July 13, 2011

Paul Soileau
Designated Representative
Plaquemine Cogeneration Facility
P. O. Box 150
Plaquemine, LA 70765-0150

Re: Petition to Use Site-Specific Default F-factors for Units 500, 600, 700, and 800 at the Plaquemine Cogeneration Facility (Facility ID (ORISPL) 55419)

Mr. Soileau:

The United States Environmental Protection Agency (EPA) has reviewed the petition submitted under §75.66 by the Dow Chemical Company (Dow) on November 17, 2009, in which Dow requested approval to use site-specific carbon-based F-factors for the multi-stream fuel flow to Units 500, 600, 700, and 800 at the Plaquemine Cogeneration Facility. The requested site-specific F-factors are necessary in order to establish carbon dioxide (CO_2) and nitrogen oxides (NO_x) emission rates, for the purposes of reporting emissions data under 40 CFR Part 75. EPA approves the petition, with conditions, as discussed below.

Background

Dow owns and operates the Plaquemine Cogeneration facility, located in Plaquemine, Louisiana. The facility consists of four natural gas-fired GE Frame 7A combustion turbines, i.e., Units 500, 600, 700, and 800. Each turbine has a nominal power rating of 170 MW and a typical operational heat input of 1,758 mmBtu/hr, when combusting natural gas. The maximum turbine firing rate of 1,931 mmBtu/hr occurs during cold weather operations. Following each turbine is a heat recovery steam generator (HRSG) with a duct burner system capable of firing multiple fuels, including pure natural gas (NG) purchased from an external supplier and delivered via pipeline, plant-produced fuel gas (PPFG) from another Dow facility, and a pure hydrogen (H_2) gas stream provided by a Dow chlorine production facility.

Each HRSG is equipped with two separate sets of duct burners. One set of burners exclusively fires the pure H_2 fuel stream and the second set of burners fires either PPFG or NG separately, or a blend of PPFG and NG. The PPFG is a by-product from ethylene production and its constituents vary depending on the manner in which the ethylene process is operated. The composition of the PPFG stream ranges anywhere from 0 to 75% H_2, with methane making up the balance. The constituents of the PPFG are determined continuously, using on-line gas chromatography.

Dow determines the hourly CO_2 mass emissions from Units 500, 600, 700, and 800 using Equation G-4 in Appendix G to Part 75 (displayed below):

$$W_{CO_c} = \frac{F_c \times H \times U_f \times MW_{CO_2}}{2000}$$

Equation G-4

Where:

W_{CO_2}	=	Hourly CO_2 mass emissions (tons/hr)
F_c	=	Carbon-based F-factor
H	=	Hourly heat input rate (mmBtu/hr)
U_f	=	1/385 scf CO_2/lb-mole at 14.7 psi and 68°F
MW_{CO_2}	=	Molecular weight of carbon dioxide (44.0)

Dow determines the hourly NO_x emission rates for Units 500, 600, 700, and 800 using Equation F-6 in Appendix F to Part 75 (displayed below):

$$E = K \times C_h \times F_c \times \frac{100}{\%CO_{2_w}}$$

Equation F-6

Where:

E	=	Hourly NO_x Emission rate (lb/mmBtu)
K	=	Conversion factor (1.194×10^{-7} lb/scf-ppm)
C_h	=	Hourly average NO_x concentration (ppm)
F_c	=	Carbon-based F-factor (scf CO_2/mmBtu)
CO_{2_w}	=	Hourly average carbon dioxide concentration (% CO_2)

Equations G-4 and F-6 require the use of F_c factors to determine the CO_2 and NO_x emission rates. The F_c factor relates the volume of CO_2 produced by the combustion of a fuel to the heat content of the fuel. In Table 1 in section 3.3.5 of Appendix F to Part 75, F_c factors are provided for coal, oil, natural gas, and other common fuels used for electrical generation. However, for an unconventional fuel, such as the PPFG stream at the Plaquemine facility, it is necessary to determine an appropriate site-specific F_c factor.

Section 3.3.6.3 of Appendix F to Part 75 states that for affected units that combust a combination of fuel (or fuels) listed in Table 1 of section 3.3.5 of Appendix F with any fuel(s) not listed in Table 1, the F_c value is subject to the Administrator's approval under §75.66. In view of this, Dow submitted a petition to EPA on November 17, 2009, requesting approval of procedures for determining site-specific F_c factors for NG and PPFG. Dow proposed to use

Equation F-7b in section 3.3.6 of Appendix F to Part 75 to calculate F_c values for NG and PPFG. For the pure hydrogen stream, which contains no carbon, Dow proposed an F_c value of zero.

Dow proposed to use its on-line gas chromatographs to measure the carbon content and gross calorific value (GCV) of both the NG and the PPFG According to Dow, these measurements are taken approximately every 12 minutes. Dow proposed to reduce the data to hourly averages and then to use Equation F-7b to calculate hourly Fc values for each fuel. For each hour in which fuels are blended, Dow proposed to use Equation F-8 in section 3.3.6.4 of Appendix F to Part 75 to calculate a prorated F_c value. The calculated F_c values would be used to determine the hourly CO_2 and NO_x emission rates, using Equations G-4 and F-6.

EPA's Determination

EPA approves Dow's petition to use site-specific F_c factors to calculate the CO_2 and NO_x emissions from Units 500, 600, 700, and 800 at the Plaquemine Cogeneration Facility. The F_c values shall be determined and applied as described below:

- For each unit operating hour in only which natural gas is combusted, Dow shall determine an F_c value, as follows. Calculate hourly average values of the weight percent carbon (%C) in the fuel and the gross calorific value (GCV) of the fuel, using all valid data recorded during the hour by an on-line gas chromatograph. Substitute these hourly average values into Equation F-7b in Appendix F to Part 75, to determine F_c.

- For each unit operating hour in which plant-produced fuel gas is combusted, Dow shall determine an F_c value, using the same approach as is used for natural gas.

- For each unit operating hour in which the pure hydrogen stream is combusted, the Agency approves the use of zero as the F_c factor, since no CO_2 is generated from the combustion of that fuel stream.

- For each unit operating hour in which fuels are blended, Dow shall determine a prorated hourly F_c value, using Equation F-8 in Appendix F to Part 75.

- Dow shall use each hourly F_c value calculated using Equation F-7b or Equation F-8 to calculate the CO_2 mass emissions and NO_x emission rate for that hour.

The conditions of this approval are as follows:

(1) Dow shall operate and maintain the on-line gas chromatographs that are used to provide data for the F_c determinations in accordance with the manufacturer's instructions;

(2) The quality control/quality assurance (QA/QC) program required by section 1 of Appendix B to Part 75 shall include information on the maintenance and quality-assurance activities associated with the gas chromatographs; and

(3) For any unit operating hour in which valid %C or GCV data are unavailable, thereby preventing calculation of a quality-assured F_c value, Dow shall report a substitute value of F_c. The substitute data value shall be the highest F_c in a lookback through the previous 720 hours of quality-assured F_c values for the fuel (or combination of fuels) combusted during the missing data hour. If fewer than 720 hours of historical quality-assured F_c values are available for the fuel (or combination of fuels) combusted, Dow shall use whatever data are available to determine the substitute data value.

EPA's determination relies on the accuracy and completeness of the information provided by Dow in the November 17, 2009, and is appealable under Part 78. If you have any questions regarding this determination, please contact Travis Johnson, either at (202) 343-9018 or johnson.travis@epa.gov.

Sincerely,

/s/
Sam Napolitano, Director
Clean Air Markets Division

cc: Ms. Cathy Lu, Louisiana Department of Environmental Quality
Joyce Johnson, EPA Region VI
Travis Johnson, CAMD