STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

Mr. Walt Walters
President
NRG/Recovery Group
1616 Athens Street
Lakeland, Florida 33802

September 25, 1986

Enclosed is Permit Number AC 35-115379 to NRG/Recovery Group which authorizes the construction of a 500 ton per day municipal solid waste energy recovery facility in Lake County, Florida. This permit is issued pursuant to Section 403, Florida Statutes.

Any Party to this permit has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this permit is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

Copies furnished to:

C. P. Nichols, P.E.
Tom Sawicki
Bruce Miller
National Park Service - AIR
Leesburg Library

PS Form 3811, July 1983 447-845 DOMESTIC RETURN RECEIPT

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2. ☐ Restricted Delivery.

3. Article Addressed to:
Mr. Walt Walters
NRG/Recovery Group
1616 Athens Street
Lakeland, Florida 33802

4. Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
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Article Number
P 408 532 050

Always obtain signature of addressee or agent and DATE DELIVERED.

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P 408 532 050

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PS Form 3800, Feb. 1982

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on Sept. 29, 1986 to the listed persons.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Patricia G. Adams — Clerk

Sept. 29, 1986 — Date

Final Determination

Lake County Waste to Energy Facility
Lake County
Okahumpka, Florida

Waste to Energy Units 1 and 2

Permit Numbers: AC 35-115379
PSD-FL-113

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

September 24, 1986

Final Determination

NRG/Recovery Group's application for a permit to construct two waste to energy units located on Jim Rogers Road in Okahumpka, Lake County, Florida has been reviewed by the Bureau of Air Quality Management. Public Notice of the department's Intent to Issue the permit was published in the Lake Region News on August 16, 1986.

Copies of the preliminary determination have been available for public inspection at the St. Johns River District office in Orlando, the Leesburg Library in Leesburg, and the Bureau of Air Quality Management office in Tallahassee.

The Bureau of Air Quality Management has received a comment on the proposed construction permit from the USEPA Region IV. Although the comment was not mailed on a timely basis, the comment will still be addressed.

Based on the analysis presented in this BACT determination, the bureau has concluded that a facility of this general type should be equipped with some degree of acid gas control (preferably the dry scrubber-baghouse combination for the larger incinerators). However, due to the specific economic conerns raised by the applicant, questions about the proper application of the current rules, and the uncertainty associated with acid gas control technologies and the actual health risk associated with the emissions of the "unregulated" toxic metals and organic compounds, the department has concluded that requiring acid gas control should be deferred until the RCRA report to Congress and other important information becomes available.

In view of these concerns the department has determined that the level and type of acid gas controls used on this facility (and other similar new facilities) should be addressed and established through the process of state rulemaking which is now in progress for MSW incineration facilities to be located in Florida.

In summary, in addition to the emission limitations and other requirements specified in this determination, the applicant shall be required to leave space for acid gas control equipment at this facility, and will be subject to rulemaking which may require that acid gas control and other control measures be employed at the facility.

The final action of the department will be to issue the permit to construct as noticed in the Public Notice.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
NRG/Recovery Group
1616 Athens Street
Lakeland, Florida 33803

Permit Number:AC 35-115379
Expiration Date: May 31, 1988
County: Lake
Latitude/Longitude: 28° 44' 22"N/
81° 53' 23"W
Project: Lake County Waste to Energy
Facility Units 1 and 2

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the department and made a part hereof and specifically described as follows:

For the construction of two (2) 250 ton per day incinerators which will be fueled by municipal solid waste and wood chips.

Construction shall be in accordance with the attached permit application and additional information except as otherwise noted in the Specific Conditions.

Attachments are as follows:

1. Application to Construct an Air Pollution Source, DER Form 17-1.202(1).

2. Mr. C. P. Nichol's letter dated June 26, 1986.

PERMITTEE:
NRG/Recovery Group

Permit Number: AC 35-115379
Expiration Date: May 31, 1988

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and department rules, unless specifically authorized by an order from the department.

GENERAL CONDITIONS:

6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the department, may be used by the department as evidence in any enforcement case arising under the Florida Statutes or department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in department rules and Florida Statutes after a reasonable time for compliance, provided however, the permittee does not waive any other rights granted by Florida Statutes or department rules.

11. This permit is transferable only upon department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

(x) Determination of Best Available Control Technology (BACT)
(x) Determination of Prevention of Significant Deterioration (PSD)
(x) Compliance with New Source Performance Standards.

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. The sources are permitted for continuous operation (8,760 hours per year).

2. The units shall be fueled only with municipal solid waste, or a combination of municipal solid waste and wood chips.

3. Each incinerator boiler shall not be loaded in excess of 20,833 pounds per hour (250 tons per day) of municipal solid waste.

SPECIFIC CONDITIONS:

4. Stack emissions from each unit shall not exceed the following:

   a. Particulate Matter: 0.020 grains per dry standard cubic foot dry gas corrected to 12% CO_2 (0.45 lb/ton, 4.7 lb/hr or 20.6 tons/yr).

   b. Sulfur Dioxide: 2.8 lb/ton or 29.2 lb/hr 30 day rolling average not to exceed 5.6 lb/ton or 58.4 lb/hr or 127.9 tons/yr.

   c. Nitrogen Oxides: 5.0 lb/ton, 52.1 lb/hr or 228.2 tons/yr.

   d. Carbon Monoxide: 400 ppmdv corrected to 12% CO_2 8 hour average and 100 ppmdv corrected to 12% CO_2 4 day average or 4.5 lb/ton or 46.9 lb/hr or 205.4 tons/yr.

   e. Volatile Organic Compounds: 0.40 lb/ton or 4.2 lb/hr or 18.4 tons/yr.

   f. Lead: 0.010 lb/ton, 0.1 lb/hr or 0.5 ton/yr.

   g. Beryllium: 1 x E-6 lb/ton, 10.4 x E-6 lb/hr or 4.6 x E-5 ton/yr.

   h. Fluoride: 0.060 lb/ton, 0.63 lb/hr or 2.8 ton/yr.

   i. Sulfuric Acid Mist: 0.040 lb/ton, 0.42 lb/hr or 1.8 ton/yr.

   j. Mercury: 3200 grams per day for the entire facility.

   k. Visible Emissions: Opacity shall be no greater than 15% maximum six minute average except that visible emissions with no more than 20% opacity may be allowed for up to three consecutive minutes in any one hour except during startup or malfunctions when the provisions of 17-2.250, FAC, shall apply.

   l. Odor: There shall be no objectionable odor at the site boundary.

PERMITTEE:
NRG/Recovery Group

Permit Number: AC 35-115379
Expiration Date: May 31, 1988

SPECIFIC CONDITIONS:

5. Compliance tests shall be run at full design capacity.

6. Compliance will be demonstrated by the maximum firing of each permitted fuel.

7. Compliance with the permitted allowable limitations shall be demonstrated in accordance with DER Methods 1, 2, 3, and 9; 40 CFR 60, Appendix A, Methods 5, 7, 8, 10, 13A or 13B and 18; 40 CFR 61, Method 10 and Method 103 or 104. Particulate testing shall include one run during representative soot blowing which shall be averaged proportionally to normal daily operations. Visible emission testing shall be conducted simultaneously with soot blowing and non-soot blowing runs.

8. Fifteen (15) days prior notification of the compliance tests shall be given to St. Johns River District office.

9. Compliance tests shall be submitted to DER's St Johns River District office within 45 days after completion of the tests.

10. The construction shall reasonably conform to the plans and schedule submitted in the application. If the permittee is unable to complete construction on schedule, he must notify the department in writing 60 days prior to the expiration of the construction permit and submit a new schedule and request for an extension of the construction permit, FAC Rule 17-4.09.

11. Continuous emission monitors for opacity, oxygen and carbon dioxide shall be installed, operated and certified in accordance with 40 CFR 60, Appendix B. Continuous monitors for carbon monoxide and combustion temperature shall be installed and operated. The monitors shall be capable of providing adequate data for the calculation of continuous combustion efficiency of not less than 99.50% given by the formula:

$$\%CE = \left[\frac{1}{1 + \left(\frac{CO}{CO_2}\right)}\right] x100$$

where: %CE is the percent combustion efficiency
CO is the carbon monoxide concentration in ppm
CO_2 is the carbon dioxide concentration in ppm

PERMITTEE:
NRG/Recovery Group

Permit Number: AC 35-115379
Expiration Date: May 31, 1988

SPECIFIC CONDITIONS:

12. To obtain a permit to operate, the permittee must demonstrate compliance with the conditions of this construction permit and submit a complete application for an operating permit, including the application fee, along with the compliance test results and Certificate of Completion, to the department's St. Johns River District office 90 days prior to the expiration date of this construction permit. The permittee may continue to operate in compliance with all terms of the construction permit until its expiration date. Operation beyond the construction permit expiration date require a valid permit to operate, FAC Rule 17-4.22.

13. If the construction permit expires prior to the permittee requesting an extension or obtaining a permit to operate, then all activities at the project must cease and the permittee must apply for a new permit to construct which can take up to 90 days to process a complete application, FAC, Rule 17-4.10.

14. Space will be provided to allow for the retrofit of additional air pollution control equipment, as may be required by subsequent rule.

Issued this 24th day of 24, 1986

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION

Victoria J. Tschinkel
VICTORIA J. TSCHINKEL, Secretary

____ pages attached.

Best Available Control Technology (BACT) Determination
Lake County Waste to Energy Facility
Lake County

The applicant plans to construct a 500 ton per day (TPD) waste-to-energy resource recovery facility to be located near Leesburg, Florida in Lake County. The thermal energy from combustion of the solid waste will be used to produce steam for electric power generation.

The present plans are to install two 250 TPD mass burn incinerators which will be fueled with a combination of municipal solid waste (MSW) and wood chips. The total daily input of combined fuels per unit shall not exceed the total heat input from 250 TPD of 5,000 Btu per pound MSW only. The wood chips heat input will not exceed twenty-five percent of total input assuming the wood chips have a heating valve of 4,500 Btu per pound at fifty percent moisture content. The intent is to utilize wood only at times when there is a deficiency of MSW.

Each incinerator is scheduled to operate 24 hours per day, 7 days per week, although the capacity factor is projected to be closer to 85 percent. The emission rates of the various pollutants emitted from the facility are calculated in tons per year based on 100 percent capacity. The applicant has projected the total maximum annual tonnage of regulated air pollutants emitted from the two units to be as follows:

Pollutant	Maximum Annual Emissions (Tons/Year)	PSD Significant Emission Rate (Tons/Year)
Particulate (PM)	60	25
Sulfur Dioxide (SO_2)	547	40
Nitrogen Oxides (NOx)	455	40
Carbon Monoxide (CO)	101	100
Vol. Org. Cmpds (VOC)	36	40
Lead (Pb)	1.1	0.6
Mercury (Hg)	0.6	0.1
Beryllium (Be)	0.0001	0.0004
Fluorides (F)	5.5	3
Sulfuric Acid (H_2SO_4)	4	7

The Lake County solid waste energy recovery facility was reviewed according to Florida Administrative Code Chapter 17-2 and Rule 17-2.500: Prevention of Significant Deterioration (PSD). The

Bureau of Air Quality Management (BAQM) performed the air quality review, which includes this BACT determination.
Rule 17-2.500(2)(f)3 requires a BACT review for all regulated pollutants emitted from a major facility in an amount equal to or greater than the significant emission rates listed in Table 500-2, Regulated Air Pollutants. The facility is located in an area classified as attainment for all criteria air pollutants.

BACT Determination Requested by the Applicant:

The following emission limits are based upon a ton of refuse basis.

PM - 0.67 lbs	CO - 4.5 lbs	Hg - 0.007 lbs
SO_2 - 6.0 lbs	Pb - 0.012 lbs	F - 0.06 lbs
NOx - 5.0 lbs	Be - 1.0 x E-6 lbs	VOC - 0.40 lbs
H_2SO_4 - 0.04 lbs	HCl - 9.0 lbs	

Date of receipt of a BACT application:

March 18, 1986

Date of publication with Florida Administrative Weekly:

May 23, 1986

BACT Determination by DER:

Pollutant	Emission Limit Per Unit
Particulate Matter	0.020 grains/dscf, corrected to 12% CO_2
Sulfur Dioxide	*2.8 lb/ton refuse charged, 30 day average, not to exceed 5.6 lb/ton
Nitrogen Oxides	5.0 lb/ton refuse charged
Carbon Monoxide	100 ppmdv corrected to 12% CO_2, 4 day average 400 ppmdv, corrected to 12% CO_2, 8 hour average
Fluorides	*0.06 lb/ton
Lead	0.010 lb/ton
Mercury	3200 grams/day (1)
Beryllium	1.0 x E-6 lb/ton refuse charged

VOC	0.40 lb/ton refuse charged,
Visible Emission	15% opacity, six minute average

*Subject to change in accordance with rulemaking for resource recovery facilities.

(1) Total emissions from the facility shall not exceed this value. Compliance with the mercury emissions limit shall be demonstrated in accordance with 40 CFR 61, Method 101 Appendix B.

Compliance with limitations for sulfur oxides, particulate matter, and nitrogen oxides will be demonstrated in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 4, and 6, and 40 CFR 60 Appendix A; Method 5, 7, 10, 12, 13A or 13B. Compliance with the opacity limit shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9.

A continuous monitoring system to measure combustion temperature plus CO, O_2, CO_2 levels and opacity of the stack's emissions shall be installed, calibrated, and maintained in accordance with the provisions of Rule 17-2.710, Continuous Emission Monitoring Requirements. The CEM's must be installed and operational prior to compliance testing. In addition, the combustion efficiency calculated by: % CE = $(1/(1 + (CO/CO_2)))$ x 100 shall be at least 99.5%.

BACT Determination Rationale:

Each incinerator will have a charging rate more than 50 tons per day, and therefore, is subject to the provisions of 40 CFR 60.50, Subpart E, New Source Performance Standards (NSPS). The NSPS standard regulates only particulate matter. The particulate matter standard is 0.08 grains/dscf, corrected to 12% CO_2. This NSPS was promulgated in 1971 and no longer reflects state-of-the-art for control of particulate emissions. Recent stack testing data for MSW incinerators indicates that both electrostatic precipitator and fabric filter control technology are capable of controlling particulate emissions well below the applicant's proposal of 0.03 grains/dscf. Based on the control technology available, a particulate matter emissions limit of 0.020 grains/dscf corrected to 12% CO_2 is judged to represent BACT for an installation of this size, and location. All the other requirements as set forth in the NSPS, Subpart E, will apply.

The Department has determined the emission limit for SO_2 to be 2.8 pounds per ton of refuse charged into the incinerator based on a 30 day average. MSW components that appear to be major

contributors of sulfur include rubber, plastics, food wastes, yard wastes, and paper.

The SO_2 emission limit was determined to be BACT by evaluating studies of emissions test data for similar MSW incinerators. Various studies have indicated average emission levels of 2.0 to 2.8 lb SO_2/ton MSW charged with deviations of $\pm$ 1.3 to 1.6 lb/ton. The amount of SO_2 emitted would be comparable to the burning of distillate oil having less than a 0.5% sulfur content. Burning low sulfur fuel is one acceptable method of controlling SO_2 emissions in industrial boilers. The installation of a flue gas desulfurization system to control SO_2 emissions alone is not warranted when burning MSW.

The mercury emission limit determined as BACT is equal to the National Emission Standard to Hazardous Air Pollutants (NESHAPs), 40 CFR 61.50, Subpart E, for municipal wastewater sludge incineration plants. The BACT is determined to be 3200 grams per day for the entire facility. This level of mercury emissions is not considered to have a major impact on the environment.

The uncontrolled emission of beryllium, according to the [1]California report on emissions from resource recovery facilties, when firing MSW is estimated to be 6.2×10^{-6} pounds per million Btu. Uncontrolled beryllium emissions would be approximately 11 grams per 24 hours or 0.01 TPY. The operating temperature of the particulate matter emission control device will be below 500°F. Operation below this temperature is necessary to force adsorption/condensation of beryllium oxides, present in the flue gas stream onto available fly ash particles for subsequent removal by the particulate control device. The annual beryllium emissions are estimated at 0.0001 tons per year. This amount of beryllium emitted is considered to have a negligible impact on the environment. The emission factor of 1.0×10^{-6} lb/ton MSW proposed by the applicant is judged to be BACT. If, however, beryllium containing waste as defined in the National Emission Standards for Hazardous Air Pollutants (NESHAPs), Subpart C, Subsection 61.31(g), is charged into the incinerator, emissions of beryllium to the atmosphere shall not exceed 10 grams per 24 hours or an ambient concentration of 0.01 ug/m^3, 30 day average. Compliance with this beryllium emission limit will be in accordance with the NESHAPs, Subpart C.

The applicant has projected abated lead and fluoride(s) emissions to be 1.1 and 5.5 tons per year respectively. These amounts are in excess of the significant emission rates given in Florida Administrative Code Rule 17-2.500, Table 500-2.

With respect to lead emissions, two conditions are needed to achieve high removal efficiencies of metallic compounds emitted at refuse burning facilities: (1) operation of particulate matter control equipment at temperatures below 260°C (500°F), and

[1] Air Pollution Control At Resource Recovery Facilities, California Air Resource Board, May 24, 1984.

(2) consistently efficient removal of submicron fly ash particles. The maximum temperature of the incinerator combustion gases at the inlet to the particulate control device is estimated to be 375°F. At this temperature the particulate control equipment would be capable of removing the lead emissions from the flue gas stream.

When flue gas temperatures are lowered below 260°C (500°F), metallic compounds are removed from the vapor phase by adsorption and condensation preferentially on fine particles with submicron particles receiving the highest concentrations of metals. Properly designed and operational fabric filter systems appear at this time to offer the best method for consistent and efficient removal of fine (and in particular submicron) fly ash. Removal efficiencies of fine fly ash using these systems can be in excess of 99% with respect to MSW incinerators. Studies have indicated the weight percent of submicron particles emitted from combustion is on the order of 45% which clearly indicates the need for efficient control of particles in this range.

The [1]California Air Resources Board (CARB) report on resource recovery facilities indicates that the highest uncontrolled lead emission rate from refuse-fired incinerators tested is 16,000 ug/MJ. Based on a heating valve of 5,000 Btu per pound of refuse, this equates to an emission rate of 0.37 lbs per ton refuse charged. Recent testing of baghouses and high efficiency four field electrostatic precipitators indicates that lead removal efficiencies greater than 99% are being achieved with both types of control devices. Taking into consideration this maximum emission rate and the required particulate control level for this facility (0.020 grains/dscf, corrected to 12% CO_2,) 0.010 lbs per ton of refuse charged is judged to be reasonable as BACT for lead emissions.

Emissions of fluoride originate from a number of sources in the refuse. The mechanisms of governing fluoride release and formation of hydrogen fluoride at refuse-burning facilities are probably similar to those for hydrogen chloride. The control of fluorides can be reduced at refuse-burning plants by removal of selected refuse components with high fluoride contents, or the use of flue gas control equipment. In view of the fact that it is proposed to incinerate materials that contain fluoride, BACT for the control of fluorides is leaving space for the installation of a wet or dry flue gas scrubber system. The addition of a scrubber system would also provide control for SO_2 emissions addressed earlier in this analysis as well as other acid gases which will be addressed in other sections of the analysis.

During combustion of municipal solid waste, NO_x is formed in high temperature zones in and around the furnance flame by the oxidation of atmospheric nitrogen and nitrogen in the waste. The

two primary variables that affect the formation of NO_x are the temperature and the concentration of oxygen. Techniques such as the method of fuel firing to provide correct distribution of combustion air between overfire and underfire air, exhaust gas recirculation, and decreased heat release rates have been used to reduce NO_x emission. A few add-on control techniques such as catalytic reduction with ammonia and thermal de-NO_x are still experimental and are not considered to be demonstrated technology for the proposed project. State-of-the-art control of the combustion variables will be used to limit NO_x emissions at 5.0 pounds per ton of MSW charged. This level of control is judged to represent BACT.

Carbon Monoxide is a product of incomplete combustion where there is insufficient air. Incomplete combustion will also result in the emissions of solid carbon particulates in the form of smoke or soot and unburned and/or partially oxidized hydrocarbons. Incomplete combustion results in the loss of heat energy to the boiler. The applicant proposes that good equipment design and practice plus continuous CO monitors are BACT for carbon monoxide. The department has determined that an emission limit for carbon monoxide which would correspond to optimum combustion is needed. Based on technical information relating good combustion practices to the control of dioxin emissions and BACT determinations from other states, a limit of 400 ppmdv corrected to 12% CO_2 for an 8 hour average and 100 ppmdv corrected to 12% CO_2 for a 4 day average in combination with a combustion efficiency of at least 99.5% is judged to represent BACT for carbon monoxide emissions.

Furthermore, CO has a calorific value of 4347 Btu/lb and when discharged to the atmosphere represents lost heat energy. Since heat energy is used to produce the steam which drives the generator to produce electric power, there is an economic incentive to minimize CO emissions.

Hydrocarbon emissions, like carbon monoxide emissions, result from incomplete oxidation of carbon compounds. Control of CO and HC emissions can be mutually supportive events. BACT for hydrocarbons is good combustion practices which correspond to the carbon monoxide limitation above.

Sulfur dioxide produced by combustion of sulfur containing materials can be oxidized to SO_3 which can then combine with water vapor to produce sulfuric acid mist. The applicant has stated that maximum sulfuric acid mist emissions would be 4.0 tons per year for the resource recovery facility. The installation of an acid gas control system would minimize sulfuric acid mist emissions.

The type of air pollutants emitted when incinerating plastics depends on the atomic composition of the polymer. Plastics

composed of only carbon and hydrogen or carbon, hydrogen and oxygen form carbon dioxide and water when completely combusted. Incomplete combustion yields carbon monoxide as the major pollutant.

Plastics containing nitrogen as a heteroatom yield molecular nitrogen, some NO_x, carbon dioxide, and water when completely combusted. Incomplete combustion may yield hydrogen cyanide, cyanogen, nitrites, ammonia and hydrocarbon gases. Complete combustion of plastics containing halogen or sulfur heteroatoms form acid gases such as hydrogen chloride, hydrogen fluoride, sulfur dioxide, carbon dioxide, and water. Halogen or sulfur compounds can form from incomplete combustion of plastic. Polyvinyl chloride (PVC), one of the many polymers, has been implicated as causing the most serious disposal problem due to the release of hydrogen chloride (HCl) gas when incinerated. This problem has long been realized resulting in other polymers being used in packaging. For example, the weight percent of chlorine in polyurethane is 2.4, with only trace amounts in polyethylene and polystyrene, as compare to the weight percent of 45.3 in PVC.

A recent study of MSW incineration performed for the USEPA has indicated that the plastics content of refuse is expected to grow by 300-400% from the year 1968 to 2000. This increase can be expected to increase uncontrolled HCl emissions from municipal waste incineration by roughly 400% from 1970 to the year 2000.

The applicant has stated that maximum HCl emissions from the incinerator are estimated to be 820 tons per year based on an emission factor of 9.0 lbs per ton of MSW incinerated. This emission factor appears to be consistent with the expected HCl emission rate when the MSW chlorine content and conversion rate are taken into account.

Data contained in the [1]California Air Resources Board report on resource recovery facilities states that approximately 60 to 65 percent of refuse chlorine is converted to HCl at mass burn facilities. Based on using the MSW chlorine composition of 0.55 percent recently submitted in the Palm Beach County Resource Recovery Facility application, the resulting HCl emission would be 6.6 to 7.2 pounds per MSW charged. This value is slightly lower than the applicant's maximum estimate but the trend for the refuse chlorine content to increase will likely cause the applicant's factor to be surpassed. For example, the HCl emission factors for mass burn resource recovery facilities which are to be constructed in Bristol Connecticut, Bridgeport Connecticut, and Warren County New Jersey are expected to be 10.0, 11.4, and 11.6 pounds per ton of MSW charged respectively. Emissions of HCl at refuse incineration facilities can be reduced by removal of selected refuse components with high chlorine contents (source separation), combustion modification, and the

use of flue gas control equipment. Although the combustor configuration may influence the amount of chlorine conversion, combustion modification is not a viable means of controlling HCl emissions.

Potential emissions of HCl can be reduced significantly by removing plastic items from the waste stream. This is particularly true when the plastics are the PVC type explained earlier. With the exception of limited recycling efforts, source separation of plastics has not been demonstrated and costs are uncertain at this time. In addition to this, the combustion of plastics may be favorable from an energy point of view due to their relatively high heat of combustion.

All plastic materials have a high heat of combustion, for example, coated milk cartons - 11,300 Btu/lb, latex - 10,000 Btu/lb and polyethylene 20,000 Btu/lb. For comparison, newspaper and wood have a heat content of 8,000 Btu/lb, and kerosene 18,900 Btu/lb. Here again there is economic incentive to obtain as complete combustion as possible.

At this time flue gas controls are the most conventional means of reducing HCl emissions at refuse burning facilities. Based on the estimates of HCl emissions and the trend for increases due to higher percentages of plastics in future waste streams, the installation of a wet or dry scrubber would provide an added benefit of controlling HCl emissions.

An analysis of a proposal to construct a MSW incinerator in 1986 would not be complete unless the subject of dioxins was addressed.

Dioxin is a hazardous material that has generated widespread public concern. It is found in trace amounts whenever substances containing chlorine (for example, plant and animal tissues and plastics) are burned. It is also an impurity that can be found in some herbicides, such as "2,4,5-T".

The applicant has stated that the incinerator will be designed to operate at high temperature and provide necessary residence time to allow for more complete burnout of organic particles. At design capacity the incinerator will operate at 1800°F with a residence time of at least one second. The department believes that optimum combustion is essential to control the emissions of dioxins. Optimum combustion pertaining to the destruction of dioxins needs to be continually demonstrated by monitoring combustion temperature plus CO, O_2, CO_2 levels as indications of combustion efficiency. In addition, scientists concerned with the destruction of dioxins in resource recovery facilities generally agree that a CO concentration limit of 400 ppmdv, corrected to 12% CO_2 for an 8 hour average and 100 ppmdv, corrected to 12% CO_2 for a 4 day average in combination with a

combustion efficiency of at least 99.5% is a good indicator that optimum combustion is occuring. This CO limit is judged to represent BACT for carbon monoxide also. Combustion temperatures must be maintained at least at 1800°F with residence times being at least 1 second.

Although the subject of dioxin is new, and relatively little is known, two important things stand out: 1) Dioxin is readily minimized in properly designed and operated BACT-equipped facilities, and 2) very small amounts cause demonstrable health effects. Although most of the reduction in dioxin emissions is believed to take place in the combustion chamber, the installation of acid gas control and a high efficiency particulate control device (grain loading not to exceed 0.02 gr/dscf) would provide an additional control strategy to remove dioxins from the flue gases based on the assumption which is thought by many that dioxins can be adsorbed on the surface of particulate matter. Thus, the greater the TSP collection, especially submicron particles, the better the dioxin control.

Throughout this BACT determination much emphasis has been placed on the controls that are needed to satisfy the BACT requirements. A dry scrubber used in conjunction with a baghouse appears to be the best method for controlling emissions from this type of facility.

Electrostatic precipitators (ESP's) without acid gas control remove Total Suspended Particluates (TSP) only, collecting submicron particles with difficulty. Submicron particle collection can be done, but as with any control, effectiveness and reliability are questionable in this area. The need for acid gas controls is clearly defined in this analysis and test data show fabric filters to be less sensitive to changes in flue gas volumes, inlet concentrations, and small excursions in temperature than ESP's usually employed at refuse burning facilities.

The recommendation that a dry scrubber baghouse combination should be used as the control strategy for the resource recovery facility and requirement that the applicant has to leave space for a flue gas scrubber system would not be warranted if the economic costs of installing and operating the recommended control technology outweigh the benefits of controlling the pollutants that would be controlled by the equipment.

The applicant has indicated that a dry scrubber system for the 500 TPD facility would cost 639,000 dollars per year. Assuming that the dry scrubber controls 70% SO_2 and 90% of the acid gases, an analysis of the cost required to control tonnage of pollutants removed is required.

Based on the cost of controlling the emissions of SO_2 alone, assuming an 85 percent annual capacity factor and the applicants proposed BACT emission limitation of 0.6 lb/million Btu, the installation and operation of a scrubber unit would remove 326 tons per year of SO_2 at a cost of $1,960 per ton. This is not excessive compared to costs of up to $2,000 per ton which are considered reasonable in developing EPA New Source Performance Standards. It should be noted that the limitation of 0.6 lb/million Btu is the maximum expected limit. The applicant believes that the expected initial average emission is approximately 0.3 lb/million Btu which would double the cost of SO_2 control on a per ton basis and not justify requiring scrubbing for SO_2 alone. However, since the resource recovery facility will emit other acid gases, the benefit obtained by acid gas scrubbing should be further addressed.

The applicant has stated that initial emission rates of HCL* should not exceed 6 lb/ton. A dry scrubber would be capable of removing 90 percent of the HCl emissions (410 tons per year based on 6 lb/ton and 85 percent capacity factor). This removal would result in a cost of $1,525 per ton which again is not excessive if the figure of $2,000 per ton for SO_2 removal is used as a general guideline for all acid gas control using the applicants proposed initial emission rates. The combined SO_2 and HCl control decreases the cost of control to $1,098 per ton which is indeed reasonable.

Using this type of analysis, the cost of controlling pollutants on a per ton basis is warranted. The cost of control using a dry scrubber becomes even more attractive since the scrubber is capable of removing 90% of fluoride and sulfuric acid mist emissions as well. In addition, it is expected that the trend is for SO_2 and HCl emissions to increase in the future as explained in previous sections of this analysis. When all these factors are taken into consideration, the expense of adding and operating a dry scrubber to this facility is not unreasonable.

The applicant has estimated the cost of adding a dry scrubber to the facility would result in an additional $5.11 per ton of refuse incinerated, based on an 85 percent capacity factor. A review of economic analyses performed for proposed resource recovery facilities of similar size indicates that previous estimates for acid gas control were less than that proposed by the applicant. In the summary of the engineering evaluation (October 15, 1984) prepared for the Mid-Connecticut facility in Hartford Connecticut, the average bids for equipping resource recovery facilities with acid gas controls ranged from $2.60 to $3.36 per ton of refuse incinerated with the higher costs being associated with smaller units. It should be noted that an accurate comparison of projected costs can only be determined by equating the amortization periods, interest rates, and site specific costs. The Lake County proposal estimated the cost of

adding acid gas control using capacity factor of 85% which could be different from the other facilities and is likely one of the discrepancies that account for the difference in the proposed cost.

Previous analyses completed for larger facilities have indicated that the cost of using the scrubber-baghouse combination was not unreasonable compared to using an electrostatic precipitator alone. At rated capacity, a unit proposed for installation in the state of Connecticut showed that the cost of using the scrubber-baghouse combination and the precipitator alone were $3.36 and $1.83 respectively per ton of refuse charged. This comparison indicates the cost of using the scrubber-baghouse combination are less than would be expected when compared to the cost of using an electrostatic precipitator alone. The reasonableness of the scrubber-baghouse combination can be attributed to the following:

1) a scrubber cools the gases and reduces their volume which reduces the size requirement (cost) of the particulate control device, and 2) a dry scrubber is mechanically a simple device and capable of off-site fabrication.

At a recent conference held in Washington D. C. (November 1985), entitled "Acid Gas and Dioxin Control For Waste-to-Energy Facilities", a topic of great concern was the methods in which emissions from resource recovery facilities should be controlled. The general consensus of the conference speakers (including EPA) is that resource recovery facilities are best controlled with a dry scrubber-baghouse combination. More recently, the May 1986 "Resource Recovery Report" published additional findings which point to acid gas control and more importantly the dry scrubber-baghouse combination as being beneficial for resource recovery facilities. The World Health Organization (WHO) Working Group on Risks to Health of Dioxins from Incineration, Sewage, Sludge, and Municipal Waste is quoted by Carolyn Konheim, president of Konheim & Ketchum, Inc., an environmental consulting firm in New York City, as follows:

"The WHO Working Group's expectation that best case emission of dioxin, those resulting from good combustion, can be even further improved seems to be supported by recent test data from facilities in Quebec, Canada; Avesta, Sweden; and Nyberg, Denmark. Ms. Konheim said the addition of a dry scrubber to the flue gas control system, operating at 50 to 200 degrees Celsius, appears to achieve 80 to 99% removal of PCDDs. The best performance appears to be a scrubber/baghouse system operating at about 125 degrees Celsius. Removal is probably due to the condensation of dioxins which may have been formed in cold spots of the furnance onto particles in the scrubber."

Based on the scrubber's ability to control SO_2, HCl*, and other acid gas emissions, and recently documented dioxin control the department feels that the cost of adding acid gas control technology to the precipitator or using the dry scrubber-baghouse combination is not unreasonable for this facility. Assuming a realistic figure of 55,000 households being served by the facility when operation begins and the applicants cost estimate, the additional cost of providing dry scrubbing acid gas control to the proposed ESP would amount to less than $1.00 per month per household. In addition, according to the bureau's analysis the incremental cost of using the dry scrubber-baghouse combination instead of the ESP only would amount to approximately $1.16 per month per household. In view that businesses and industry will also generate refuse and share the cost, the actual cost per household for the alternative control measures is expected to be even less than the projections above. The added cost of using these alternative controls instead of an ESP alone, according to general equipment vendors, designers and contractors, is typically in the range of 2 to 5 percent of the total cost of the project and would be offset by the immediate economic and environmental benefits realized by the installation.

(*Hydrochloric acid (HCl), though not listed as a pollutant regulated by the PSD rule for MSW incinerators, is intensely corrosive and should be included in the economic analysis when justifying the addition of flue gas scrubbing equipment. It is EPA policy that the control of nonregulated air pollutants may be considered in imposing a more stringent BACT limit on regulated pollutants (i.e, sulfur dioxide, fluorides), if there is a reduction in the nonregulated air pollutants which can be directly attributed to the control device selected for the abatement of the regulated pollutants. This policy was recently reaffirmed by the Administrator in a remand of a PSD permit for the North County Resource Recovery Facility in San Marcos, California. In addition, the EPA is currently requiring hazardous waste incinerators emitting more than four (4) pounds of HCl per hour to achieve a removal efficiency of 99%).

Although the bureau feels that the added cost per household of having acid gas controls on this facility is not unreasonable, the applicant does not agree. The applicant has stated that for the system as proposed, the reported cost to the county is approximately $9.50/ton MSW incinerated, and an increase of $5.00 to $6.00/ton MSW to provide additional control of pollutants is not justified. The bureau and the applicant have studied the possibility of using other types of control which would provide less acid gas control but would result in costs at a fraction of that for a dry scrubbing system. One such technology is a dry injection system which is now being incorporated into a resource recovery facility of similar size in the state of Utah. The dry injection system is reported to provide 50 percent removal of acid gases at a cost of approximately $1.50 per ton of MSW

incinerated. It should be noted that this particular technology has only been used at a test facility in Europe for MSW incineration and the Utah facility will be the first application of this technology on a full scale sized unit in the United States.

In view of the potentially sensitive concerns that have been identified with the Lake County facility, the bureau feels that BACT includes leaving space at the facility for installing acid gas control technology. In accordance with the content of this BACT determination, the bureau feels that the facility should be equipped with some degree of acid gas control and preferably the dry scrubber-baghouse combination. However, due to the specific economic concerns raised by the applicant and the uncertainty associated with acid gas control technologies, the bureau feels that more information is needed that would justify requiring this type of control at this time. In view of these concerns the bureau has determined that the level and type of acid gas controls used on this facility should be addressed and established through the process of state rulemaking which is now in progress for MSW incineration facilities located in Florida.

In summary, in addition to the emission limitations and other requirements specified in this determination, the applicant is required to leave space for acid gas control equipment at this facility and is subject to subsequent rule making which may require that acid gas control and other control measures be added to the facility.

The air quality impact of the proposed allowable emissions has been analyzed. Atmospheric dispersion modeling has been completed and used in conjunction with an analysis of existing air quality data to determine maximum ground-level ambient concentrations. Based on these analyses, the department has reasonable assurance that the proposed solid waste resource recovery facility in Lake County, subject to these BACT emission limitations and pending policies, will not cause or contribute to a violation of any PSD increment or ambient air quality standard.

Details of the Analysis May be Obtained by Contacting:

Barry Andrews, P.E., BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Recommended by:

C. H. Fancy, P.E., Deputy Bureau Chief

Date: 9/24/86

Approved:

Victoria J. Tschinkel, Secretary

Date: 9/24/86

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

FOR ROUTING TO OTHER THAN THE ADDRESSEE

To: _____ Loctn: _____
To: _____ Loctn: _____
To: _____ Loctn: _____
From: _____ Date: _____

TO: Victoria J. Tschinkel

FROM: Clair Fancy

DATE: September 24, 1986

SUBJ: Approval of Air Construction Permit and BACT Determination

Attached for your approval and signature is one air construction permit and a BACT determination for NRG/Recovery Group to construct two waste to energy units in Okahumpka, Lake County, Florida.

The waiver date, after which the permit would be issued by default, is September 30, 1986.

The Bureau recommends your approval and signature.

CF/pa

Attachment