RIDGE GENERATING STATION, L. P.

General Partners

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DECKER ENERGY-RIDGE, INC. *WHEELABRATOR POLK INC.*

March 19, 1992

Florida Department of Environmental Regulation
Division of Air Resources Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C. H. Fancy, P.E.
Chief, Bureau of Air Regulation

Re: Permit Application AC 53-206244, PSD-FL-183
Ridge Generating Station

Dear Mr. Fancy:

This letter provides responses to the questions you raised in your letter dated January 17, 1992. For your convenience, we have repeated the questions and provided our response immediately below the question.

1. **The flow diagram shows no bypass around the dry scrubber/ baghouse. There may be times when the boiler flue gas temperature exceeds the baghouse design temperature. Are there plans to install a bypass, and if so, under what conditions would the bypass be open?**

   RESPONSE:

   As discussed in the application, the Ridge Generating Station (RGS) will be equipped with a spray dryer absorber (SDA) and fabric filter. Under normal circumstances, the SDA and fabric filter will both be in operation when the boiler is on-line. A bypass of the fabric filter will, however, be installed to protect the bags and structural integrity of the baghouse during infrequent upset or emergency conditions.

   The RGS boiler will be a conventional stoker fired unit, in which the solid fuel will be burned both in suspension and on the grate. If a system failure occurred which resulted in the SDA going off-line, the fuel feed to the boiler would automatically stop and the suspension burning would cease. However, fuel already on the grate would continue to burn, sending combustion products to the SDA/fabric filter. To

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Company: Florida Dept. of Env. Regulations

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prevent the possibility of having burning embers and higher than normal temperature flue gases causing a fire, the bypass would be temporarily opened to divert the gases directly to the fabric filter outlet. The duration of the bypass would be limited to the time required to burn the fuel remaining on the grate at the time of the malfunction or the time necessary to correct the SDA malfunction, whichever is shorter.

As indicated above, the bypass capability would only be used under upset or emergency situations to prevent fires or damage to the air pollution control equipment. Conditions that would result in a bypass include:

- Loss of water flow to the SDA. Redundant water pumps will be installed to minimize the potential for this occurrence.
- Extreme high fabric filter inlet temperatures (i.e., greater than 500°F). This situation would occur only under system upset conditions.
- Extremely high fabric filter pressure differential (i.e., greater than approximately 30 inches of water). Again, this situation would occur only under system upset conditions.

The only other proposed bypass condition would occur during periods of boiler warm-up when only propane gas is being burned. This bypass is warranted to prevent excess moisture from "blinding" the bags.

2. **How many days supply of wood and tires will be stored on site? Will landfill gas be available in sufficient quantities to offset temporary shortages of wood or tires? Are there contingency plans for use of other alternate fuels and if so, what are they?**

RESPONSE:

The site will have separate piles for both processed and unprocessed wood. The piles will encompass an area of approximately 2.8 acres of unprocessed wood storage and 8.5 acres of processed wood storage. Based upon this arrangement, on-site wood storage will provide an inventory in excess of thirty (30) days.

The tire pile storage area encompasses approximately 2.3 acres. There will be four (4) tire piles, each separated by fifty (50) foot fire access lanes. It is currently anticipated that one (1) pile will contain chipped tires and the remaining piles will contain whole tires. Based upon this arrangement, the tire piles will provide a fourteen (14) day inventory. The size of the tire storage area and the required layout limits the inventory to a maximum of 28 days.

Current estimates of the quantity of landfill gas indicate that up to 10% of the total heat input of the facility could be landfill gas. This fuel will not be available in sufficient quantities to be a complete substitute for wood and tires.

In addition to wood, tires, and landfill gas, the RGS boiler will be equipped with a propane burner (or burners). The propane burner(s) will have a maximum heat input of 180 MMBtu/hour and will be used for start-up, shutdown and infrequent combustion stabilization purposes. No other alternate fuels are proposed for use at RGS.

RGSLP has conducted two market studies of the supply of wood. These studies indicate that there are between 1.2 million and 2.5 million tons of wood fuel available per year within the procurement area. The project will require approximately 350,000 tons of wood per year.

It is also estimated that greater than 5 million scrap tires per year are disposed of within the procurement area of the facility. In addition, there are illegal tire piles which need to be brought into compliance, including a large site in Polk County.

Based on our studies, we are confident that there are adequate supplies of wood, scrap tires, and landfill gas from Polk County's North Central Landfill to reliably fuel the plant. Therefore, there are no contingency plans for use of other alternate fuels.

3. **Unreacted ammonia from the SNCR system may pose a difficult control problem due to variability in the fuel mix. Given the public's and the Department's concern about ammonia discharges from phosphate plants in the area, some control system or practice must be in place to effectively prevent ammonia from being detected beyond the RGS property line. The application states that this problem will be minimized through careful attention to combustion control by the**

operator (i.e, manual adjustments). A properly designed facility should have some control loop or system such that the operator will not have to make very many manual adjustments. The application should address other methods that may prove necessary for controlling ammonia slip.

RESPONSE:

The RGS will have an automated control system which will minimize manual adjustments by the operator. As discussed in the application, the SNCR process incorporates a reagent storage and delivery system to feed a solution through injectors into the combustion gases of the boiler. The injectors atomize the solution as it enters the boiler and mixes with the boiler flue gas. The solution reacts with the NO_x in the flue gas to form N_2, and H_2O. Excess levels of solution can result in emissions of ammonia into the atmosphere (referred to as ammonia slip). Control of the SNCR system will be maintained through the use of a programmable logic controller and single loop controllers. This system will automatically maintain acceptable NO_x emissions and control reagent use, which will limit ammonia emissions. Operation and control of the SNCR system is described in the following paragraphs:

A concentrated solution is typically metered to the boiler for NO_x reduction by a variable stroke chemical metering pump. The feed rate of the solution is automatically controlled through an auto/manual NO_x control station that uses a feed-forward boiler load signal and a feedback stack NO_x signal. The control station output signal is sent to the chemical metering pump electronic capacity control which automatically adjusts the stroke of the pump.

Process water and the concentrated solution are typically mixed in the chemical mixing pump, located downstream of the chemical metering pump. In addition to providing intimate mixing when diluting the concentrated solution, the chemical mixing pump provides the required reagent pressure at the injectors. The degree of dilution is generally affected by the location of the injectors and the temperature and gas velocity profiles in the boiler. The net effect of the dilution is to assure more efficient contact between the NO_x and the solution in the boiler, thus increasing NO_x removal efficiency and minimizing ammonia slip.

Dilution water requirements will be optimized during start-up. A single loop controller will be used to provide for automatic control of the dilution water rate. The controller receives a signal from the pressure transmitter in the chemical mixing pump recirculation line and outputs a signal to the pressure regulating valve.

A control system will interface with the SNCR system, and will include a programmable logic controller for relay and timing functions, regulators, circuit breaker/fuses, selector switches, status lights and annunciator. The control system will include monitors and recorders for boiler load and NO_x emissions as well as chemical and carrier feed rates. Various status lights and annuniciators will provide operators with continuous indications of system operability and equipment conditions. The control system will require only infrequent adjustment or manual operation by plant personnel.

Wheelabrator has SNCR systems currently operating at two facilities, including a California facility with three wood fired boilers. The automatic control systems at these facilities have proven to be effective at controlling NO_x emissions and ammonia slip. Therefore, Ridge Generating Station Limited Partnership (RGSLP) is confident that a similar control system at the RGS facility will minimize potential concerns associated with ammonia slip.

4. **Table B-2 lists essentially the same emission factors for all three fuel types. Typically, one would expect some difference, although small. It would be helpful to include footnoted or numbered references in the discussion so that items such as "test data and other literature" could be properly identified. Also, an explanation of the rationale that went into derivation of the emission rates would be desirable.**

RESPONSE:

Emission rates may vary depending on the specific mix of fuels being burned. For the most part, however, these variations are expected to be small. Furthermore, the primary objective of the emission estimation process was to assess maximum emissions for impact assessment purposes and for emission compliance purposes. Therefore, rather than indicating separate emission rates for all pollutants and all fuel mixes, the approach followed for most pollutants was simply to indicate the maximum emission rate expected for operation of the Ridge Generating Station (RGS) at a given load level. These maximum rates were then in turn used in the impact analysis. Another consideration related to estimating variations in emissions is that available emissions data references are not specific to the types of fuels and types of emission controls to be used at RGS. With reference data of this type, making a precise distinction in emission factors among the RGS fuel mixes did not seem supportable.

The principal references used to derive the emission factors in Table B-2 are listed below. The complete citation for these references is provided as Attachment A. Also presented in the following list is a brief rationale for emission rate derivation.

Sulfur Oxides - Derived from the expected fuel sulfur content, the expected fuel mix and the anticipated scrubber control efficiency. Data on fuel sulfur content were obtained from wood analyses and published data, including Grasso and Atkins, 1990. See permit application for additional information on fuel analysis and control methods.

Particulate Matter - Based on design data and the BACT analysis. The emission rate of 0.02 lb/MMBtu assumes that the test method is U.S. EPA Method 5, front-half catch only. See permit application for additional information. Revised versions of Table 5-4 and Table B-2 are attached to clarify the test method for particulate matter.

Nitrogen Oxides - Based on design data and the BACT analysis. See permit application for additional information.

Carbon Monoxide - Based on design data and the BACT analysis. See application for additional information.

Volatile Organic Compounds - Based on design data and the BACT analysis. See permit application for additional information.

Lead - Based primarily on Genesse Generating Station, 1991 and an evaluation of urban wood ash compositional data (Grasso and Atkins, 1990). Also reviewed Malcolm Pirnie, 1991; Oxford Energy, 1988; and Oxford Energy, 1990.

Hydrogen Chloride - The emission rate presented in the application was based primarily on information presented in the permit applications for the Genesse Generating Station (1991) and the Westminster, Massachusetts facility (ERL 1989), which was adjusted based upon the anticipated control efficiency of the scrubber. Additional fuel chlorine content data have been obtained since the application was initially submitted. Attachment B summarizes the chlorine fuel data.

As a result of these data, RGSLP is proposing to increase the hydrogen chloride emission rate from 0.005 lb/MMBtu to 0.008 lb/MMBtu. This revised emission rate conservatively assumes a wood chlorine content of 0.12% (which represents the 95% upper confidence limit) and a scrubber removal efficiency of 95%.

Tables 4-5, 6-8, B-1 and B-2 have been revised to include this change. Table 6-8 shows that the predicted maximum ambient concentrations based on the increased emission rate is less than the Florida no-threat levels.

<u>Beryllium</u> - Based primarily on Genesse Generating Station, 1991 and emissions test data from Champion International in Bucksport, Maine (Malcolm Pirnie, 1991). Also reviewed Oxford Energy, 1990, and Dow Corning, 1989. Beryllium was not detected in Dow Corning test results.

<u>Mercury</u> - Based primarily on an evaluation of urban wood and ash compositional data (Grasso and Atkins, 1990, and personal communications with ERL, 1991 and 1992) with an assumed control efficiency of fifty percent, and tire emissions data (Oxford Energy, 1990). The Genesse Generating Station Permit Application (1991) and stack test data at Wheelabrator's Shasta wood-burning facility in California (Galson, 1991), were also considered.

<u>Ammonia</u> - Based on design data.

<u>Arsenic</u> - Based primarily on an evaluation of urban wood ash compositional data (Grasso and Atkins, 1990 and personal communications with ERL, 1991 and 1992) and the assumed particulate matter control efficiency. Also reviewed Oxford Energy (1988 and 1990) test results which show minimal arsenic emissions from tire burning.

<u>Cadmium</u> - Based primarily on wood and tire emission test data from the Port Townsend facility (Washington Department of Ecology, 1986).

Chromium - The emission rate initially proposed in the application was based upon total chromium emission test results (Dow Corning, 1989 and Washington Department of Ecology, 1986). Based upon a review of wood and ash composition data (Grasso and Atkins, 1990 and personal communications with ERL, 1991 and 1992) a revised emission rate is being proposed for chromium. RGSLP is proposing to increase the total chromium emission rate from 2.6E-05 lb/MMBtu to 1.15E-04 lb/MMBtu. The revised emission rate was derived using the chromium concentration in urban wood ash (95th percentile) when considering the proposed particulate matter control efficiency. Data on chromium concentrations in urban wood ash are provided in Attachment C.

Chromium VI - The proposed emission rate for hexavalent chromium is also being revised based upon the information obtained from ERL. ERL has indicated that a maximum of 5 to 10 percent of the total chromium could be in the form of hexavalent chromium. To be conservative, in terms of impact assessment, RGSLP has assumed that 20 percent of the total chromium could be in the form of Chromium VI. This results in a reduction of the Chromium VI emission rate from 2.6E-05 to 2.3E-05.

Tables 4-5, 6-8, B-1 and B-2 have been revised to account for the revisions to the emission rates for chromium and chromium VI. Table 6-8 shows that the predicted maximum ambient concentrations based on the revised emission rates are less than the Florida no-threat levels.

Nickel - Based primarily on wood and tire emission test data from the Port Townsend facility (Washington Department of Ecology, 1986).

Zinc - Based primarily on emissions test data from the Oxford Energy facility (1988), adjusted to account for the fact that Oxford Energy burns 100% tires, while RGS will burn mostly wood with a maximum of 20% tires. Tires will represent the primary source of zinc emissions. Wood emissions estimates are based upon urban wood compositional data (ERL, 1991 and 1992) and stack test data from the Champion International Facility in Bucksport, Maine (Malcolm Pirnie, 1991).

Benzene - Based primarily on emissions test data reported in Caron, et al., 1990.

Formaldehyde - Based primarily on stack test data from Wheelabrator's Shasta wood-burning facility in California (Galson, 1991) and personal communications with ERL related to their emissions databases.

Pursuant to your request, Table B-3 has been revised to identify the specific references that were used to establish the emission factors. This has been done by numbering the references and identifying the numbered reference for each emission factor.

5. **The flow diagram contains a table showing the process material balance. Review of the application would be facilitated if the diagram also showed process conditions, including flue gas temperatures ahead of and after the baghouse.**

RESPONSE:

A revised flow diagram is attached. It has been revised to provide the additional information that you requested. The information is provided to illustrate the expected conditions. It is based upon the best available information and it is expected to be representative. The actual conditions, however, may vary depending upon the final equipment suppliers that are selected for the facility.

It should be noted that a number of additional changes have also been made to the flow diagram. These additional changes deal with the facility water balance. There have been no changes in the amount of fuel used or flue gases generated.

6. **The predicted maximum SO_2 24-hour and 3-hour concentrations in the Chassohowitzka PSD Class I area due to the Ridge Generating Station boiler emissions are greater than the National Park Service proposed 24-hour and 3-hour significant impact levels of 0.07 and 0.48 ug/m^3, respectively. Please perform a cumulative 24-hour and 3-hour SO_2 Class I increment analysis as required by the National Park Service. An air quality related**

values (AQRVs) analysis should also be done since there are presently no significant impact levels that exempt a proposed PSD project from performing this analysis. The AQRVs analysis includes impacts to soils, vegetation, and wildlife.

RESPONSE:

A response to Item No. 6 is in preparation. This response will include the results of an additional modeling evaluation assessing in more detail the effect of Ridge Generating Station sulfur dioxide emissions and emissions of other sources within a wide region around the Chassahowitzka PSD Class I area. Effects on air quality related values (including soils, vegetation, and wildlife) will also be discussed in the response.

During the process of preparing a response to Item No. 6, several discussions with DER's air quality modeling staff have been held. Among the topics discussed was the inventory of other sulfur dioxide emission sources to be included in the impact evaluation. DER has been developing an updated inventory of PSD sources that might affect ambient sulfur dioxide concentrations within the Chassahowitzka PSD Class I area. The latest version of this inventory, consisting of 83 emission sources, was received from DER on March 6, 1992. This recently updated inventory is being used in the modeling analysis required for preparation of a response to Item No. 6. A response will be submitted as soon as it is available.

ADDITIONAL TOPICS

Revised Site Plan

An updated site plan is also enclosed. While the turbine generator building, boiler building and stack configuration have remained unchanged from the original submittal, there have been a number of minor changes to other portions of the site. The paragraph below, summarizes the changes that have been made since the initial submittal.

The processed wood storage area has been expanded. The 2.2 acre pond has been removed. The sewage treatment system has been replaced by a septic system with drainfield. Potable well P3 has been moved to a location southwest of the turbine-generator building. The ash silo has been replaced by an ash building containing "roll-on roll-off" containers.

The fines storage area located next to the truck dump has been removed. A condensate tank has been added and the name of the treated water tank has been changed to service water tank.

Table B-2

There is a typographical error in Table B-2 of the permit application. The emission factor shown in Table B-2 for Arsenic is 0.0003 lb/MMBtu, while the correct factor is 0.00003. The correct factor was used to calculate emissions in lb/hr so that the emission rates for Arsenic in Table B-1 and in Table 4-5 are correct. The correct emission rate was also used for the impact evaluation. A revision to Table B-2 containing the correct emission factor for Arsenic is attached.

We have attempted to provide comprehensive responses to Questions 1 through 5, to ensure that the application will now be complete with respect to those issues. As discussed above, a complete response to Question 6 will be forwarded as soon as it is completed. We currently expect to submit that response prior to March 27, 1992. The submittal of that response has been delayed by the revision of the emissions inventory and the large number of additional sources that were added to the inventory.

We would be happy to provide any additional assistance to facilitate the review of this application. Please contact Matt Killeen at 1-800-682-0026 if you have additional questions or comments. We appreciate the efforts of you and your staff on this important project.

Sincerely,

Richard C. Stone

Richard C. Stone
Project Manager

MPK112:ga

Attachments (See attached List)

cc: John Reynolds - FDER
Cleve Holladay - FDER
Matt Killeen - WESI
Macauley Whiting - Decker
B. Thomas, SW Dist
J. Harper, EPA
C. Shaver, NPS

<u>List of Attachments</u>

1.	Attachment A	- References
2.	Attachment B	- Ultimate Analysis, Percent Chlorine in Wood and Tires
3.	Attachment C	- Summary Data from Six Wood Processors, Chromium Analysis
4.	Revised Table 4-5	- Ridge Generating Station, Estimated Maximum Toxic Air Pollutant Emissions at Maximum Continuous Rating, dated 3/12/92.
5.	Revised Table 5-4	- Ridge Generating Station, Summary of Proposed BACT Approach, dated 3/12/92.
6.	Revised Table 6-8	- Ridge Generating Station, Summary of Predicted Maximum Concentrations of Toxic Air Pollutants Attributable to Boiler Emissions, dated 3/12/92.
7.	Revised Table B-1	- Ridge Generating Station Boiler Emission Rate Calculations for Maximum Continuous Rating, dated 3/12/92.
8.	Revised Table B-2	- Ridge Generating Station Boiler Emission Rate Calculation Variables for Maximum Continuous Rating, dated 3/12/92.
9.	Revised Table B-3	- Ridge Generating Station Boiler Derivation of Emission Rate Calculation Variables, dated 3/12/92.
10.	Revised Figure 3-1	- Ridge Generating Station Flow Diagram, last revised 3/11/92.
11.	Revised Figure 3-2	- Ridge Generating Station Site Plan, last revised 02/06/92.

Attachment A

References

Caron, A., Messmer, R. and Hoy, D., 1990. Project progress report: the emissions of selected air contaminants from wood-residue fired boilers, in Proceedings of 1990 National Council of the Paper industry for Air and Stream Improvement West Coast Regional Meeting.

Dow Corning Corp., 1989. Report of tire chip test burn performed March 9-29, 1989.

Environmental Risk Limited (ERL), 1989. An Application to the Massachusetts Department of Environmental Protection for a 16 MW Wood-Fired Electric Generating Facility in Westminster, Massachusetts.

ERL, 1991 and 1992. Personal communications with R. Atkins, M. Holzman and others; and information received from ERL databases.

Galson Technical Services, 1991. Source Test Report, Source Emission Testing of the Wood-Fired Boiler #1 Exhaust Stack at the Wheelabrator Shasta Energy Company, Anderson, California.

Genesse Generating Station, 1991. Air emission permit application for Genesse Generating Station, Michigan.

Grasso, D.T. and Atkins, R.S., Environmental Risk Limited, 1990. The composition of recycled wood fuel and its environmental permitting implications. Presented at the ACA/CIPCA Fourth Annual Meeting and Exposition, Hartford, CT, September 16-17, 1990.

Malcolm Pirnie, Inc., 1991. Air emissions associated with the combustion of scrap tires for energy recovery.

Oxford Energy Co., 1988. Final emission test report for Modesto Energy Company waste tire to energy facility, Westley, California.

Oxford Energy Co., 1990. Stack test report (for the Oxford Energy Company facility at Westley, California, October 9-10, 1990).

Washington Department of Ecology, 1986. Source test for Port Townsend Paper Company (February 25 and March 5, 1986).

Attachment B

Ultimate Analysis

Percent Chlorine in Wood and Tires
(Dry Weight Basis)

	Number of Samples	Arithmetic mean	Standard Deviation	95% Upper Confidence Limit
C/D Wood[b]	21	0.05	0.03	0.12[a]
Tires[c]	7	0.10	0.05	0.15[d]

Source: Environmental Risk Limited (ERL) Databases.

Notes:
a. Defined as mean plus two standard deviations.
b. Construction/Demolition wood composition data collected and analyzed by ERL.
c. Tire-derived fuel data summarized by ERL.
d. The maximum chlorine content detected was 0.15%. The mean plus two standard deviations was higher than the maximum detected; therefore, the 95% upper confidence limit was set equal to the maximum detected.

Attachment C

Summary Data from Six Wood Processors

Chromium Analysis (ppm in Ash)

Number of Samples	Arithmetic mean	95th Percentile
41	992	5760.9

Source: Environmental Risk Limited (ERL) Databases

Revised 3/12/92

TABLE 4-5

RIDGE GENERATING STATION
ESTIMATED TOXIC AIR POLLUTANT EMISSIONS
AT MAXIMUM CONTINUOUS RATING

Pollutant	Highest Emissions (lb/hr) for Any Fuel Mix
• Metals	
arsenic	0.019
beryllium	0.0063
cadmium	0.033
chromium (total)	0.072
chromium VI	0.014
lead	0.25
mercury	0.022
nickel	0.063
zinc	0.63
• Non-Metal Inorganics	
ammonia	17.8
hydrogen chloride	5.04
• Organics	
benzene	5.0
formaldehyde	1.7

TABLE 5-4

RIDGE GENERATING STATION
SUMMARY OF PROPOSED BACT APPROACH

Pollutant	Proposed Best Available Control Technology	Proposed Emission Limit (lb/MMBtu)
PM	Fabric Filtration	0.02[a]
SO_2	Spray Dryer with Fabric Filtration	0.17[b]
NO_X	Combustor Design and Selective Noncatalytic Reduction System	0.15[b]
CO	Good Combustion Practices	0.5[b,c]
VOCs	Good Combustion Practices	0.035
Pb	Fabric Filtration	0.0004
Be	Fabric Filtration	0.00001

[a] Based on EPA Method 5 front-half catch only.

[b] On a 24-hour block average basis.

[c] Excluding periods of start-up and shut down.

TABLE 6-8 Revised 3/12/92

RIDGE GENERATING STATION
SUMMARY OF PREDICTED MAXIMUM CONCENTRATIONS
OF TOXIC AIR POLLUTANTS ATTRIBUTABLE
TO BOILER EMISSIONS

	Maximum Predicted Concentrations ($\mu g/m^3$)			Florida DER No-Threat Levels[b] ($\mu g/m^3$)		
Pollutant	8-Hour	24-Hour	Annual	8-Hour	24-Hour	Annual
Arsenic	0.002	0.0008	7.2×10^{-5}	2	0.48	2.3×10^{-4}
Beryllium	0.0007	0.0003	2.4×10^{-5}	0.02	0.005	4.2×10^{-4}
Cadmium	0.004	0.001	1.2×10^{-4}	0.5	0.12	5.6×10^{-4}
Chromium (total)	0.008	0.003	2.7×10^{-4}	5	1.2	2.0×10^{-3}
Chromium VI	0.002	0.0006	5.3×10^{-5}	0.5	0.12	8.3×10^{-5}
Lead	0.03	0.01	9.5×10^{-4}	1.5	0.36	9.0×10^{-2}
Mercury	0.002	0.0009	8.4×10^{-5}	0.5	0.12	0.3
Nickel	0.007	0.003	2.4×10^{-4}	0.5	0.12	4.2×10^{-3}
Zinc	0.07	0.03	-	50	12	-
Ammonia	2.0	0.7	0.07	180	43.2	1.0
Hydrogen chloride	0.6	0.2	0.02	70	16.8	7.0
Formaldehyde	0.2	0.07	6.4×10^{-3}	4.5	1.08	7.7×10^{-2}
Benzene	0.6	0.2	0.02	30	7.2	0.12

[a] Based on operating year-round at maximum continuous rating or 75 percent load firing an 80% wood/20% tires fuel mix.

[b] Including any relevant federal reference air concentrations, reference specific doses (divided by 10), or inhalation reference concentrations.

TABLE B-1

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATIONS FOR
MAXIMUM CONTINUOUS RATING

	EMISSION RATES (LB/HR) BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)		
POLLUTANT	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
sulfur oxides (as SO_2)	B x C x E x H = 69.4	B x C x E x H = 109.4	B x C x E x H = 92.5
particulate matter/PM_{10}	A x I = 12.6	A x I = 12.6	A x I = 12.6
nitrogen oxides (as NO_2)	A x J = 94.5	A x J = 94.5	A x J = 94.5
carbon monoxide	A x K = 315.0	A x K = 315.0	A x K = 315.0
volatile organic compounds	A x L = 22.1	A x L = 22.1	A x L = 22.1
lead[a]	A x M = 0.25	A x M = 0.25	A x M = 0.25
hydrogen chloride	B x D x F x G x AA = 5.04	B x D x F x G x AA = 4.70	B x D x F x G x AA = 4.44
beryllium[a]	A x N = 0.0063	A x N = 0.0063	A x N = 0.0063
mercury[a]	A x O = 0.022	A x O = 0.022	A x O = 0.022
ammonia[a]	P x Q x R = 17.8	P x Q x R = 17.8	P x Q x R = 17.8
arsenic[a]	A x S = 0.019	A x S = 0.019	A x S = 0.019
cadmium[a]	A x T = 0.033	A x T = 0.033	A x T = 0.033
chromium (total)[a]	A x U = 0.072	A x U = 0.072	A x U = 0.072
chromium VI[a]	A x U x Z = 0.014	A x U x Z = 0.014	A x U x Z = 0.014
nickel[a]	A x V = 0.063	A x V = 0.063	A x V = 0.063
zinc[a]	A x W = 0.63	A x W = 0.63	A x W = 0.63
benzene[a]	A x X = 5.0	A x X = 5.0	A x X = 5.0
formaldehyde[a]	A x Y = 1.7	A x Y = 1.7	A x Y =1.7

Note: Calculation variables are defined in Table B-2.

[a] Highest estimated emissions for any fuel mix shown in each column.

Revised 3/12/92

TABLE B-2

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATION VARIABLES FOR
MAXIMUM CONTINUOUS RATING

VARIABLE	CALCULATION VALUES BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)		
	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
A = heat input, MMBtu/hr	630	630	630
B = fuel consumption, lb/hr	115,596	101,477	103,947
C = SO_2 dry scrubber/ fabric filter efficiency factor (1 - 80%/100%)	0.2	0.2	0.2
D = fuel chlorine content fraction, dry basis	0.0012	0.00123	0.00110
E = fuel sulfur content fraction	0.0015	0.00269	0.00222
F = adjustment to dry fuel basis lb/MMBtu	0.708	0.733	0.756
G = ratio of HCl to Cl	1.028	1.028	1.028
H = ratio of SO_2 to S	2	2	2
I = PM emission factor[a], lb/MMBtu	0.02	0.02	0.02
J = NO_X emission factor, lb/MMBtu	0.15	0.15	0.15
K = CO emission factor, lb/MMBtu	0.50	0.50	0.50
L = VOC emission factor, lb/MMBtu	0.035	0.035	0.035
M = Pb emission factor[b], lb/MMBtu	0.0004	0.0004	0.0004
N = Be emission factor[b], lb/MMBtu	0.00001	0.00001	0.00001
O = Hg emission factor[b], lb/MMBtu	0.000035	0.000035	0.000035

TABLE B-2 Revised 3/12/92

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATION VARIABLES FOR
MAXIMUM CONTINUOUS RATING
(continued)

	CALCULATION VALUES BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)		
VARIABLE	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
P = NH_3 volume (ppmv) divided by 10^6	$35.36/10^6$	$35.18/10^6$	$35.26/10^6$
Q = flue gas volume, ft^3/hr (@ 170°F)	13,593,360	13,481,580	13,653,180
R = factor to convert ft^3 of NH_3 @ 170°F flue gas exit temperature	0.037	0.037	0.037
S = arsenic emission factor[b], lb/MMBtu	0.00003	0.00003	0.00003
T = cadmium emission factor[b], lb/MMBtu	0.000052	0.000052	0.000052
U = chromium (total) emission factor[b], lb/MMBtu	0.000115	0.000115	0.000115
V = nickel emission factor[b], lb/MMBtu	0.0001	0.0001	0.0001
W = zinc emission factor[b], lb/MMBtu	0.001	0.001	0.001
X = benzene emission factor[b], lb/MMBtu	0.008	0.008	0.008
Y = formaldehyde emission factor[b], lb/MMBtu	0.0027	0.0027	0.0027
Z = chromium VI fraction of total chromium	0.2	0.2	0.2
AA = HCl dry scrubber/ fabric filter efficiency factor (1-95%/100%)	0.05	0.05	0.05

[a] Based on EPA Method 5 front-half catch only.

[b] Represents highest emission factor for any fuel combination.

TABLE B-3

RIDGE GENERATING STATION BOILER
DERIVATION OF EMISSION RATE CALCULATION VARIABLES

VARIABLE[a]	DERIVATION
A	design data
B	design data and expected fuel heating value
C	design data
D	reference 4
E	test data
F	test data
G	basic chemistry
H	basic chemistry
I	design data
J	design data
K	design data
L	design data
M	references 6, 7, 8, 9, 10
N	references 2, 6, 8, 10
O	references 4, 5, 6, 7, 10
P	design data
Q	design data
R	17 lb/lb mole x lb mole/358.8 ft^3 (@ 32 °F) x (460 + 32 °R)/(460 + 170 °R) = 0.037
S	references 4, 7, 9, 10
T	reference 11
U	references 3, 4
V	reference 11
W	references 4, 8, 9
X	reference 1
Y	references 4,5
Z	reference 4
AA	design data

[a] Variable defined in Table B-2.

TABLE B-3
(Continued)

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4. Environmental Risk Limited, 1991 and 1992. Personal communications with R. Atkins, M. Holzman, and others; and information received from Environmental Risk Limited databases.

5. Galson Technical Services, 1991. Source test report, source emission testing of the wood-fired boiler #1 exhaust stack at the Wheelabrator Shasta Energy Company, Anderson, California.

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8. Malcolm Pirnie, Inc., 1991. Air emissions associated with the combustion of scrap tires for energy recovery.

9. Oxford Energy Co., 1988. Final emission test report for Modesto Energy Company waste tire to energy facility, Westley, California.

10. Oxford Energy Co., 1990. Stack test report (for the Oxford Energy Company facility at Westley, California, October 9-10, 1990).

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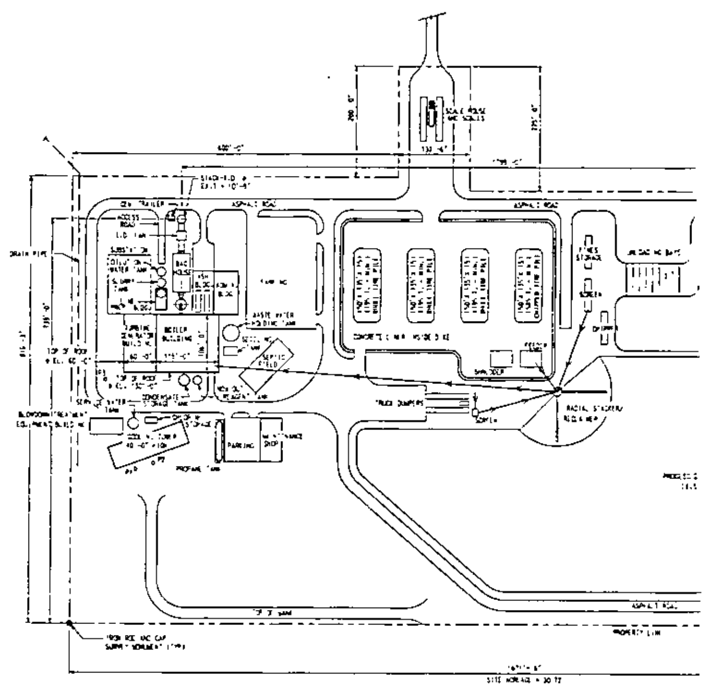

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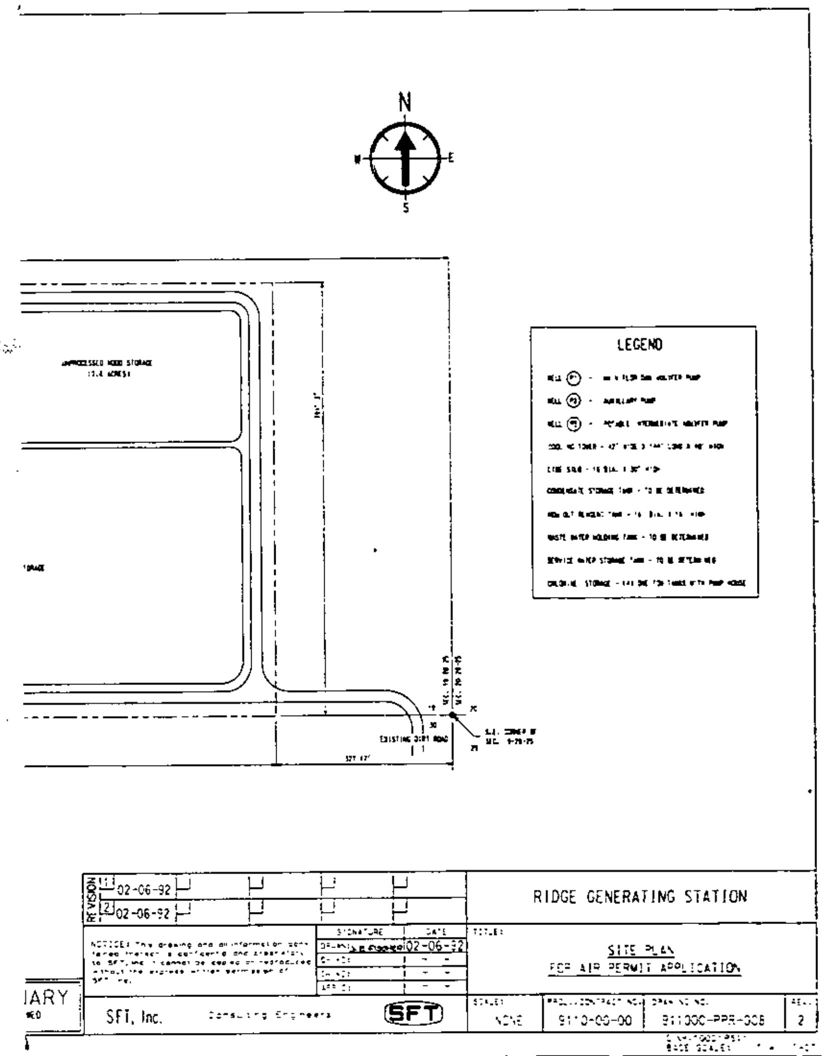
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RIDGE GENERATING STATION
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