Geomatrix

June 5, 2008

Mr. Tom Cackette
Chief Deputy Executive Officer

Mr. Doug Thompson
Manager, GHG Mandatory Reporting Section

Climate Change Reporting Section
California Air Resources Board
1001 "I" Street
Post Office Box 2815
Sacramento, California 95812

Subject: Comments on the Proposed GHG Mandatory Reporting Regulations for the California Air Resources Board AB32 Reporting Section

Dear Mr. Cackette and Mr. Thompson:

The purpose of this letter is to outline a number of concerns about the draft greenhouse gas (GHG) mandatory reporting (MR) regulations that were posted by the California Air Resources Board (ARB) on May 15, 2008. These concerns relate to both cement and cogeneration issues, and the comments are in agreement with comments made by other parties in the past.

The cogeneration comments are also consistent with the petition made to the California Public Utilities Commission (CPUC) on behalf of five cement companies ("Motion for Party Status of Indicated Cement Companies" to Docket 07-0IIP-01 for R.06-04-009, dated June 2, 2008).

The following are specific comments made:

- We are providing specific comments on Section 95110 and Section 95125, as shown in Attachment A.
- The options for fuel emissions calculations (Section 95125) are complex and appear to be limiting in terms of test methods. It would be useful to add to the rules an option for use of additional methods after demonstration of equivalence to be approved by the ARB executive officer, given that it is not clear the current provisions will apply to all cases in the future.
- We are also providing comments on the cogeneration emissions calculations (Section 95112), as shown in Attachment B.

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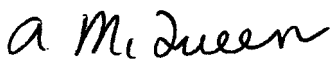
We would be happy to meet with ARB staff to discuss the issues raised in this letter. Please contact me via email at amcqueen@geomatrix.com or via phone at 949-642-0245.

Sincerely yours,
GEOMATRIX CONSULTANTS, INC



Anne McQueen, Ph.D., P.E.
Senior Engineer

Enclosures

ATTACHMENT A

Attachment A

06-05-08
MARK-UP BY
Cement
Manufacturers
(A-40 & A-93)
and See Insert A

CKD Emission Factor

$$EF_{CKD} = \frac{\frac{EF_{Cli}}{1+EF_{Cli}} * d}{1-\frac{EF_{Cli}}{1+EF_{Cli}} * d}$$

Where:

EF_{CKD} = CKD Emission Factor
EF_{Cli} = Clinker Emission Factor
d = CKD Calcination Rate

Plant-specific CKD Calcination Rate

$$d = 1-\frac{fCO_{2CKD} * (1-fCO_{2RM})}{(1-fCO_{2CKD}) * fCO_{2RM}}$$

Where:

fCO_{2CKD} = weight fraction of carbonate CO_2 in the CKD
fCO_{2RM} = weight fraction of carbonate CO_2 in the raw material

(2) ***TOC Content in Raw Materials.*** Operators of cement plants shall calculate CO_2 process emissions from the TOC content in raw materials by applying an assumed 0.2 percent organic carbon factor to the amount of raw material consumed then converting from carbon to CO_2 using the equation below.

TOC Content in Raw Materials

CO_2 emissions = $(TOC_{R.M.})$ * (R.M.) * (3.664)

Where:

$TOC_{R.M}$ = 0.2% = Organic carbon content of raw material (%)
R.M. = The amount of raw material consumed (metric tonnes/yr)
3.664 = The CO_2 to carbon molar ratio

(d) ***Stationary Combustion CO_2 Emissions.*** Operators of cement plants shall calculate stationary combustion CO_2 emissions at cement kiln and non-kiln units separately for the quantity and type of each fuel combusted during each report year as specified in this section.

(1) Natural Gas and Associated Gas: Operators of cement plants that combust natural gas and associated gas shall calculate CO_2 emissions resulting from the combustion of natural gas and associated gas using the method provided in section 95125(c) or section 95125(d).

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(2) Coal or Petroleum Coke: Operators of cement plants that combust coal or petroleum coke shall calculate CO_2 emissions using the method provided in section 95125(d). Operators of cement plants shall measure and record weekly coal consumption.

(3) Other Fossil Fuels: Operators of cement plants that combust middle distillates (such as diesel, fuel oil, or kerosene), residual oil, or LPG (such as ethane, propane, isobutene, n-Butane, or unspecified LPG) shall calculate CO_2 emissions using the method provided in section 95125(c) or section 95125(d).

(4) Refinery Fuel Gas: Operators of cement plants that combust refinery gas, still gas, or process gas shall calculate CO_2 emissions using the method provided in section 95125(e).

(5) Landfill Gas or Biogas: Operators of cement plants that combust landfill gas or biogas from waste water treatment shall calculate CO_2 emissions using the method provided in section 95125(c) or section 95125(d).

(6) Biomass Solids: Operators of cement plants that combust biomass shall calculate CO_2 emissions using the method provided in section 95125(a), section 95125(c), section 95125(d) or section 95125(h)(3).

(7) Waste-Derived Fuels: Operators of cement plants that combust waste-derived fuels including municipal solid waste shall calculate CO_2 emissions using the method provided in section 95125(c), or section 95125(d), or section 95125(h)(3).

section 95125(h)(1)

(8) Co-Firing of Fuels: Operators of cement plants that co-fire more than one fuel shall calculate CO_2 emissions separately for each fuel type using methods provided in sections 95125(a) and (c)-(e) as specified by fuel type in sections 95110(d)(1)-(7) and 95110(d)(9). Operators that co-fire waste-derived fuels that are partly biomass but not pure biomass with other fuels, shall determine the biomass-derived portion of total CO_2 emissions resulting from the combustion of the co-fired fuels, using the method specified in section 95125(h)(2), if applicable.

section 95125(h)(1)

(9) Start-Up Fuels: Operators of cement plants that primarily combust biomass-derived fuels but that combust fossil fuels for start-up, shut-down, or malfunction operating periods only, shall report CO_2 emissions from the fossil fuels using methodologies in section 95125(a) or methods specified in this section by fuel type.

(e) ***Efficiency Metrics.*** Cement plant operators shall calculate for the report year the CO_2 emissions generated per metric tonne of cementitious product and CO_2

of hourly CO_2 mass emissions over the year, converted to metric tonnes. Operators who add CEMS under this article are subject to specifications in section 95125(g)(3)-(6), if applicable.

(h) ***Method for Calculating CO_2 Emissions from Combustion of Biomass or Municipal Solid Waste.*** [Insert A -- See attached]

(1) The operator shall use the following method to calculate CO_2 emissions in the report year from combustion of biomass solid fuels or municipal solid waste.

(A) CO_2 emissions from combusting biomass or municipal solid waste shall be calculated using the following equation:

$$CO_2 = Heat * CC_{EF} * 3.664 * 0.001$$

Where:
CO_2 = CO_2 emissions from fuel combustion, metric tonnes per year
Heat = Heat calculated in section 95125(h)(1)(B), MMBtu per year
CC_{EF} = Default carbon content emission factor provided in Appendix A, kg carbon per MMBtu
3.664 = CO_2 to carbon molar ratio
0.001 = Conversion factor to convert kilograms to metric tonnes

(B) Heat content shall be calculated using the following equation:

$$Heat = Steam * B$$

Where
Heat = Heat, MMBtu per year
Steam = Actual Steam generated, pounds per year
B = Boiler Design Heat Input/Boiler Design Steam Output, as Design MMBtu per pound Steam

(2) The operator that combusts fuels or fuel mixtures that are at least 5 percent biomass by weight and not pure biomass, except waste-derived fuels that are less than 30 percent biomass by weight of total fuels combusted for the report year, shall determine the biomass-derived portion of CO_2 emissions using ASTM D6866-06a as specified in this article. The operator shall conduct ASTM D6866-06a analysis at least every three months, and shall collect each gas sample for analysis during normal operating conditions over at least 24 consecutive hours. The operator shall divide total CO_2 emissions between biomass-derived emissions and non-biomass-derived emissions using the average proportionalities of the samples analyzed. If there is a common fuel source to multiple units at the facility, the operator may elect to conduct ASTM D6866-06a testing for one of the units.

(3) In lieu of the method provided in section 95125(h)(1), operators of facilities that combust biomass solid fuels, waste-derived fuels, or municipal solid waste may elect to calculate CO_2 emissions using ARB approved source specific emission factors derived from source tests conducted at least annually under the supervision of ARB or the local air pollution control district or air quality management district. For fuels or fuel mixtures that contain at least 5 percent biomass by weight but are not pure biomass, the source test protocol shall include determination of the biomass-derived portion of CO_2 emissions as specified in section 95125(h)(2) if applicable. Upon approval of a source test plan by ARB, the source test procedures in that plan shall be repeated in subsequent years to update the source specific emission factors annually. In the absence of source specific emission factors approved by ARB, the operator shall determine CO_2 emissions using a method otherwise specified for the source in this article.

(i) ***Method for Calculating Mobile Combustion Emissions.***

(1) For operators choosing to report mobile source combustion emissions, the operator shall use the following equation to compute mobile combustion CO_2 emissions for the report year by fuel type:

$$CO_2 = Fuel * EF_{CO2} * 0.001$$

Where:

CO_2 = emissions from mobile combustion by fuel type, metric tonnes per year

Fuel = volume of fuel consumed, gallons per year

EF_{CO2} = default emission factor by fuel type provided in Appendix A, kg CO_2/gallon

0.001 = conversion factor to convert kg to metric tonnes

(2) The operator shall obtain data on the volume of fuel consumed during the report year from fuel records data (including bulk fuel purchase records, collected fuel receipts, official logs of vehicle fuel gauges or storage tanks) as shown in section 95125(i)(2)(A), unless the operator elects to calculate fuel use from miles traveled per vehicle using the fuel economy method shown in section 95125(i)(2)(B).

(A) The operator shall use the following equation to calculate mobile source fuel consumption from fuel records data:

$$Fuel = FP + FS_{beg} - FS_{end}$$

Where:

Fuel = volume of fuel consumed, gallons per year

Insert A to 95125(h) [***insert to be located immediately after title—see changes to title and to section (h)(1) on markup***]

The operator shall use either method (h)(1) or method (h)(3) for calculating CO2 emissions in the report year from combustion of biomass solid fuels, waste-derived fuels, or municipal solid waste. Operators who combust waste-derived fuels that are partly but not pure biomass shall determine the biomass-derived portion of CO2 emissions using the method specified in section 95125(h)(2), if applicable.

ATTACHMENT B

Recommendations for Modifying section 95112(b)(4)(B)

Section 95112(b)(4)(B) of the mandatory reporting regulation describes the procedure for allocating carbon dioxide emissions among three activities connected with bottoming-cycle cogeneration—the high-temperature manufacturing process from which heat is recovered, electricity generation, and production of low-temperature thermal energy. Of concern to us in this procedure is the transfer of emissions from the high-temperature manufacturing process to the other two activities. For a given high-temperature manufacturing facility, the amount of fuel burned to heat the high-temperature manufacturing process is driven by the physical and chemical requirements of the process and is unaffected by the amount of electricity and/or low-temperature thermal energy produced. The fuel consumption in the high-temperature manufacturing process and the emissions there from are separate from, and bear no relation to, the production of electricity and low-temperature thermal energy.

In the following recommendations, we are assuming the following position on bottoming-cycle cogeneration system emission calculations, consistent with policy under consideration at the Public Utilities Commission (PUC) and with Federal Energy Regulatory Commission (FERC) requirements:

- The bottoming-cycle cogeneration system is an add-on piece of equipment to a manufacturing process that would otherwise be a stand-alone process, with the same performance and temperature parameters as the process has after addition of the bottoming-cycle cogeneration system (i.e., with waste heat exiting the stack). The proposed calculation procedure looks at the scenario without bottoming-cycle cogeneration and with bottoming-cycle cogeneration.
- The only new emissions associated with the scenario with bottoming-cycle cogeneration are those for supplementary firing. These new emissions are assigned to the combination of the electricity generation and the thermal heat generation (or only to the electricity generation, if there is no thermal heat generation).
- The distribution of the new emissions between the electricity generation and the thermal heat generation can continue to be made using the fractional approach at the start of section 95112 (b)(4)(B).
- All existing emissions (emissions from the scenario without bottoming cycle cogeneration) continue to be assigned to the manufacturing process. There is no GHG reduction due to CHP that is assigned to the manufacturing process. Instead, the GHG reduction, which results from the use of is assigned to the CHP subsector of the power generation sector, as explained further below.
- Because only the new emissions actually resulting from the application of a bottoming-cycle cogeneration system (i.e. from supplementary firing) are assigned to the combination of the electricity generation and thermal heat generation, these systems can more easily be compared to a conventional system generating power and heat. If emissions that should be assigned to the manufacturing process are shifted to the electricity generation process, then these generation systems can no longer be compared effectively to conventional power generation systems.

The new emissions resulting from a bottoming-cycle cogeneration system and the GHG reduction achieved by a CHP system relative to a conventional power generation system are best assigned to

the CHP subsector of the power generation sector and regulated by the PUC under a minimum efficiency standard for bottoming-cycle units, in agreement with FERC and international standards and as proposed by these authors in comments provided to the PUC.

We, therefore, recommend the following modifications to the equations and definitions in section 95112(b)(4)(B):

1. Define a new term, F_M, which would have the definition: "Fuel input to the manufacturing process, MMBtu."
2. Redefine the term, E_M, as: "CO_2 emissions resulting from F_M, metric tonnes."
3. Delete sections 95112(b)(4)(B)2 and 95112(b)(4)(B)3.

First, the redefinition of E_M would make the procedure consistent with the physical circumstances of the high-temperature manufacturing process in a bottoming-cycle cogeneration facility—fuel use in, and emissions from, the high-temperature manufacturing process are separate from, and bear no relation to, electricity and low-temperature thermal energy production.

Second, the redefinition of E_M would make the procedure more consistent with the approach used by the Federal Energy Regulatory Commission (FERC) for calculating the efficiency of bottoming-cycle cogeneration facilities[1]. For those bottoming-cycle cogeneration facilities that only make electricity, the approach represented by the redefinition of E_M would make the approach exactly consistent with FERC's approach. For those bottoming-cycle cogeneration facilities that make both electricity and low-temperature thermal energy, which is not used to power a mechanical drive, the approach would be consistent with FERC's approach of attributing the fuel consumed by the manufacturing process to the process; however, FERC does not make provisions for accounting for thermal energy that is not used to power mechanical drives.

Third, the redefinition of E_M would make the procedure consistent with the approach taken by the United Nations in evaluating reductions in emissions of greenhouse gases from cement kilns[2].

Finally, these modifications would make the calculations simpler and easier to follow. Deleting sections 95112(b)(4)(B)2 and 95112(b)(4)(B)3 would eliminate two calculations, one of which is complicated and other of which is difficult to understand. The simplification of the calculations can be expected to reduce the number of errors made in reporting greenhouse gas emissions from bottoming-cycle cogeneration.

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[1] See FERC form 556.

[2] UNFCCC/CCNUCC
CDM – Executive Board AM0024 / Version 01
Sectoral Scopes: 1 and 4, 30 September 2005
Approved baseline methodology AM0024
"Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants"