I INTRODUCTION

EnviroPower of Illinois, LLC is proposing to construct a nominal 500-megawatt independent power facility near Benton, Illinois at the site of the former Old Ben 24 coal mine. Power will be generated by combusting coal mine tailings in two 2550 mmBtu/hr circulating fluidized bed combustors (CFBC). Coal mine tailings will be taken from the mine tailing piles at the former Old Ben 24 mine site as well as from other sites in southern Illinois.

II PROJECT DESCRIPTION

EnviroPower of Illinois, LLC (EnviroPower) has requested a permit for two circulating fluidized bed boilers (CFB), each with limestone injection, a baghouse, and a selective non-catalytic NO_x reduction system; solid fuel handling and storage; ash handling and storage; limestone handling and storage; cooling towers; fuel oil storage and ancillary operations. Together the CFB boilers will have the ability to generate the steam for nominal 500 MW of electricity. The CFB boilers will be fired on coal tailings and coal as their primary fuel with capability to fire natural gas as a startup fuel with low-sulfur distillate oil as a back up startup fuel.

In a CFB boiler, crushed limestone is added directly into the bed of the boiler with the coal, and air is forced in from the bottom. The pressure floats the limestone and coal within the combustion chamber allowing it to behave like a fluid. This provides certain combustion benefits, including reduced formation of nitrogen oxides (NO_x). In addition the limestone chemically absorbs sulfur dioxide (SO_2) directly from the gases in the boiler, reducing SO_2 emissions. Particulate matter (PM) suspended in the flue gas, as well as fine particulates of limestone, are captured by a fabric filter, also known as a baghouse.

Natural gas is used in the start-up phase to heat the bed to approximately 1000°F, at which point combustion is maintained by the continuous addition of solid fuel. Solid fuel, consisting of coal tailings and/or coal, and a sorbent, typically limestone (for SO_2 control) are injected into the fluidized bed. Hot combustion gases and entrained solid fuel and limestone flow up the boiler and through hot cyclones. Particles captured in the cyclone are recirculated to the fluidized bed for better utilization of fuel and sorbent. Selective Non-Catalytic Reduction (SNCR) technology is employed for NO_x control, where ammonia (NH_3) is injected into the hot flue gas resulting in rapid and complete mixing of the NH_3 with the flue gas.

Flue gas typically leaves the hot cyclone at 1500°-1600°F and passes through the convective heat transfer sections (superheaters, economizer, and tubular air heaters). The flue gas leaves the tubular air heaters at approximately 350°-375°F and passes through a baghouse, where fabric filters collect the particulate matter in the flue gas.

Fluidizing and combustion air is introduced at two levels in the combustion section, creating a staged combustion effect, which suppresses NO_x formation. The high degree of solids mixing in CFB provides uniform temperatures throughout the combustion section and greatly enhances the rate of combustion

of solid fuel particles. Gas residence time and gas temperature are sufficient to reduce emissions of CO and hydrocarbons to low levels in the circulating fluid bed boiler.

Limestone is gravity fed to the CFB bed with the solid fuel. While fuel is burning at an optimum temperature for calcining, the limestone converts from $CaCO_3$ to CO_2 and CaO. Further reaction of the CaO with SO_2 (from the fuel) and oxygen (from the combustion air) produces $CaSO_4$. The recycling of particulates, including limestone, through the bed section greatly enhances the effectiveness of the limestone in controlling SO_2.

With the construction of these boilers, bed ash and fly ash will be pneumatically conveyed to an ash silo. The pneumatic system for ash movement contains separators with final particulate clean up through fabric filter collectors. Solid fuel will be transferred by covered conveyors at the solid fuel handling facilities. Limestone will be transferred by enclosed conveyors from a new limestone silo. A new limestone truck dump with a fabric filter and enclosure will also be installed.

III. PROJECT EMISSIONS

NO_x, SO_2, CO, VOM, PM/PM_{10}, Pb, and Fluorides are air pollutants regulated by the Illinois Environmental Protection Agency (Illinois EPA). The increase in these air pollutants (except Pb) will be significant with respect to 40 CFR 652.21 for the Prevention of Significant Deterioration of Air Quality (PSD). In addition, air quality impacts based on the proposed BACT emissions rates were modeled for NO_x, SO_2, CO, PM, and Fluorides. NO_x, SO_2, CO, and PM_{10} and F are all above the PSD modeling exemption levels.

Particulate matter emissions from the new coal fired boiler at EnviroPower will be controlled by a baghouse.

The emissions of the new boiler are listed below. Potential emissions are calculated based on continuous operation at the maximum load. Actual emissions may be less to the extent that the boiler may not operate year round or its maximum rated capacity.

Contaminant	Emission (Ton/Yr)
Sulfur Dioxide	5590.0
Nitrogen Oxides	2792.0
Carbon Monoxide	6031.0
Particulate Matter	336.0
Particulate $Matter_{10}$	336.0
Volatile Organic Material	161.0

A small amount of particulate matter will also be released from the storage and handling of coal, ash and limestone.

III. APPLICABLE EMISSION STANDARDS

All emission sources in Illinois must comply with Illinois Pollution Control Board emission standards. The Board's emission standards represent the basic requirements for sources in Illinois. The new CFB boilers should readily comply with applicable Board standards.

EnviroPower of Illinois will be a major source of pollution, because it is a fossil-fueled steam electric plant with heat input greater than 250 million Btu/hour and potential emissions greater than 100 tons/year for several regulated pollutants. Therefore, the proposed projects at EnviroPower will be subject to NSR requirements. Because EnviroPower is located in an area that is classified as attainment or unclassifiable for all criteria pollutants, if NSR is required it will take the form of a Prevention of Significant Deterioration (PSD) review.

This project is also subject to the federal New Source Performance Standards (NSPS), 40 CFR 60 Subpart Da, for electric utility steam generating unit greater than 250 mmBtu/hr. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement. The NSPS sets emission limits for nitrogen oxides, sulfur dioxide and particulate matter emissions from the new boiler. Testing, record keeping, reporting and continuous emissions monitoring are also required.

A major project is one, which entails construction of a major source or major modification, i.e., a significant net increase in emissions of an attainment contaminant at an existing major source. This project is considered major for emissions of nitrogen oxides, sulfur dioxide, volatile organic materials, particulate matter and carbon monoxide as discussed in more detail below.

Under federal regulations (40 CFR 52.21(b)) a modification to an existing major source of air pollution is subject to NSR permitting requirements if the modification results in a net emission increase for any pollutant greater than the following significant emission rates:

Pollutant	Significant Emission Rate (Tons/Year)
Nitrogen Oxides (NO_x)	40
Sulfur Dioxide (SO_2)	40
Carbon Monoxide (CO)	100
Ozone (As VOM)	40
Total Suspended Particles (TSP)	25
Small Particles (PM_{10})	15
Lead	0.6

The proposed plant is also a major source for emissions of hazardous air pollutants (HAP). The potential HAP emissions from the plant will be greater than 10 tons of certain individual HAP i.e. hydrogen fluoride and hydrogen chloride and more than 25 tons in aggregate for a combination of HAP. Therefore, the plant may be subject to review under Section 112(g) of the Clean Air Act. The USEPA’S related determination under Section 112(n) of the Clean Air Act has been appealed and applicability of Section 112(g) is still under review. Compliance with the proposed emission limits will also assure

Maximum Achievable Control Technology (MACT) if the source ultimately is subject to the requirements of Section 112 (g).

IV. PROPOSED PERMIT

Under federal Prevention of Significant Deterioration of Air Quality (PSD) regulations, the Permitte must demonstrate Best Available Control Technology (BACT) for controlling NO_x, SO_2, CO, VOM, PM/PM_{10}, and F emissions. In this application, EnviroPower has provided data supporting that BACT will be achieved as established by the Illinois EPA.

The proposed permit contains limitations on all emissions in accordance with the BACT limit. The conditions of the permit also establish appropriate compliance procedures, including continuous emissions monitoring (CEM), record keeping and reporting requirements, and stack testing. The Permittee may carry out these procedures on an ongoing basis to demonstrate that the plant is operating within the limitations as set forth by the permit and that emissions are properly controlled.

V. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

A. Introduction

The Clean Air Act defines BACT as:

". . .an emission limitation based on the maximum degree of reduction . . .which the permitting authority, on a case-by-case basis, taking into account energy, environmental and other costs, determines is achievable . . .".

BACT is generally set by a "Top Down Procedure." In this procedure, the most stringent control requirement in practice elsewhere is assumed to constitute BACT for a particular project, unless the impacts associated with the control requirements are shown to be excessive. This approach has generally been followed by the Agency.

B. Discussion:

Nitrogen Oxide - Review of the USEPA's BACT/LAER Clearinghouse indicates that selective non-catalytic reduction in combination with combustion controls as proposed by EnviroPower are the NO_x control measures used on new CFB fired boilers. Further add-on control devices have not been used.

Based on available data, the following technologies were reviewed as possible control options for NO_x: 1) selective catalytic reduction, 2) selective non-catalytic reduction, and 3) combustion controls. Selective catalytic reduction (SCR) uses a chemical reaction to remove NO_x from the exhaust gas. The reaction between gaseous NO_x and a reagent, e.g. ammonia (NH_3) as it passes through a porous bed or screen impregnated with catalyst, reduces NO_x back to N_2. This reaction takes place at a temperature of 750 degree F or

above. The temperature of exhaust gas from the baghouse will be about 270 degree F, making it unsuitable for SCR operation without reheating. Particulates in the exhaust before the baghouse would be present in sufficient concentration to coat and poison the catalyst if SCR was installed before the baghouse. SCR is not a demonstrated technology for control of NO_x emissions from CFB boilers. Hence this option is not technically feasible for controlling NO_x from the CFB boilers.

Selective non-catalytic reduction (SNCR) also involves injection of a reactant, but without the use of a catalyst. The effectiveness of this method is dependent on initial NO_x concentration, residence time, mixing and on the temperature in the reaction zone. The temperature of the gas must be in the range of 1400 degree F to 1800degree F, to be suitable for SNCR operation. This range is satisfied at the intermediate zone in the boiler between the combustion bed and steam tubes.

The technically feasible option for controlling NO_x is use of SNCR and combustion control and is therefore proposed for the new CFB boilers.

For the proposed new CFB boilers the use of SNCR in conjunction with the inherent low-NO_x from a CFB boiler is the most stringent technically feasible alternative. While this alternative will have greater capital and operating costs than a CFB boiler by itself, for these new CFB boilers, the increase is not considered excessive.

Sulfur dioxide - Technically feasible SO_2 control alternatives for the proposed new CFB boiler include limestone injection and limestone injection in combination with flue gas desulfurization. Of the available FGD alternatives, lime spray drying is judged to be the most appropriate in this case due to the common waste and raw material handling requirements between this process and the CFB's limestone injection process. None of the CFB boilers listed in the BACT/LAER Clearinghouse reports using an FGD process in combination with limestone injection.

Limestone injection is inherent to operation of a CFB boiler. This SO_2 control alternative has been demonstrated to be reliable, effective, and would not result in adverse economic, energy, or environmental impacts. Based on these criteria, the use of limestone injection is concluded to be representative of BACT for the proposed new CFB boilers.

Particulate matter - For the proposed new CFB boilers, the alternative controls for particulate matter emissions include fabric filters and ESPs. Wet scrubbers are concluded to not represent a demonstrated control technique for CFB boilers and do not offer more stringent levels of control of particulate matter than fabric filters. Beryllium is emitted as a particulate and represents a fraction of the particulate matter emitted from the facility. Therefore, achieving BACT for particulate matter also achieves BACT for beryllium because the same technology is used to control both PM/PM_{10} and beryllium emissions.

Both the proposed new CFB boilers will employ fabric filters for control of particulate matter. Compared with the alternative control device (ESP), the

fabric filter offers a greater degree of control of fine particles. This alternative is thus considered the appropriate control device. A more stringent emission rate of particulate matter may be technologically feasible by utilizing specialty bags in the fabric filter. It is not normal practice for BACT to specify requirements that can only be satisfied by a single vendor.

Carbon monoxide and volatile organic compounds - Control of the emissions of CO and VOC from combustion sources may be effected two ways: (1) combustion modifications to minimize the formation of the pollutants, and (2) flue gas catalytic oxidation of any CO and VOC formed in the combustion process.

Combustion controls are concluded to represent BACT for control of CO and VOC emissions from the CFB boilers. Catalytic oxidation has been utilized on some combustion sources, but is considered technically infeasible on CFB boilers.

C. BACT Determination

1. Particulate Matter

The Agency has determined that BACT for particulate matter emissions from CFB boilers is a limit of 0.015 pounds per million Btu. These boilers will control PM emissions to this level by a cyclone dust collector and a fabric filter.

2. Sulfur Dioxide

The Agency has determined that BACT for sulfur dioxide emissions is a limit of 0.25 lb/million Btu and 90% sulfur dioxide removal efficiency. The new boilers #1 and #2 will meet this requirement.

3. Nitrogen Oxide

The Agency has determined that BACT for NO_x emissions continues to be a limit of 0.125 lbs/million Btu for new CFB boilers. The design of the fluidized bed boiler limits nitrogen oxide emissions allowing it to meet this limit.

4. Carbon Monoxide

The Agency has determined BACT to be a limit of 0.27 pounds per million Btu for new CFB boilers.

5. Volatile Organic Materials

BACT for VOM is good combustion practices by maintaining proper combustion efficiencies.

6. Mercury and Fluorine

There is currently no specific established means to specifically control the emissions of these elements, which are found in trace quantities of coal tailing composition. However, the inherent design of CFBs in conjunction with

criteria pollutant control devices is believed to constitute maximum achievable control technology (MACT) for this source, if applicable under 112 (g).

VI. AIR QUALITY ANALYSIS

A Introduction

The previous discussion addressed emissions and emission standards. Emissions are the quantity of pollutants emitted by a source, as they are released to the atmosphere from a stack. Standards are set limiting the amount of these emissions primarily as a means to address the quality of air. The quality of air as we breathe it or as plants and animals experience it, is known as ambient air quality. Ambient air quality considers the emissions from a particular source after they have dispersed following release from a stack, been added to the background level of pollutants in the air entering the region, and joined with the pollutants emitted from other nearby sources.

The concern for pollutants in ambient air is typically expressed in terms of the concentration of the pollutant in the air. One form of this expression is parts per million. A more common scientific form is microgram per cubic meter, millionth of a gram in a cube of air one meter on a side.

The United States EPA has established standards, which set limits on the level of pollution in the ambient air. These ambient air quality standards are based on a broad collection of scientific data to define levels of ambient air quality where adverse human health impacts and welfare impacts may occur. As part of the process of adopting air quality standards, the United States EPA compiles the various scientific information on impacts into a “criteria” document. Hence the pollutants for which legal air quality standards exist are known as criteria pollutants. Based upon the nature and effects of a pollutant, appropriate numerical limitation(s) and associated averaging times are set to protect against adverse impacts. For some pollutants several standards are set, for others a single standard may suffice.

Areas can be designated as attainment or nonattainment for criteria pollutants, based on the existing air quality. Locations can either have good air quality complying with the air quality standard for a pollutant, in which case the area is known as attainment. If the air quality standard is exceeded the area is known as nonattainment.

In attainment areas one wishes to generally preserve the existing clean air resource and prevent increases in emissions which would result in nonattainment. In a nonattainment area efforts must be taken to reduce emissions to come into attainment. An area can be attainment for one standard and nonattainment for another or comply with the long-term standard for a pollutant but violate the short-term standard.

Compliance with air quality standards is determined by two techniques -- monitoring and modeling. In monitoring one actually samples the levels of pollutants in the air on a routine basis. This is particularly valuable as monitoring provides data on actual air quality, considering actual weather and

source operation. The Illinois EPA operates a network of ambient monitoring stations across the State.

Monitoring is limited because one cannot operate monitors at all locations. One also cannot monitor to predict the effect of a future source, which has not yet been built, or to evaluate the effect of possible regulatory programs to reduce emissions. Modeling is used for these purposes: modeling uses mathematical equations to predict ambient concentrations based on various factors, including the height of a stack, the velocity and temperature of exhaust gases, and weather data (speed, direction and atmospheric mixing).

Modeling is usually performed by computer, allowing detailed estimates to be made of air quality impacts over a range of weather data. Modeling techniques are well developed for essentially stable pollutants like particulate matter, NO_x, and CO, and can readily address the impact of individual sources. Modeling techniques for reactive pollutants, e.g., ozone, are more complex and have generally been developed for analysis of entire urban areas. They are not applicable to a single source with small amounts of emissions.

Air quality analysis is the process of predicting ambient concentrations in an area or as a result of a project and comparing the concentration to the air quality standard or other reference level. Air quality analysis uses a combination of monitoring data and modeling as appropriate.

B. Air Quality Analysis for EnviroPower

An ambient air quality analysis was conducted by a consulting firm, Goodwin Environmental Consultants, Inc., on behalf of EnviroPower to assess the impacts of its emissions of PM, SO_2, NO_x and CO on ambient air quality. Under the PSD rules, this analysis must determine whether the proposed project will cause or contribute to a violation of any applicable air quality standard.

Modeling was done incorporating proposed new emissions at EnviroPower and major stationary sources in surrounding areas. The analysis performed conforms to the guidance and requirements of the USEPA and the Agency. Background concentrations were added to modeled impacts for SO_2, NO_x and PM_{10} National Ambient Air Quality Standards (NAAQS). The highest regional values from the particular averaging period of the most recent three years of IEPA monitoring data were used as background.

Table 1 shows the dispersion modeling results of the Benton facility with respect to the NAAQS. The modeled impacts on ambient air quality from CO are less than the significant impact levels. Under no circumstances is air quality in a PSD area allowed to deteriorate beyond the National Ambient Air Quality Standard (NAAQS).

TABLE 1

Predicted Maximum Concentrations (ug/m^3)

Pollutant	Averaging Period	Project Impact	Significant Impact Level	Existing Background	Total (Project& Background)	NAAQS
SO_2	24 Hour*	82*	5	136	218	365
SO_2	3 Hour*	175*	25	411	586	1,300
SO_2	Annual	12	1	18	30	80
NO_x	Annual	5	1	36	41	100
PM	24 Hour**	90*	5	41	131	150
PM	Annual	9	1	23	32	50
CO	1 Hour	143	2000			40,000
CO	8 Hour	42	500			10,000

* Highest Second high concentration
** Sixth highest concentration

PSD areas have predetermined maximum allowable pollution increases for sulfur dioxide, nitrogen oxides and PM_{10}, which cannot be exceeded. These limits are called "allowable increments". (See Table 2).

TABLE 2

Comparison of Predicted Concentration
With the Allowable PSD Increment (ug/m^3)

Pollutant	Averaging Period	Maximum Predicted Conc.	Class II PSD Increment
SO_2	24 Hour*	18.0	91
SO_2	3 Hour*	64.0	512
SO_2	Annual	2.6	20
NO_x	Annual	1.7	25
PM_{10}	Annual	6.2	17
PM_{10}	24 Hour*	29.5	30

* Highest second high concentration

In summary EnviroPower has provided adequate information to determine that emissions from the facility, when constructed, will not cause a violation of the relevant National Ambient Air Quality Standard (NAAQS) or a violation of PSD increment allowables.

VII. OTHER ANALYSES

At the above air quality impact levels for NO_x, SO_2, CO and PM_{10} emissions as shown in Tables 1 and 2, there will not be a significant affect on soils, vegetation or visibility.

VIII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed permit meets all applicable state and federal air pollution control requirements, subject to the conditions proposed in the draft permit.

The Illinois EPA will hold a public hearing on Tuesday, May 8, 2001 at 7:00 p.m. at the Kiwanis Hall, 414 West Hudelson in Benton. The hearing will be held by the Illinois EPA to receive comments and data and to answer questions from the public prior to making a final decision concerning the permit. Lengthy comments and questions should be submitted to the Illinois EPA in writing. Written comments must be postmarked by midnight, June 8, 2001, unless otherwise specified by the hearing officer at the time of the hearing. Comments need not be notarized and should be sent to the Illinois EPA Hearing Officer, 1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276.

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