From: Poloncarz, Kevin
To: Alexander Crockett;
cc: Brian Bunger; Kissinger, William D.;
Subject: RCEC: Startup/Shutdown Analysis of Annual Limits, Auxiliary Boiler and CO BACT
Date: Thursday, April 02, 2009 8:00:22 PM
Attachments: SU-SD analysis final 4-1-09.pdf
Aux Boiler emissions.msg
RE Aux Boiler emissions cost effectiveness.msg
CO Average Cost effectiveness 4-2-09.xls
CO Icremental 4-2-09.xls
Support for CO cost effectiveness.xls

Sandy:

Attached are various pieces of technical information supporting the BACT analysis for startup emissions, including estimated operating scenarios as a basis for the annual limits on emissions.

Assumed Operating Scenario/Basis for Annual Emissions Limits: The attached table, "SU-SD analysis final 4-1-09.pdf", is intended to illustrate a typical operating profile, wherein the facility is operated six days a week, sixteen hours a day (i.e., "6x16"). This provides a conservatively high estimate of startup events and emissions, e.g., it assumes 6 cold startup events per year for the facility, which, based upon Calpine's experience at its other facilities is highly unlikely. This provides the basis for proposing a lower annual limit on emissions of CO and uses the following assumptions for predicting annual emissions. (Note that this number is larger than in the last draft of the analysis I sent you because there was a problem with the spread-sheet that kept it from summing-up warm startup emissions; it is still 50 tons per year lower than it was in the Draft Permit.)

- For NOx, the emissions for both baseload/peak operations and startup/shutdown events reflect the permit limits.
- For CO, the emissions during baseload/peak operation are based upon the reduced limit of 2 ppmvd CO.
- For cold startup events, CO emissions are based upon the permit limit of 5,028 lbs, given that the CO catalyst will not be achieving significant reductions during cold startup events.
- For hot startup events, CO emissions were estimated at 50% of the highest annual average for all hot startup events recorded at Delta Energy Center during the past four calendar years, as shown on the bottom part of the table. This is based upon Calpine's assessment that, during hot startup events, the catalyst should still be able to achieve emissions 50% lower than the average annual emissions of CO for all events recorded at Delta in calendar year 2008. (Delta does not have a catalyst; hence, 50% efficiency of the catalyst at the less than peak temperature would achieve 50% reductions.)
- For warm startup events, CO emissions are based upon 50% of the maximum recorded during a hot startup event at Delta during the past four calendar years (2,446 lbs CO). This is because Calpine believes the catalyst will still achieve substantial reductions during warm startups, but is not as comfortable that this will be as high as during hot startups (given the longer down-time); hence, it has taken the maximum record hot startup event as the basis for then applying the 50% reduction.
- For shutdown events, the CO emissions are based upon 50% of the average CO emissions observed at Delta during shutdown events during the past four calendar years, as shown on the table.

Auxiliary Boiler BACT Analysis: Also attached are two emails from Barbara McBride providing an analysis of the emissions reductions and costs associated with use of an auxiliary boiler to achieve reductions in startup emissions. Barbara's emails provide an explanation for the basis for calculating reductions that would be achieved during startup by an auxiliary boiler, using Los Medanos Energy Center's emissions profile as the basis for the small offsetting increase in emissions from the auxiliary boiler itself. This emissions estimate is based upon the same operating profile/scenario as illustrated by the table described above and therefore represents a conservatively high estimate of the reductions that might be achieved, e.g., it assumes 6 cold startup events per year at the facility, which is unlikely.

CO BACT Analysis: I have also attached an average and incremental cost-effectiveness analysis for CO, along with supporting information showing calculation of the emissions reductions achieved through use of an oxidation catalyst to achieve emissions of 1.5 ppmvd CO @ 15% O2. Again, the emissions estimate is conservatively high, since it is based upon the same 6X16 operating scenario and set of assumptions described above on the reductions that will be achieved by the catalyst during hot and warm startup and shutdown events (when most of the CO emissions will occur).

The cost effectiveness analysis indicates that the incremental cost-effectiveness to achieve a limit of 1.5 rather than 2.0 ppmvd CO is $45,400 per ton. The average cost-effectiveness is $4,200 per ton of CO. While the Air District has not established a cost-effectiveness threshold for CO BACT, this is more than ten times higher than the cost-effectiveness thresholds developed and applied by other agencies for purposes of the CO BACT analysis.

- South Coast Air Quality Management District has adopted average and incremental “maximum cost-effectiveness criteria” for major sources of $400 and $1,150 per ton of CO reduced (respectively). (SCAQMD, Best Available Control

Technology Guidelines, August 17, 2000, revised July 14, 2006, at 29.)

- San Joaquin Valley Air Pollution Control District has adopted a “recommended cost threshold” for BACT analysis of $300 per ton of CO. (Memorandum, David Warner, Director of Permit Services, to Permit Services Staff, Subject: “Revised BACT Cost Effectiveness Thresholds”, May 14, 2008.)
- I did a search on U.S. EPA’s clearinghouse and only identified only one recent CO BACT permitting decision for the source category which was based on cost-effectiveness: It imposed a CO limit of 1.8 ppmvd (3-hr average), based upon an average cost-effectiveness of $1,750 per ton of CO. (Clearinghouse ID No. GA-0127; Plant McDonough Combined Cycle, Permit No. 4911-067-0003-V-02-2, January 7, 2008.)
- There were only two other CO BACT decisions for the source category in the past four calendar years where an oxidation catalyst was required based upon cost-effectiveness:
  - In one, an average and incremental cost-effectiveness were $2,736 and $5,472 per ton of CO (respectively). (Clearinghouse ID No. NV-0035; Sierra Pacific Power Company Tracey Substation Expansion Project, Permit No. AP4911-1504, August 16, 2005.)
  - In the other, average cost-effectiveness was $1,161 per ton of CO. (Clearinghouse ID No. OR-0041; Wanapa Energy Center, Permit No. R10PSD-OR-05-01, August 8, 2005.)

In summary, the average cost-effectiveness of 1.5 ppmvd is more than ten times higher than either SCAQMD's or SJVAPCD's cost-effectiveness threshold and significantly higher than any of the other three decisions I could find (in the past four calendar years) where a oxidation catalyst was required based upon cost-effectiveness. The incremental cost-effectiveness is many times higher than SCAQMD's threshold or the one decision where a CO catalyst was required for a similar facility based upon incremental cost-effectiveness analysis. A decision that BACT constitutes the 2.0 ppmvd level, rather than 1.5 ppmvd, based upon this analysis is, in my view, perfectly consistent with the holding of the EAB in *In re General Motors, Inc*., PSD Appeal No. 01-30 10 Env. Admin. Dec. 360 (2002).

Please let me know if you have any questions.

Thanks.

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