

**Air Pollution Control
40 CFR 52.21(i)
Prevention of Significant Deterioration Permit to Construct
Final Statement of Basis
for Permit No. PSD-OU-0002-04.00
August 30, 2007**

**Deseret Power Electric Cooperative
Bonanza Power Plant, Waste Coal Fired Unit
Uintah & Ouray Reservation
Uintah County, Utah**

In accordance with requirements at 40 CFR 124.7, the Region 8 office of the U.S. Environmental Protection Agency (EPA) has prepared this Statement of Basis describing the issuance of a Prevention of Significant Deterioration (PSD) permit to Deseret Power Electric Cooperative. This Statement of Basis discusses the background and analysis for the PSD permit for construction of a new Waste Coal Fired Unit (WCFU) at Deseret Power's Bonanza power plant, and presents information that is germane to this permit action.



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E. Supercritical Boiler Technology for BACT.

EPA has evaluated a supercritical CFB boiler as a BACT option and has determined that since there are no known supercritical pressure turbines available in the size needed for the WCFU project, this option should be eliminated at step two of the top-down BACT analysis as technically infeasible, because it is not available and applicable for the WCFU project.

At the first step of the top-down BACT analysis, all demonstrated and potentially applicable control technology alternatives must be identified. This must include a survey of production processes or innovative technologies that have a practical potential for application to reduce relevant emissions at the source type being evaluated. At the second step, technically infeasible options are eliminated. A technology is feasible if either it is demonstrated, i.e. installed and operated successfully at a similar facility, or it is both “available” and “applicable.” A technology is considered “available” if it can be obtained by the applicant through commercial channels. An available technology is “applicable” if it can reasonably be installed and operated on the source type under consideration. If a technology is not demonstrated, or is found to be unavailable or not applicable, that technology will be eliminated from BACT consideration as technically infeasible.

As described by Babcock & Wilcox, a major boiler supplier, a supercritical boiler (regardless of combustion process, i.e. PC-fired, CFB, gas-fired, etc.) is designed to operate with the working medium, i.e. water, at a pressure above the critical point (3200 psia). At this pressure the medium cannot be separated to liquid and steam thus natural circulation is impossible, and the fluid is pumped through all heat absorbing tubes (called “Once-Through” in the boiler industry, versus natural circulation that the sub-critical pressure WCFU boiler is based on). (Ref: e-mails and attachments from Ed Thatcher, Deseret Power, to Mike Owens, EPA Region 8, November 6, 2006.)

The use of supercritical pressure in a power plant affects the design of all components within the plant cycle, boiler, turbine, pumps, etc. The steam cycle is based on available turbine designs. The boiler and other equipment are designed to meet the steam cycle defined by the turbine. This technology is being deployed currently at pulverized coal utility boilers. EPA therefore concludes that it is appropriate to consider supercritical technology, as a technology transfer control option under step one of the top-down BACT analysis.

However, according to Babcock & Wilcox and Foster-Wheeler, two major boiler suppliers, supercritical pressure steam turbines are not available in the size needed for the WCFU project. The smallest supercritical pressure turbine currently known to be available is three to four times larger than is needed for the WCFU project, which will operate at approximately 1500 psia and is thus based on a sub-critical steam cycle. (Ref: e-mails and attachments from Ed Thatcher, Deseret Power, to Mike Owens, EPA Region 8, November 6, 2006 and November 13, 2006.)

In addition, the following information was provided by Siemens Power Systems to Deseret Power (forwarded to EPA Region 8 via e-mail from Deseret Power on November 13, 2006):

"To our knowledge, no manufacturer offers supercritical steam turbines in 110-120 MW range. The reason is that you would be unlikely to see any significant performance improvements for units that small. Key reasons are as follows:

1. When you go to supercritical steam conditions the specific volume of the steam is reduced because of the higher pressure. That means the blades in the HP section have to be shorter. A major source of inefficiency in steam turbines is due to "flow disruptions" at the top and bottom of the blade where the moving flow meets the stationary rotor or casing. As the blades get shorter the impact of this "end wall" condition increases which in turn increases the flow losses.

2. The supercritical conditions require a once-through boiler which requires a more powerful feed pump drive (higher pressures). That decreases plant efficiency and if you can't make that difference up with improved cycle performance, supercritical makes no sense.

We generally don't see units less than about 500 MW being built as supercritical because the performance improvement isn't significant and the unit is more expensive than subcritical."

A Western Governors Association report, cited in public comments on the draft WCFU permit, states that "no supercritical CFB combustion units have been demonstrated on a commercial scale." EPA is aware of only one supercritical CFB boiler that has been proposed, designed and/or constructed anywhere in the world. As of January 11, 2006, design of that unit had not yet been completed. The unit is being designed for Poland's Poludniowy Koncern Energetyczny (PKE) for installation at its power plant at Lagisza in southern Poland. The proposed unit will have an output of 460 MW (four times larger than Deseret Power's proposed WCFU) and is being designed to fire bituminous coal. It is currently scheduled to begin operation in 2009. The unit is being designed to fire bituminous coal. (Ref: Foster-Wheeler press release, January 11, 2006.)

Supercritical CFB boilers, while potentially applicable as a BACT option, are not a "demonstrated" technology under the BACT analysis, as the only such boiler EPA is aware of (the PKE boiler planned in Poland) has not been installed and operated successfully. Further, the technology is not "available" under the BACT analysis since, as explained above, it is not commercially available for CFB boilers, and supercritical pressure steam turbines are not available in the size needed for the WCFU project. Therefore, this technology is eliminated at step two of the top-down BACT analysis because it is undemonstrated and is not available.