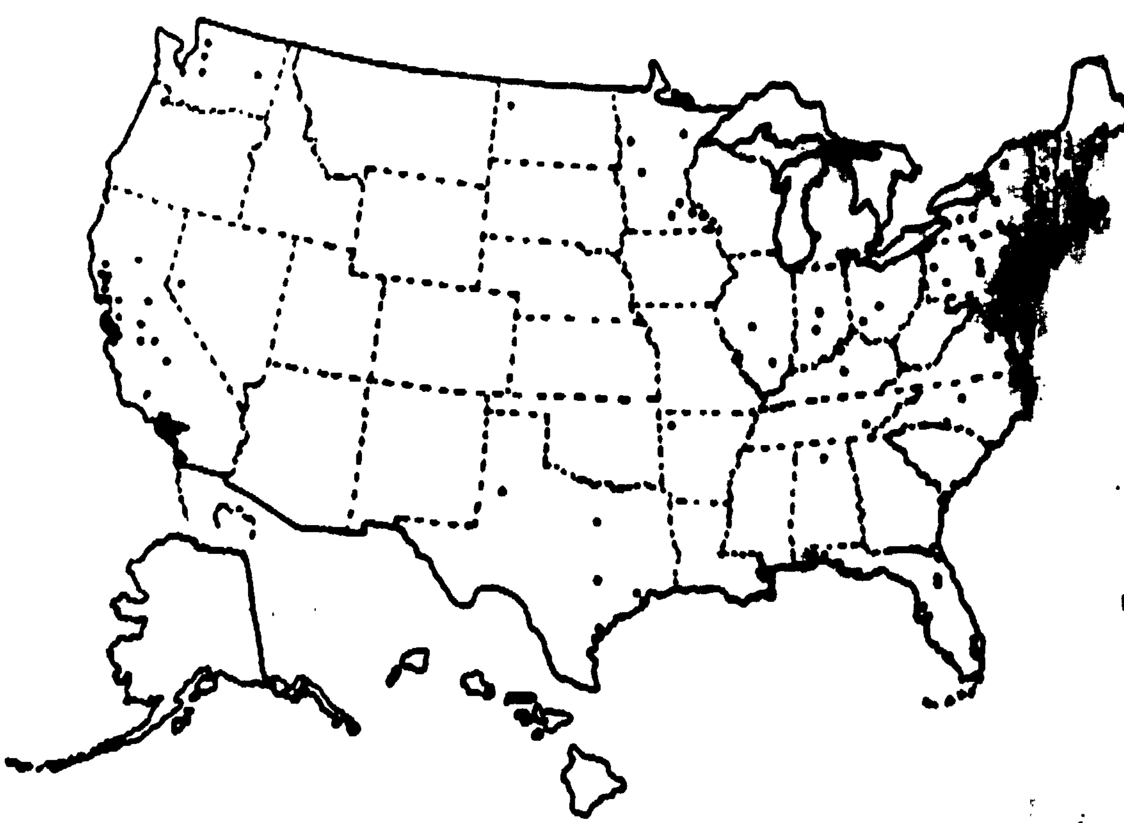
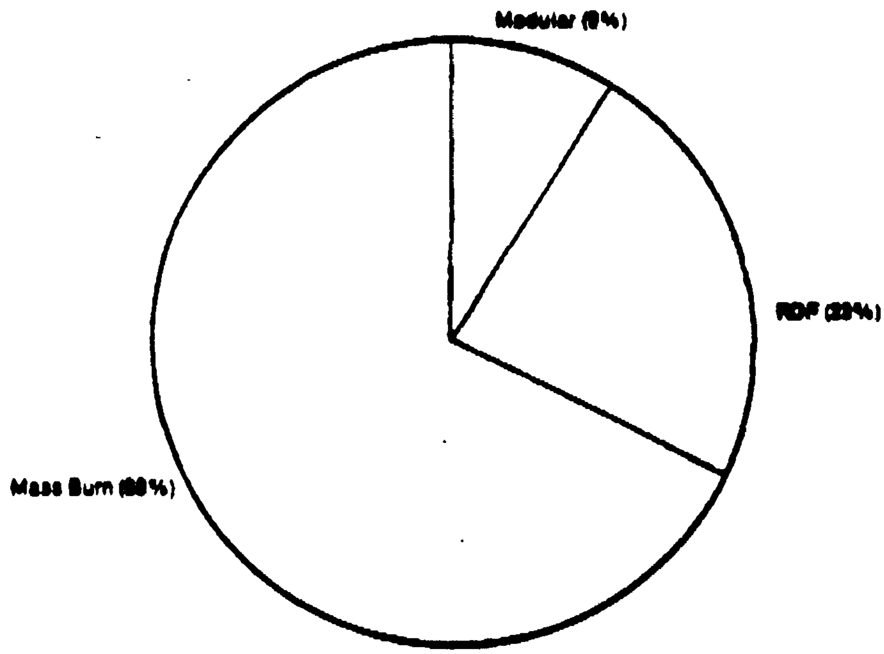


Figure 2. Regional Distribution of Planned Municipal Waste Combustion Facilities

Three main types of combustors are used for combustion of municipal waste: mass burn, modular, and those that fire refuse-derived fuel (RDF). The first type is called "mass burn" because the waste is combusted without any pre-processing other than removal of items too large to go through the feed system. In a typical mass burn combustor, refuse is placed on a grate that moves through the combustor. Combustion air in excess of stoichiometric amounts is supplied both below (underfire air) and above (overfire air) grate. Mass burn combustors are usually field-erected and range in size from 50 to 1000 tons per day of refuse throughput per unit. Many mass burn facilities have 2 or more combustors and have site capacities of greater than 1000 tons per day.

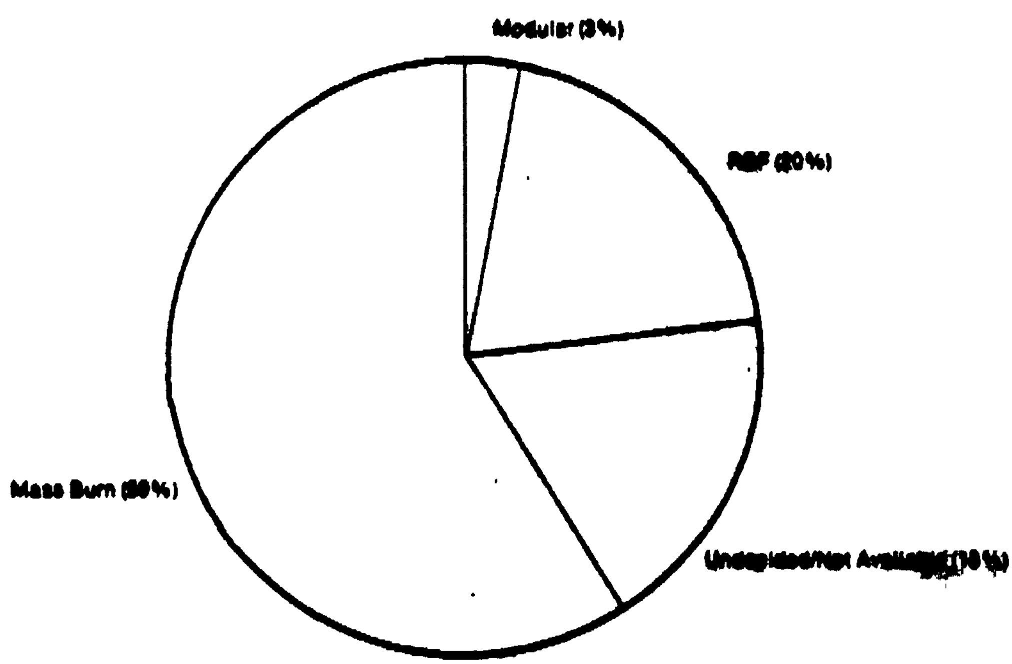
Modular combustors also burn waste without pre-processing, but they are typically shop fabricated and generally range in size from 5 to 100 tons per day of refuse throughput. One of the most common types of modular combustors in the starved air or controlled air type, incorporating two combustion chambers. Air is supplied to the primary chamber at substoichiometric levels. The incomplete combustion products pass into the secondary combustion chamber where excess air is added and combustion is completed. Another type of modular combustor, functionally similar to larger, mass burn units, uses excess air in the primary chamber; no additional air is added in the secondary chamber. The third major type burns refuse-derived fuel (RDF). This type of combustor burns processed waste which may vary from shredded waste to finely divided fuel suitable for co-firing with pulverized coal.

The distribution of the existing U.S. waste combustion capacity among the three types is shown in Figure 3. As shown, mass burn facilities have the largest share of U.S. capacity, 68 percent of the total. RDF facilities represent 23 percent of the total capacity, and modular facilities account for 9 percent. Although modular facilities represent a small fraction of the total U.S. capacity, the number of facilities equipped with modular facilities is greater than the number of combustion facilities equipped with mass burn units (56 modular facilities compared to 48 mass burn facilities). There are ten RDF facilities in operation.



Total Design Capacity = 48,000 tons per day

Figure 3. Distribution of Existing Installed Municipal Waste Combustion Capacity by Design Type



Total Design Capacity = 190,800 tons per day

Figure 4. Distribution of Planned Municipal Waste Combustion Capacity by Design Type

Figure 4 shows the expected distribution of design types for planned facilities the EPA has knowledge of. Mass burn facilities are expected to continue to dominate with 59 percent of the U.S. design capacity. RDF facilities are expected to account for 20 percent, and design capacity for modular facilities is expected to account for 3 percent.

EMISSIONS AND THEIR CONTROL

Environmental concerns have been raised about both solid residues and pollutants emitted to the air from municipal waste combustors. Particular concern has been raised concerning the presence of chlorinated dibenzo-p-dioxins (CDD) and chlorinated dibenzofurans (CDF) in emissions to the air and solid residues.

The EPA is currently working to determine the most environmentally acceptable methods for disposal of municipal waste combustor solid residues. The Agency's findings concerning residue disposal will be published when that work is complete. The remainder of this Report to Congress and the accompanying technical reports focus on environmental effects of emissions to the air from municipal waste combustors.

As part of the integrated study, EPA attempted to collect all available data on emissions from municipal waste combustors. From this data the EPA established an emissions data base of almost 50 facilities from which emissions had been measured in documented tests. Comparison of the data from different tests is difficult because the facilities vary widely in design and operating conditions, the tests were conducted with different objectives and different protocols, and the level of detail of the reported data varies. Further, the specific sampling and analysis methods were not the same for all tests. These differences make it difficult not only to make comparisons among the combustors tested, but also to draw conclusions about the entire population of combustors. Nevertheless, this study has used these data to the extent possible to evaluate municipal waste combustion practices.

Pollutants of interest emitted from municipal waste combustors include metals, acid gases (primarily HCl), organics (including CDD and CDF), and, in some localities, NO_x, as well. Table 1 contains a summary of emissions quantities measured from municipal waste combustors.

For municipal waste combustors controlling emissions involves controlling emissions of a whole list of pollutants. Moreover, application of control technology for one pollutant or class of pollutants may affect control of other pollutants. Devising a control strategy, then, involves consideration of control techniques for each of the classes of pollutants present but also requires consideration of the effects of a selected control technique on the entire list.

Options for control include optimization for minimizing organic emissions; scrubbing for acid gas control; flue gas cooling for condensation of metals and organics; high efficiency particulate matter collection; and NO_x control where necessary. A control approach designed to incorporate all of these processes, thereby minimizing emissions of the whole list of pollutants would be:

- optimization of the combustion process,
- alkaline scrubbing combined with ESPs or fabric filters operated at temperatures conducive to promoting condensation, and
- flue gas treatment for NO_x control, if necessary.

Some of the newest facilities in Europe and in the United States have incorporated the first two parts of this approach, and at least one facility in California has incorporated all three parts. The alkaline scrubbers being chosen for most of the new facilities are dry scrubbers.

With a goal of optimizing combustion in mind the EPA developed a set of combustion strategy elements termed "good combustion practices," summarized in Table 2. Also shown are preliminary specifications for each of the elements. Even though these good combustion practices are preliminary and have not been verified in field tests, they have been included because it is important for permit writers and those applying for permits to be aware of the conditions that promote achievement of complete combustion.

TABLE 1. SUMMARY OF EMISSIONS MEASURED FROM THE THREE MAJOR CLASSES OF MUNICIPAL WASTE COMBUSTORS[a]

Pollutant	Mass Burn	Modular	RDF-Fired
Particulate matter	5.5 - 1,530 mg/Nm³	23 - 300 mg/Nm³	220 - 530 mg/Nm³
	(0.002 - 0.669 gr/dscf)	(0.012 - 0.13 gr/dscf)	(0.096 - 0.230 gr/dscf)
Sulfur dioxide	0.04 - 401 ppmdv	61 - 124 ppmdv	55 - 100 ppmdv
Nitrogen oxides	39 - 300 ppmdv	260-310 ppmdv	263 ppmdv[b]
Carbon monoxide	10.5 - 1,350 ppmdv	3.2 - 67 ppmdv	217 - 430 ppmdv
Hydrogen chloride	7.5 - 477 ppmdv	100 - 1270 ppmdv	96 - 700 ppmdv
Hydrogen fluoride	0.62 - 7.2 ppmdv	1.1 - 16 ppmdv	2.1 mg/Nm³ [b]
Arsenic	0.452 - 233 ug/Nm³	6.1 - 119 ug/Nm³	19 - 100 ug/Nm³
Beryllium	0.0065 - 0.33 ug/Nm³	0.096 - 0.11 ug/Nm³	21 ug/Nm³ [b]
Cadmium	6.2 - 500 ug/Nm³	21 - 942 ug/Nm³	34 - 370 ug/Nm³
Chromium	21 - 1,020 ug/Nm³	3.6 - 390 ug/Nm³	490 - 6,700 ug/Nm³
Lead	25 - 15,000 ug/Nm³	237 - 15,500 ug/Nm³	970 - 9,000 ug/Nm³
Mercury	9 - 2,200 ug/Nm³	150 - 705 ug/Nm³	170 - 440 ug/Nm³
Nickel	250 - 480 ug/Nm³	<1.92 - 353 ug/Nm³	130 - 3,000 ug/Nm³
TCDD	0.20 - 1,200 ng/Nm³	1.0 - 40.7 ng/Nm³	3.5 - 200 ng/Nm³
TCDF	0.32 - 4,000 ng/Nm³	12.2 - 345 ng/Nm³	32 - 600 ng/Nm³
PCDD	1.1 - 11,000 ng/Nm³	63 - 1540 ng/Nm³	54 - 2,040 ng/Nm³
PCDF	0.420 - 15,000 ng/Nm³	97 - 1800 ng/Nm³	135 - 9,100 ng/Nm³

[a]See Appendix C for summary of facilities represented in emission data for each pollutant category. Results [illegible] techniques only.

[b]Only one test.

TABLE 2. GOOD COMBUSTION PRACTICES FOR THE MINIMIZATION OF ORGANIC EMISSIONS FROM MUNICIPAL WASTE COMBUSTORS

Practice	Mass Burn Preliminary Target	RDF Preliminary Target	Starved-air Preliminary Target
sign temperature at fully mixed height	1800°F at fully mixed height	1800°F at fully mixed height	1800°F at fully mixed height
derfire air control	At least four separately adjustable plenums. One each under the drying and burnout zones and at least two separately adjustable plenums under the burning zone.	As required to provide uniform bed burning stoichiometry	
erfire air capacity ot an operating requirement)	40% of total air	40% of total air	80% of total air
erfire air injector design	That required for penetration and coverage of furnace cross-section	That required for penetration and coverage of furnace cross-section	That required for penetration and coverage of furnace cross-section
xiliary fuel capacity	That required to meet start-up temperature and 1800°F criteria under part-load operations	That required to meet start-up temperature and 1800°F criteria under part-load operations	That required to meet start-up temperature and 1800°F criteria under part-load conditions
cess Air	6 - 12% excess oxygen (dry basis)	3 - 9% excess oxygen (dry basis)	6 - 12% excess oxygen (dry basis)
rndown restrictions	80 - 110% of design - lower limit may be extended with verification tests	80 - 110% of design - lower limit may be extended with verification tests	80 - 110% of design - lower limit may be extended with verification tests
tart-up procedures	On auxiliary fuel to design temperature	On auxiliary fuel to design temperature	On auxiliary fuel to design temperature
se of auxiliary fuel	On prolonged high CO or low furnace temperature	On prolonged high CO or low furnace temperature	On prolonged high CO or low furnace temperature
ygen in flue gas (continuous monitor)	6 - 12% dry	3 - 9% dry	6 - 12% dry
in flue gas (continuous monitor)	50 ppm on 4 hour average - corrected to 12% CO_2	50 ppm on 4 hour average - corrected to 12% CO_2	50 ppm on 4 hour average - corrected to 12% CO_2
rnace temperature (continuous monitor)	Minimum of 1800°F (mean) at fully mixed height across furnace	Minimum of 1800°F (mean) at fully mixed height	Minimum of 1800°F (mean) at fully mixed plane (secondary chamber)
dequate air distribution	Verification test[a]	Verification test[a]	Verification test[a]

[a] Chapter [illegible].

Recent test data obtained from a new municipal waste combustor in Tulsa show that low concentrations of organics may be achieved by optimizing combustion conditions. Moreover, emissions testing has recently begun on municipal waste combustors equipped with dry scrubbers combined with particulate matter collection devices. Recently collected test data show generally high removal efficiencies for all pollutants except mercury, and even for mercury one set of pilot plant test data show higher control efficiencies may be possible with sufficient cooling.

HEALTH RISK ANALYSIS

The EPA performed a health risk analysis of two control scenarios. One, the baseline scenario, approximates the status quo in control technology, mostly particulate matter emission control. The second reflects uniform application of dry alkaline scrubbing combined with particulate matter collection devices. Estimated health risk under these two control scenarios was generated for both the existing population of combustors and for those facilities planned for construction.

Two different expressions of health risk were generated: aggregate annual incidence and maximum individual risk. Aggregate annual incidence values include the total number of cancer cases per year predicted by the models in populations living within 50 kilometers of all the municipal waste combustors in the United States. Maximum individual risk values are the model's estimates of the probability that a person exposed to the highest modeled concentration of pollutants from a municipal waste combustor will develop cancer due to continuous exposure over a 70-year lifetime.

The EPA's risk analysis estimated direct inhalation cancer risks associated with maintaining the status quo in control technology for the existing facilities and those projected for the near future. Most of the estimated cancer risk is attributable to chlorinated dibenzo-para-dioxins (CDD) and chlorinated dibenzofurans (CDF). There remain basic questions concerning the mechanism of carcinogenesis for these and related compounds. The models used to estimate the plausible, upper bound carcinogenic potency of compounds such as CDD/CDF, implicitly assume that the substance acts directly to initiate cancer. If, however, CDD/CDF acts as a promoting agent, as some scientists believe, to amplify the carcinogenic response of other direct acting carcinogens, the present model may not be appropriate. A change of this nature in the assumption on which the cancer potency estimate is based could lead to a reduction in this estimate.

The ranges presented below reflect uncertainties regarding the relative toxicity of structurally related compounds, and the ability to accurately measure compounds at trace levels. These estimates also reflect assumptions including a conservative extrapolation of the results of epidemiological and animal studies, mathematical modeling of pollutant dispersion, constant emission rates based on those at tested facilities, and constant exposure of persons to pollutants for 70 years.

The estimates of annual incidence aggregated over the United States and for all pollutants modeled are 3 to 38 cases per year for the existing combustors and 2-22 for those projected. Estimated maximum individual risks (As noted above, these are for the greatest potential exposure.) range from 1/1000 to 1/10,000 for existing facilities and from 1/10,000 to 1/100,000 for those projected to be built in the next few years. Uniform application of dry scrubbers combined with high efficiency particulate collection devices would be expected to reduce annual incidence to 0.2 to 3 cases for existing sources, and 0.3 to 1 for those projected. Similarly, such controls would reduce maximum individual risks to 1/10,000 to 1/100,000 for existing facilities and 1/100,000 to 1/1,000,000 for projected facilities.

When the risk estimates are disaggregated by design type, the component contributed by mass burn technology used in existing facilities dominates the risk contributed by the major design types. However, the risk component contributed by RDF technology dominates in the projected facilities.

A preliminary analysis was performed to determine whether indirect exposure routes due to surface deposition of pollutants from municipal waste combustors could contribute significantly to total exposure due to municipal waste combustors. The analysis was designed to evaluate the combination of parameters that would result in the maximum exposure that was still within the realm of plausibility. Results showed that for mercury and lead indirect exposure may be a significant part of the total exposure due to municipal waste. However, no such indications were seen for nickel, chromium, or formaldehyde. Also, the modeling results showed that indirect exposure to environmentally persistent organic compounds may be comparable to the direct inhalation route of exposure. Analysis of indirect exposure as a possible source of health risk is continuing.

COST OF CONTROL

The incremental cost of adding dry scrubbing to particulate matter control (considered representative of the status quo) at municipal waste combustors is $4 to $9 per ton of garbage combusted at mass burn units and $4 to $5 per ton for RDF-fired combustors. The same increment for modular combustors is $5 to $12 per ton of garbage combusted. However, many existing modular units are equipped with no flue gas treatment devices, so the cost for those units would be higher, about $7 to $16 per ton.

TABLE B-1. EXISTING FACILITIES ORDERED BY STATE AND DESIGN TYPE

LOCATION								
CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	# OF COMBUSTORS	TOTAL PLANT CAPACITY (TPD)	TYPE OF CONTROL(S)	STARTUP DATE	REFERENCES
Sitka	AK	MI/SA	YES	2	25	ESP	1985	CITY CURRENTS 10/86
Tuscaloosa	AL	MI/SA	YES	4	300	ESP	1984	CITY CURRENTS 10/86
Hope	AR	MI/SA	NO	3	38	NONE	NA	
Batesville	AR	MI/SA	YES	1	50	NONE	1981	
Blytheville	AR	MI/SA	NO	2	70	NONE	1983	DIRECT CONTACT TO FACILITY 2/87
Osceola	AR	MI/SA	YES	2	50	NONE	1980	
North Little Rock	AR	MI/SA	YES	4	100	NONE	1977	CITY CURRENTS 10/86
Stuttgart	AR	MI/SA	NO	3	60	NONE	NA	MRI
Hot Springs	AR	MI/SA	NO	8	100	NONE	NA	
New Canaan	CT	MB/OF	NO	1	108	VWS	NA	
Stamford I	CT	MB/OF	YES	1	200	ESP	1974	DIRECT CONTACT TO FACILITY 3/87
Stamford II	CT	MB/OF	YES	1	360	ESP	1974	DIRECT CONTACT TO FACILITY 3/87
Windham	CT	MI/SA	YES	3	108	BAG	1981	
Washington(Solid Waste Red.Cont.I)	DC	MB/OF	NO	4	1000	ESP	1972	DIRECT CONTACT TO FACILITY 2/87
Dade Co.	FL	RDF	YES	4	3000	ESP	1982	CITY CURRENTS 10/86, MRI
Pinellas Co.	FL	MB/OF	YES	2	2000	ESP	1983	CITY CURRENTS 10/86
Pinellas Co. (Expansion)	FL	MB/OF	YES	1	1150	ESP	1986	CITY CURRENTS 10/86
Tampa	FL	MB/OF	YES	4	1000	ESP	1985	
Mayport Naval Station	FL	MI/EA	YES	1	48	C	1978	CITY CURRENTS 10/86
Lakeland	FL	RDF/C	YES	3	300	ESP	1981	CITY CURRENTS 10/86
Honolulu	HA	MB/OF	NO	1	600	ESP	1970	DIRECT CONTACT TO FACILITY 3/87
Ames	IA	RDF/C	YES	2	200	ESP	1975	DIRECT CALL TO FACILITY 3/87
Cassia County	ID	MI/SA	YES	2	50	NONE	1982	
Chicago (NW Waste to Energy Fac)	IL	MB/OF	YES	4	1600	ESP	1970	
East Chicago	IN	MB/OF	NO	2	450	VWS	1971	DIRECT CONTACT TO FACILITY 3/87
Louisville	KY	MB/OF	NO	4	1000	WS	NA	MRI
Simpson Co. (Franklin)	KY	MI/SA	YES	2	77	NONE	NA	STATE OF KENTUCKY
Shreveport	LA	MB/OF	NO	1	200	VWS	NA	
Haverhill/Lawrence	MA	RDF	YES	3	1300	ESP	1984	CITY CURRENTS 10/86
Fall River	MA	MB/OF	NO	2	600	WS	1972	DIRECT CONTACT TO FACILITY 3/87
Framingham	MA	MB/OF	NO	2	500	DS/BAG	1970	DIRECT CONTACT TO FACILITY 3/87
North Andover	MA	MB/OF	YES	2	1500	ESP	1985	CITY CURRENTS 10/86
Saugus	MA	MB/OF	YES	2	1500	ESP	1985	
Pittsfield	MA	MI/EA	YES	3	240	EGB	1981	
Baltimore (Pulaski)	MD	MB/OF	NO	4	1200	ESP	NA	
Baltimore (RESCO)	MD	MB/OF	YES	3	2250	ESP	1985	
Harpswell	ME	MI/SA	NO	1	14	NONE	NA	
Auburn	ME	MI/SA	YES	4	200	BAG	1981	
Clinton (Grosse Pointe)	MI	MB/OF	NO	2	600	ESP	NA	MICHIGAN APC
S.E. Oakland Co.	MI	MB/OF	NO	2	600	WS	NA	MICHIGAN APC
Duluth	MN	RDF	YES	2	400	VWS	NA	
Savage	MN	MI/SA	YES	1	60	ESP	NA	DEPARTMENT OF AIR QUALITY (MN)
Perham	MN	MI/SA	YES	2	80	ESP	1986	DEPARTMENT OF AIR QUALITY (MN)
Red Wing	MN	MI/SA	YES	1	72	ESP	1982	
Collegeville (St. Johns)	MN	MI/SA	YES	1	50	WS	1981	CITY CURRENTS 10/86
St. Louis (1 and 2)	MO	MB/OF	NO	4	800	WS	NA	
Fort Leonard Wood	MO	MI/SA	YES	3	75	NONE	NA	
Pascagoula	MS	MI/SA	YES	2	150	ESP	1985	

TABLE B-1. EXISTING FACILITIES ORDERED BY STATE AND DESIGN TYPE (Continued)

LOCATION: CITY	LOCATION: STATE	COMBUSTOR TYPE	HEAT RECOVERY	# OF COMBUSTORS	TOTAL PLANT CAPACITY (TPD)	TYPE OF CONTROL(S)	STARTUP DATE	REFERENCES
Livingston	MT	MI/SA	YES	2	75	NONE	1982	
Wilmington	NC	MB/OF	YES	2	200	ESP	1984	
Wrightsville	NC	MI/SA	NO	2	50	NONE	NA	TRIP REPORT
Litchfield	NH	MI/SA	NO	1	22	NONE	NA	
Durham	NH	MI/SA	YES	3	108	C	1980	DIRECT CONTACT TO FACILITY 2/87
Wilton	NH	MI/SA	NO	1	30	NONE	NA	
Auburn	NH	MI/SA	NO	1	5	NONE	NA	
Pittsfield	NH	MI/SA	NO	1	48	NONE	NA	
Meredith	NH	MI/SA	NO	2	31	NONE	NA	
Groveton	NH	MI/SA	YES	1	24	NONE	NA	
Portsmouth	NH	MI/SA	YES	4	200	BAG	1982	
Nottingham	NH	MI/SA	NO	1	8	NONE	1972	DIRECT CONTACT TO FACILITY 3/87
Candia	NH	MI/SA	NO	1	15	NONE	NA	
Wolfeboro	NH	MI/SA	NO	2	16	NONE	1975	DIRECT CONTACT TO FACILITY 3/87
Canterbury	NH	MI/SA	NO	1	10	NONE	NA	
Albany	NY	RDF	YES	2	600	ESP	1981	
Niagra Falls	NY	RDF	YES	2	2200	ESP	1981	
Brooklyn (SW)	NY	MB/OF	NO	3	750	ESP	NA	
Glen Cove	NY	MB/OF	YES	2	250	ESP	1983	NEW YORK STATE
Westchester Co.	NY	MB/OF	YES	3	2250	ESP	1984	
Brooklyn (N.Henry St.)	NY	MB/OF	NO	1	1000	ESP	NA	
Huntington	NY	MB/OF	NO	3	450	WS	NA	
New York (Betts Avenue)	NY	MB/OF	YES	4	1000	ESP	NA	
Skaneateless	NY	MI/SA	NO	1	13	NONE	1975	DIRECT CONTACT TO FACILITY 3/87
Oneida Co. (Rome)	NY	MI/SA	YES	4	200	NONE	1985	
Cattaraugus Co. (Cuba)	NY	MI/SA	YES	3	112	NONE	1983	CITY CURRENTS 10/86
Oswego County (Volney)	NY	MI/SA	YES	4	200	ESP	1985	
Akron	OH	RDF	YES	3	1000	ESP	1979	
Columbus	OH	RDF	YES	6	2000	ESP	1983	
N.Dayton	OH	MB/OF	NO	2	600	ESP	1970	
S.Dayton	OH	MB/OF	NO	2	600	ESP	1970	
Euclid	OH	MB/OF	NO	NA	200	ESP	NA	STATE OF OHIO
Tulsa	OK	MB/OF	YES	2	750	ESP	1986	
Miami	OK	MI/SA	YES	3	108	NONE	1982	DIRECT CONTACT TO FACILITY 2/87
Marion County	OR	MB/OF	YES	2	550	DS/BAG	1986	
Philadelphia (Northwest Unit)	PA	MB/OF	NO	2	750	ESP	1957	DIRECT CONTACT TO FACILITY 3/87
Philadelphia (E.Central Unit)	PA	MB/OF	NO	2	750	ESP	1965	DIRECT CONTACT TO FACILITY 3/87
Harrisburg	PA	MB/OF	YES	2	720	ESP	1973	
Johnsonville	SC	MI/SA	YES	1	50	NONE	NA	
Hampton	SC	MI/SA	YES	3	270	ESP	1985	CONSUMAT
Nashville	TN	MB/OF	YES	2	720	ESP	1974	CITY CURRENTS 10/86
Nashville (Expansion)	TN	MB/OF	YES	1	400	ESP	1986	CITY CURRENTS 10/86
Gallatin	TN	MB/RC	YES	2	200	ESP	1981	DIRECT CONTACT TO FACILITY 2/87
Dyersburg	TN	MI/SA	YES	1	100	NONE	1980	CITY CURRENTS 10/86
Lewisburg	TN	MI/SA	YES	1	60	WS	1980	CITY CURRENTS 10/86
Cleburne	TX	MI/SA	YES	3	115	ESP	1986	STATE OF TEXAS, CITY CURRENTS 10/86
Carthage City	TX	MI/SA	YES	1	36	NONE	1985	STATE OF TEXAS
Gatesville	TX	MI/SA	YES	1	20	NONE	NA	

TABLE B-1. EXISTING FACILITIES ORDERED BY STATE AND DESIGN TYPE (Continued)

LOCATION								
CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	# OF COMBUSTORS	TOTAL PLANT CAPACITY (TPD)	TYPE OF CONTROL(S)	STARTUP DATE	REFERENCES
Center	TX	MI/SA	YES	1	36	NONE	1985	STATE OF TEXAS
Palestine	TX	MI/SA	YES	1	28	WS	NA	
Waxahachie	TX	MI/SA	YES	2	50	WS	1982	CITY CURRENTS 10/86
Ogden	UT	MB/OF	YES	3	450	ESP	NA	
Portsmouth	VA	MB/OF	YES	2	160	ESP	1971	
Norfolk (Navy Station)	VA	MB/OF	YES	2	360	ESP	1967	
Hampton	VA	MB/OF	YES	2	200	ESP	1980	
Harrisonburg	VA	MB/OF	YES	2	100	ESP	1982	
Galax	VA	MB/RC	YES	1	56	BAG	NA	CITY CURRENTS 10/86
Salem	VA	MI/SA	YES	4	100	NONE	1970	
Newport News (Ft. Eustis)	VA	MI/SA	YES	1	35	NONE	1980	
Bellingham	WA	MI/EA	YES	1	100	NONE	1986	
Bellingham	WA	MI/SA	YES	2	100	NONE	1986	
Sheboygan	WI	MB/OF	NO	2	240	WS	NA	STATE OF WISCONSIN
Waukesha	WI	MB/OF	YES	2	175	ESP	1971	
Barron County	WI	MI/SA	NO	2	80	ESP	1986	STATE OF WISCONSIN
Madison	WI	RDF/C	YES	2	400	ESP/C	1979	CITY CURRENTS 10/86

KEY

COMBUSTOR TYPES:
- MI/SA = MODULAR COMBUSTOR WITH STARVED AIR
- MI/EA = MODULAR COMBUSTOR WITH EXCESS AIR (VICON)
- RDF = REFUSE DERIVED FUEL FIRED IN DEDICATED BOILER
- RDF/C = REFUSE DERIVED FUEL/COAL COFIRING
- MB/OF = MASS BURN WITH OVERFEED STOKER
- MB/RC = MASS BURN IN ROTARY COMBUSTOR

TYPES OF CONTROLS:
- C = CYCLONE
- ESP = ELECTROSTATIC PRECIPITATOR
- WS = WET SCRUBBER
- DS = DRY SCRUBBER
- VWS = VENTURI WET SCRUBBER
- BAG = BAGHOUSE
- EGB = ELECTROSTATIC GRAVEL BED

NA = DATA NOT AVAILABLE OR TECHNOLOGY UNDECIDED

TABLE B-2. PLANNED FACILITIES ORDERED BY STATE AND DESIGN TYPE

LOCATION				TOTAL				
CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	PLANT CAPACITY (TPD)	STARTUP DATE	STATUS CODE	CONTROL STATUS	REFERENCES
JUNEAU	AK	MI/SA	YES	70	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
HUNTSVILLE	AL	MB/OF	YES	690	1989	4	NA	CITY CURRENTS, 10/86
FAYETTEVILLE	AR	MB/OF	YES	150	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
SAN DIEGO (SANDER)	CA	MB/OF	YES	2250	1989	2	NA	CITY CURRENTS 10/86
DOWNEY	CA	MB/OF	YES	200	NA	3	NA	McILVANE 5/86
LOS ANGELES CO. (PUENTE HILLS E)	CA	MB/OF	YES	2000	NA	2	NA	WASTE AGE
LOS ANGELES CO. (PUENTE HILLS W)	CA	MB/OF	YES	2000	NA	2	NA	CWMB
SAN MARCOS (SAN DIEGO CO.)	CA	MB/OF	YES	1672	1989	4	NA	CITY CURRENTS 10/86
LOS ANGELES CO. (SPADRA)	CA	MB/OF	YES	1000	NA	1	NA	CWMB
CITY OF COMMERCE (LOS ANGELES CO.)	CA	MB/OF	YES	300	1987	4	NA	CITY CURRENTS 10/86
UKIAH	CA	MB/OF	YES	100	1987	2	NA	CITY CURRENTS 10/86
IRWINDALE	CA	MB/OF	YES	3000	1989	3	NA	McILVANE 5/86
VISALIA	CA	MB/OF	YES	350	1990	1	NA	SCAMD SUBMITTAL
BRISBANE	CA	MB/OF	YES	1500	NA	1	NA	
SOUTH GATE (LOS ANGELES)	CA	MB/OF	YES	375	1990	1	NA	McILVANE 5/86
FRESNO COUNTY	CA	MB/OF	YES	600	NA	3	NA	U.S. EPA
SANTA CLARA	CA	MB/OF	YES	400	NA	3	NA	McILVANE 5/86
STANISLAUS COUNTY	CA	MB/OF	YES	800	1989	4	NA	CITY CURRENTS 10/86
GARDENA	CA	MB/OF	YES	1200	1991	3	NA	U.S. EPA
LONG BEACH, STAGE I	CA	MB/OF	YES	920	1988	4	NA	WASTE AGE
LONG BEACH, STAGE II	CA	MB/OF	YES	1350	NA	3	NA	SCAMD SUBMITTAL
LANCER (LOS ANGELES)	CA	MB/OF	YES	1600	1989	3	NA	U.S. EPA
WILMINGTON	CA	MB/RC	YES	2000	1988	4	NA	McILVANE 5/86
VENTURA COUNTY	CA	MB/RC	YES	1000	NA	0	NA	U.S. EPA
SANGER	CA	MB/RC	YES	500	1987	2	NA	McILVANE 5/86
FREMONT	CA	MI/EA	YES	480	1989	4	NA	CITY CURRENTS 10/86
PLEASANTON	CA	MI/SA	YES	100	NA	2	NA	McILVANE 5/86
SANTA CRUZ	CA	NA	YES	175	NA	1	NA	FRANKLIN
ALAMEDA	CA	NA	YES	1600	1989	2	NA	McILVANE 5/86
RIVERSIDE	CA	NA	YES	1500	1990	1	NA	SCAMD SUBMITTAL
LOS GATOS	CA	RDF	YES	200	NA	5	NA	EPA REGION IV
SACRAMENTO COUNTY	CA	RDF	YES	700	NA	1	NA	
CONCORD	CA	RDF	YES	900	1989	1	NA	SCAMD SUBMITTAL
REDWOOD (SAN FRANCISCO)	CA	RDF	YES	3850	NA	3	NA	CWMB
SAN BERNARDINO	CA	RDF	YES	1600	1989	3	NA	McILVANE 5/86, WASTE AGE 11/86
MILLIKEN LANDFILL	CA	RDF	YES	1600	NA	2	NA	CWMB
AZUSA	CA	RDF	YES	2000	1989	1	NA	McILVANE 5/86
CONTRA COSTA COUNTY (RICHMOND)	CA	RDF	YES	900	1989	1	NA	WASTE AGE
COMPTON	CA	RDF	YES	1800	NA	2	NA	WASTE AGE
NEW MILFORD	CT	MB/OF	YES	750	NA	1	NA	WASTE TO ENERGY
MIDDLETOWN	CT	MB/OF	YES	230	1989	4	DS/BG	McILVANE 5/86
BRIDGEPORT	CT	MB/OF	YES	2250	1988	4	DS/BG	CITY CURRENTS 10/86
WATERBURY	CT	MB/OF	YES	360	1989	1	NA	EPA REGION VII SUBMITTAL
BRISTOL	CT	MB/OF	YES	650	1988	4	DS/BG	CITY CURRENTS 10/86
PRESTON	CT	MB/OF	YES	600	1990	3	NA	SCAMD SUBMITTAL
WALLINGFORD	CT	MI/EA	YES	420	1988	4	DS/BG	CITY CURRENTS 10/86
NEW HAVEN	CT	MI/SA	YES	450	1989	4	DS/BG	McILVANE 5/86
DANBURY	CT	NA	YES	450	1990	0	NA	FRANKLIN
STRATFORD	CT	NA	YES	360	1989	4	NA	CITY CURRENTS 10/86

TABLE B-2. PLANNED FACILITIES ORDERED BY STATE AND DESIGN TYPE (Continued)

LOCATION CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	TOTAL PLANT CAPACITY (TPD)	STARTUP DATE	STATUS CODE	CONTROL STATUS	REFERENCES
HARTFORD	CT	RDF	YES	2000	1988	4	DS/BG	WASTE TO ENERGY
WILMINGTON (DELAWARE SWA)	DE	RDF	YES	600	1987	4	NA	EPA REGION IV SUBMITTAL
OKALOOSA	FL	MB/OF	YES	450	NA	1	NA	STATE OF FLORIDA
HILLSBOROUGH COUNTY	FL	MB/OF	YES	1200	1987	4	ESP	CITY CURRENTS 10/86
JACKSONVILLE (DUVAL COUNTY)	FL	MB/OF	YES	2700	1990	1	NA	STATE OF FLORIDA
PASCO CO.	FL	MB/OF	YES	1200	NA	1	NA	STATE OF FLORIDA
MONROE CO. (KEY WEST)	FL	MB/OF	YES	150	1987	4	ESP	STATE OF FLORIDA
ESCAMBIA	FL	MB/OF	YES	400	NA	3	NA	STATE OF FLORIDA
PANAMA CITY (BAY COUNTY)	FL	MB/RC	YES	510	1987	4	ESP	CITY CURRENTS 10/86
BROWARD COUNTY (SOUTH)	FL	NA	YES	2250	1989	4	ESP/S	CITY CURRENTS 10/86
BROWARD COUNTY (NORTH)	FL	NA	YES	2200	1989	4	ESP/S	CITY CURRENTS 10/86
LAKE COUNTY (PROJECT 1)	FL	NA	YES	250	1988	2	ESP	McILVANE 5/86
LAKE COUNTY (PROJECT 2)	FL	NA	YES	250	1988	2	NA	McILVANE 5/86
WEST PALM BEACH COUNTY	FL	RDF	YES	2000	1989	4	NA	CITY CURRENTS 10/86
NAPLES (COLLIER COUNTY)	FL	RDF	YES	860	1988	4	BH	EPA REGIONAL SUBMITTAL
SAVANNAH	GA	MB/OF	YES	500	1987	4	NA	CITY CURRENTS 10/86
HONOLULU	HA	RDF	YES	1800	1989	4	NA	CITY CURRENTS 10/86
SANGAMON CO. (SPRINGFIELD)	IL	NA	YES	450	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
JEFFERSON CO. (MT. VERNON)	IL	NA	YES	300	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
INDIANAPOLIS	IN	MB/OF	YES	2360	1989	4	NA	CITY CURRENTS 10/86
BLOOMINGTON	IN	MB/RC	YES	370	1988	4	NA	CITY CURRENTS 10/86
FORT KNOX	KY	MI/SA	YES	40	NA	4	NA	McILVANE 5/86
CAMPBELLSVILLE	KY	MI/SA	YES	100	NA	1	NA	CITY CURRENTS 10/86
HOLYOKE	MA	MB/OF	YES	685	1989	3	AG	McILVANE 5/86
MILLBURY	MA	MB/OF	YES	1500	1988	4	ESP/AG	CITY CURRENTS, 10/86
LOWELL	MA	MB/OF	YES	750	NA	1	NA	U.S. EPA
DORCHESTER	MA	MB/OF	YES	1500-1800	NA	1	ESP/DS	U.S. EPA
PLAINVILLE	MA	MB/OF	YES	2000	NA	1	NA	U.S. EPA
WEBSTER	MA	MI/EA	YES	360	1989	4	NA	CITY CURRENTS 10/86
SPRINGFIELD (AGAWAM)	MA	MI/EA	YES	360	1988	3	DS/BH/AG	McILVANE 5/86
NANTUCKET	MA	MI/SA	YES	75	1987	0	NA	McILVANE 5/86, WASTE AGE 11/86
SOMERVILLE	MA	RDF	YES	330	NA	1	NA	U.S. EPA
ROCHESTER	MA	RDF	YES	1800	1989	4	ESP/AG	CITY CURRENTS 10/86
WEYMOUTH	MA	RDF/FB	YES	400	NA	1	NA	WASTE TO ENERGY 8/28/85
MONTGOMERY CO.	MD	MB/OF	YES	1800	NA	1	NA	McILVANE 5/86, WASTE AGE 11/86
HOWARD CO. (BALTIMORE)	MD	MB/OF	YES	1000-1500	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
EDGEWOOD (HARFORD COUNTY)	MD	MI/SA	YES	360	1987	4	NA	EPA REGION III SUBMITTAL
ANNE ARUNDEL CO.	MD	NA	YES	500	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
AUGUSTA (BATH/BRUNSWICK & AUGUSTA)	ME	MB/OF	YES	500	1989	4	NA	CITY CURRENTS 10/86
PORTLAND	ME	MB/OF	YES	500	1988	4	ESP/AG	CITY CURRENTS 10/86
LEWISTON	ME	MB/OF	YES	300	NA	1	NA	McILVANE 5/86
BANGOR/BREWER/ORRINGTON	ME	RDF	YES	750	1988	4	BH/AG	CITY CURRENTS 10/86
BIDDEFORD/SACO	ME	RDF	YES	607	1987	4	AG	CITY CURRENTS 10/86
JACKSON COUNTY	MI	MB/OF	YES	200	1987	3	DS/BH	McILVANE 5/86
WAYNE CO. (DEARBON HEIGHTS)	MI	MB/OF	YES	800	NA	1	NA	McILVANE 5/86, WASTE AGE 11/86
LITCHFIELD	MI	MI/SA	YES	75	NA	0	AG	MICHIGAN APC
MUSKIGON	MI	MI/SA	YES	150	NA	4	DS/BH	MICHIGAN APC
DETROIT	MI	RDF	YES	3300	1988	2	NA	CITY CURRENTS 10/86
HENNEPIN COUNTY (MINNEAPOLIS)	MN	MB/OF	YES	1200	1989	4	BH/AG	CITY CURRENTS 10/86

TABLE B-2. PLANNED FACILITIES ORDERED BY STATE AND DESIGN TYPE (Continued)

LOCATION CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	TOTAL PLANT CAPACITY (TPD)	STARTUP DATE	STATUS CODE	CONTROL STATUS	REFERENCES
PERHAM	MN	MI/SA	YES	72	1986	4	ESP	McILVANE 5/86, WASTE AGE 11/86
OLMSTEAD CO.	MN	NA	YES	200	NA	4	ESP	McILVANE 5/86, WASTE AGE 11/86
POPE AND DOUGLAS COUNTIES	MN	NA	YES	100	NA	3	ESP	McILVANE 5/86, WASTE AGE 11/86
MANKATO (1 & 2)	MN	RDF	YES	940	1987	3	ESP	McILVANE 5/86, WASTE AGE 11/86
NEWPORT	MN	RDF	YES	1000	1987	4	BH/AG	CITY CURRENTS 10/86
RED WING (1 & 2)	MN	RDF	YES	940	1987	3	ESP	McILVANE 5/86, WASTE AGE 11/86
ST. LOUIS	MO	MB/RC	YES	600	1989	3	NA	CITY CURRENTS 10/86, CITY OF ST. LOUIS
CHARLOTTE	NC	MB/OF	YES	200	NA	2	NA	STATE OF NORTH CAROLINA
GREENSBORO	NC	MB/RC	YES	400	NA	2	NA	STATE OF NORTH CAROLINA
WILLISTON	ND	MB/OF	YES	100	NA	3	NA	CITY CURRENTS 10/86
PORTSMOUTH	NH	MB/OF	YES	800	NA	3	BH	McILVANE 5/86, WASTE AGE 11/86
CLAREMONT	NH	MB/OF	YES	200	1987	4	NA	CITY CURRENTS 10/86
CONCORD	NH	MB/OF	YES	400	1987	3	NA	McILVANE 5/86
MANCHESTER	NH	MI/EA	YES	450	1989	4	NA	CITY CURRENTS 10/86
DERRY	NH	NA	YES	400	1988	3	NA	McILVANE 5/86, WASTE AGE 11/86
CONWAY	NH	NA	YES	150	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
WARREN COUNTY	NJ	MB/OF	YES	400	1988	4	NA	CITY CURRENTS 10/86
PENNSAUKEN	NJ	MB/OF	YES	500	1989	3	NA	McILVANE 5/86
ATLANTIC CO.(LITTLE EGG HARBOR)	NJ	MB/OF	YES	750	1990	3	NA	McILVANE 5/86, WASTE AGE 11/86
HUDSON COUNTY	NJ	MB/OF	YES	1500	1989	3	NA	McILVANE 5/86
GLOUCESTER COUNTY	NJ	MB/OF	YES	575	1989	2	NA	CITY CURRENTS 10/86
CARTERET	NJ	MB/OF	YES	3000	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
CAMDEN COUNTY	NJ	MB/OF	YES	1000	1989	3	NA	McILVANE 5/86
ESSEX COUNTY	NJ	MB/OF	YES	2250	1989	4	ESP/S	CITY CURRENTS 10/86
PASSAIC COUNTY	NJ	MB/OF	YES	1400	1989	3	NA	McILVANE 5/86
BERGEN COUNTY	NJ	MB/OF	YES	3000	1990	4	NA	CITY CURRENTS 10/86
OCEAN CO.	NJ	MB/OF	YES	1000	1992	0	NA	McILVANE 5/86, WASTE AGE 11/86
CAPE MAY	NJ	MB/OF	YES	300	1990	1	NA	McILVANE 5/86
FORT DIX	NJ	MI/SA	YES	80	1988	4	BH/S	CITY CURRENTS 10/86
UNION CO.(RAHWAY)	NJ	NA	YES	1500	1990	0	NA	McILVANE 5/86, WASTE AGE 11/86
HUNTERDON CO.	NJ	NA	YES	300-500	NA	0	NA	McILVANE 5/86, WASTE AGE 11/86
EDISON TOWNSHIP	NJ	NA	YES	3000	1989	1	NA	McILVANE 5/86, WASTE AGE 11/86
SUSSEX CO.(LAFAYETTE)	NJ	NA	YES	400	NA	1	NA	McILVANE 5/86, WASTE AGE 11/86
SOMERSET CO.(BRIDGEWATER)	NJ	NA	YES	600	1988	0	NA	McILVANE 5/86, WASTE AGE 11/86
MERCER CO.(HAMILTON TOWNSHIP)	NJ	NA	YES	1200	NA	0	NA	McILVANE 5/86, WASTE AGE 11/86
MORRIS COUNTY	NJ	RDF	YES	1000	NA	1	NA	WASTE TO ENERGY 9/25/85
RENO (PHASE II)	NV	RDF	YES	1000	NA	4	NA	CITY CURRENTS 10/86
HUDSON FALLS (WASHINGTON COUNTY)	NY	MB/OF	YES	400	1988	3	DS/ESP	CITY CURRENTS 10/86
ONTARIO CO.(WESTERN FINGER LAKES)	NY	MB/OF	YES	600	NA	1	NA	STATE OF NEW YORK
HUNTINGTON	NY	MB/OF	YES	750	1990	2	NA	STATE OF NEW YORK
BABYLON	NY	MB/OF	YES	750	1988	4	DS/BH	CITY CURRENTS 10/86
OYSTER BAY	NY	MB/OF	YES	1650	1989	4	ESP	McILVANE 5/86
ST. LAWRENCE COUNTY	NY	MB/OF	YES	225	1989	3	NA	CITY CURRENTS 10/86
NEW YORK (BROOKLYN NAVY YARD)	NY	MB/OF	YES	3000	1989	2	DS/BH	WASTE TO ENERGY 10/23/85
LONG BEACH	NY	MB/OF	YES	200	1988	4	ESP	STATE OF NEW YORK
NORTH HEMPSTEAD	NY	MB/OF	YES	1000	1990	2	NA	STATE OF NEW YORK
SOUTH BRONX	NY	MB/OF	YES	800	NA	3	BH/S	McILVANE 5/86
ONONDAGA COUNTY (SYRACUSE)	NY	MB/OF	YES	1400	NA	2	NA	WASTE AGE 11/86
HEMPSTEAD	NY	MB/OF	YES	2250	1989	2	DS/ESP	CITY CURRENTS 10/86

LE B-2. PLANNED FACILITIES ORDERED BY ST AND DESIGN TYPE (Continued)

LOCATION								
CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	TOTAL PLANT CAPACITY (TPD)	STARTUP DATE	STATUS CODE	CONTROL STATUS	REFERENCES
BROOME COUNTY	NY	MB/OF	YES	500	1991	3	NA	McILVANE 5/86
DUTCHESS COUNTY	NY	MB/RC	YES	400	1987	4	BH	CITY CURRENTS 10/86
ISLIP	NY	MB/RC	YES	518	1988	4	ESP	EPA REGION IV SUBMITTAL
GREENE COUNTY	NY	MI/SA	YES	300	NA	1	NA	EPA REGION IV SUBMITTAL
ERIE COUNTY	NY	MI/SA	YES	250	NA	1	NA	EPA REGION IV SUBMITTAL
GENESEE COUNTY	NY	MI/SA	YES	100	NA	1	NA	WASTE AGE 11/86
BRONX (BARRETTO POINT)	NY	NA	YES	2000	NA	2	NA	STATE OF NEW YORK
MANHATTAN(SHERMAN CREEK)	NY	NA	YES	1200	NA	2	NA	STATE OF NEW YORK
STATEN ISLAND	NY	NA	YES	3000	NA	2	NA	STATE OF NEW YORK
QUEENS(MASPETH)	NY	NA	YES	1200	NA	2	NA	STATE OF NEW YORK
SARATOGA CO.	NY	NA	YES	360	NA	2	NA	McILVANE 5/86, WASTE AGE 11/86
MONTGOMERY COUNTY	OH	MB/OF	YES	300	1987	4	NA	CITY CURRENTS 10/86
RANKLIN	OH	RDF	YES	150	1987	3	NA	U.S. EPA
ORTLAND	OR	MB/OF	YES	1200	1990	1	NA	McILVANE 5/86
ORK COUNTY	PA	MB/OF	YES	1000	1989	1	NA	EPA REGION III SUBMITTAL
HANOVER BOROUGH	PA	MB/OF	YES	200	NA	1	NA	EPA REGION III SUBMITTAL
HESTER	PA	MB/OF	YES	1200	1988	3	NA	EPA REGION III SUBMITTAL
ERKS COUNTY	PA	MB/OF	YES	1200	1988	1	NA	McILVANE 5/86
ONTGOMERY COUNTY	PA	MB/OF	YES	1200	1989	4	NA	CITY CURRENTS 10/86
OUTHWEST BUCKS	PA	MB/OF	YES	200	NA	1	NA	WASTE TO ENERGY 12/85
ENTRAL BUCKS	PA	MB/OF	YES	150	NA	1	NA	EPA REGION III SUBMITTAL
ELAWARE COUNTY (RESOURCE REC. 2)	PA	MB/OF	YES	1500	NA	1	NA	McILVANE 5/86
IFFLIN COUNTY (LEWISTOWN)	PA	MB/OF	YES	100	NA	1	NA	McILVANE 5/86
UCKS COUNTY (FALLS TOWNSHIP)	PA	MB/OF	YES	2200	NA	1	NA	McILVANE 5/86
ERCER COUNTY	PA	MB/OF	YES	250	NA	1	NA	WASTE TO ENERGY 10/23/85
PPER BUCKS	PA	MB/OF	YES	200	NA	1	NA	EPA REGION III SUBMITTAL
EHIGH VALLEY	PA	MB/OF	YES	1050	1989	3	NA	EPA REGION III SUBMITTAL
PHRATA BOROUGH	PA	MB/OF	YES	1250	1990	1	NA	EPA REGION III SUBMITTAL
WER LUZERNE COUNTY	PA	MB/OF	YES	100	NA	1	NA	EPA REGION III SUBMITTAL
ILADELPHIA (SOUTH)	PA	MB/OF	YES	2200	NA	1	NA	McILVANE 5/86
NCASTER COUNTY	PA	MB/OF	YES	1000	1990	1	NA	EPA REGION III SUBMITTAL
NROE COUNTY (EAST STRAUSBURG)	PA	MI/SA	YES	300	1987	1	NA	EPA REGION III SUBMITTAL
INTON COUNTY (LOCKHAVEN)	PA	MI/SA	YES	200	NA	1	NA	McILVANE 5/86
TTER COUNTY	PA	MI/SA	YES	25	NA	1	NA	EPA REGION III SUBMITTAL
STMORELAND COUNTY	PA	MI/SA	YES	50	1986	5	NA	CITY CURRENTS 10/86
RGANTOWN	PA	NA	YES	600-750	NA	0	NA	EPA REGION III SUBMITTAL
RTH PENN	PA	NA	YES	200	NA	1	NA	EPA REGION III SUBMITTAL
RK	PA	NA	YES	1000	1989	3	NA	McILVANE 5/86
IE	PA	RDF	YES	847	1988	2	NA	CITY CURRENTS 10/86
RTHERN TIER SOLID WASTE AUTHORITY	PA	RDF	YES	100	NA	1	NA	CALIFORNIA WASTE MANAGEMENT SURVEY
N JUAN	PR	MB/RC	YES	1000	NA	1	NA	McILVANE 5/86
ONSET INDUSTRIAL PK	RI	MB/OF	YES	710	1990	4	NA	CITY CURRENTS 10/86
NSTON	RI	MB/RC	YES	710	NA	3	NA	STATE OF RHODE ISLAND
ONSOCKET	RI	MB/RC	YES	710	NA	3	NA	STATE OF RHODE ISLAND
RLESTON	SC	MB/OF	YES	600	1988	3	NA	McILVANE 5/86, WASTE AGE 11/86
X CO. (KNOXVILLE)	TN	NA	YES	1200	1991	1	NA	McILVANE 5/86, WASTE AGE 11/86
USTON (PASADENA)	TX	MB/OF	YES	1500	1990	3	NA	WASTE AGE
STIN	TX	MB/OF	YES	550	1989	3	NA	McILVANE 5/86, WASTE AGE 11/86
BOCK	TX	MB/RC	YES	500	1987	3	NA	McILVANE 5/86

TABLE B-2. PLANNED FACILITIES ORDERED BY STATE AND DESIGN TYPE (Continued)

LOCATION				TOTAL PLANT				
CITY	STATE	COMBUSTOR TYPE	HEAT RECOVERY	CAPACITY (TPD)	STARTUP DATE	STATUS CODE	CONTROL STATUS	REFERENCES
ORPUS CHRISTI	TX	NA	YES	550	NA	1	NA	McILVANE 5/86, WASTE AGE 11/86
ALVESTON	TX	NA	YES	200	1992	3	NA	McILVANE 5/86, WASTE AGE 11/86
RAND PRAIRIE(IRVING)	TX	NA	YES	700-800	NA	1	NA	McILVANE 5/86, WASTE AGE 11/86
LEXANDRIA/ARLINGTON	VA	MB/OF	YES	975	1987	4	NA	CITY CURRENTS 10/86
AIRFAX COUNTY	VA	NA	YES	3000	1990	2	NA	McILVANE 5/86
ETERSBURG	VA	RDF	YES	2400	1986	4	NA	CITY CURRENTS 10/86
ORTSMOUTH	VA	RDF/C	YES	2000	1987	4	NA	CITY CURRENTS 10/86
UTLAND	VT	MI/EA	YES	240	1987	4	ESP	CITY CURRENTS 10/86
YNDONVILLE	VT	NA	YES	200	NA	3	NA	McILVANE 5/86, WASTE AGE 11/86
POKANE COUNTY	WA	MB/OF	YES	1000	1990	2	NA	McILVANE 5/86
NOHOMISH COUNTY	WA	MB/OF	YES	1500	1992	1	NA	WASTE TO ENERGY 9/25/85
KAGET COUNTY	WA	MB/RC	YES	150	1988	2	NA	WASTE AGE
ING COUNTY	WA	NA	YES	2000	1993	1	NA	EPA REGION X
ACOMA	WA	RDF	YES	500	1988	4	NA	FRANKLIN

KEY

MBUSTOR TYPES:
MI/SA = MODULAR COMBUSTOR WITH STARVED AIR
MI/EA = MODULAR COMBUSTOR WITH EXCESS AIR (VICON)
RDF = REFUSE DERIVED FUEL FIRED IN DEDICATED BOILER
RDF/C = REFUSE DERIVED FUEL/COAL COFIRING
MB/OF = MASS BURN WITH OVERFEED STOKER
MB/RC = MASS BURN IN ROTARY COMBUSTOR
NA = DATA NOT AVAILABLE OR TECHNOLOGY UNDECIDED

ATUS CODE:
) = STATUS UNKNOWN
= EARLY PLANNING STAGES
= PERMITTING STAGES
= CONTRACT AWARDED
= CONSTRUCTION UNDERWAY OR EXPECTED SOON
= TESTING STAGES

TROL STATUS:
H = BAGHOUSE
= WATER SCRUBBER
SP = ELECTROSTATIC PRECIPITATOR
3 = ACID GAS CONROL
5 = DRY SCRUBBER