Petroleum Refineries

Proposed Rule: Mandatory Reporting of Greenhouse Gases

Under the proposed Mandatory Reporting of Greenhouse Gases (GHGs) rule, owners or operators of facilities that refine petroleum would report emissions from petroleum refining processes and all other source categories located at the facility for which methods are defined in the rule. Owners or operators would collect feedstock and product data or emission data; calculate GHG emissions; and follow the specified procedures for quality assurance, missing data, recordkeeping, and reporting.

Facilities that refine petroleum would also be required to report emissions under 40 CFR part 98, subpart MM (Suppliers of Petroleum Products).

How Is This Source Category Defined?

Under the proposal, petroleum refineries are facilities that produce gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt (bitumen) or other products by the distillation of petroleum or the redistillation, cracking, or reforming of petroleum derivatives.

What GHGs Would Be Reported?

Under the proposal, the refinery processes and gases that would be reported are listed in the table below along with the rule subpart that specifies the calcluation methodology that would be used.

For this refinery process…	Report emissions of the listed GHGs by following the requirements of the 40 CFR part 98, subpart indicated…		
	Carbon Dioxide (CO_2)	Methane (CH_4)	Nitrous Oxide (N_2O)
Stationary combustion	C	C	C
Flares	Y	Y	Y
Catalytic cracking	Y	Y	Y
Traditional fluid coking	Y	Y	Y
Fluid coking with flexicoking design	C/Y	C/Y	C/Y
Delayed coking	-	Y	-
Catalytic reforming	Y	Y	Y
Onsite and offsite sulfur recovery	Y	-	-
Onsite wastewater treatment	II	II	-
Coke calcining	Y	Y	Y
Asphalt blowing (controlled)	Y	-	-
Asphalt blowing (uncontrolled)	-	Y	-
Equipment leaks	-	Y	-
Storage tanks	-	Y	-
Delayed coking	-	Y	-
Other process vents	Y	Y	Y
Uncontrolled blowdown systems	-	Y	-
Loading operations	-	Y	-
Hydrogen plants (nonmerchant)	P	P	-
Onsite landfills	-	HH	-

Key:

C = 40 CFR part 98, subpart C (General Stationary Combustion Sources)
P = 40 CFR part 98, subpart P (Hydrogen Production)
Y = 40 CFR part 98, subpart Y (Petroleum Refineries)
HH = 40 CFR part 98, subpart HH (Landfills)
II = 40 CFR part 98, subpart II (Industrial Wastewater Treatment)
- = Reporting from this process is not required

For refinery processes that are subject to subparts other than 40 CFR part 98, subpart Y, the information sheets for 40 CFR part 98, subparts C, P, HH, and II summarize the requirements for calculating and reporting emissions.

How Would GHG Emissions Be Calculated?

Under 40 CFR part 98, subpart Y, the proposal calls for owners or operators of petroleum refineries to calculate CH_4 and N_2O emissions using the calculation methods described below for each refinery process.

For CO_2 emissions, owners or operators would use one of two alternative methods:

- Refinery units with certain types of continuous emission monitoring systems (CEMS) in place would report using the CEMS and follow the methodology of 40 CFR part 98, subpart C to report total CO_2 emissions from calcination and fuel combustion. At other refinery units, the use of CEMS would be optional.
- Facilities without CEMS would calculate CO_2 emissions using the methods summarized below.

Flares

CO_2 emissions from flares would be calculated using the gas flow rate (either measured with a continuous flow meter or estimated using engineering calculations) and either: 1) the daily measured carbon content of the flare gas, or 2) the daily measured heat content of the flare gas and an emission factor provided in the rule. If the carbon content and heat content of the gas are not measured on a daily basis, CO_2 emissions for each startup, shutdown, and malfunction event would be calculated separately using engineering estimates of the quantity of gas discharged and the carbon content of the flared gas. CH_4 and N_2O emissions from flares would be calculated using the methods specified in 40 CFR part 98, subpart C.

Catalytic Cracking Units, Fluid Coking Units, and Catalytic Reforming Units

CO_2 emissions would be calculated using the volumetric flow rate of the exhaust gas (measured or calculated) and the measured carbon monoxide (CO) and CO_2 concentrations in the exhaust stacks from the catalytic cracking unit regenerator, fluid coking unit burner, or catalytic reforming unit catalyst regenerator prior to the combustion of other fossil fuels. Catalytic reforming units would have the option of using an alternative method in which annual CO_2 emissions would be calculated using the quantity of coke burned off, the carbon content of the coke (using either a measured or a default value), and the number of regeneration cycles. CH_4 and N_2O emissions would be calculated using the CO_2 emissions and default emission factors. Fluid coking units that use the flexicoking design may account for their GHG emissions either by using the methods specified for traditional fluid coking units, or by using the methods for stationary combustion specified in 40 CFR part 98, subpart C.

Onsite and Offsite Sulfur Recovery

CO_2 emissions would be calculated using the volumetric flow rate of the sour gas (measured continuously or estimated from engineering calculations) and the carbon content of the sour gas stream (using a measured or a default value).

Coke Calcining Units

CO_2 emissions would be calculated from difference between the carbon input as green coke and the carbon output as marketable petroleum coke, and as coke dust collected in the dust collection system. The CH_4 and N_2O emissions from coke calcining units would be calculated using the calculated CO_2 emissions and default emission factors.

Asphalt Blowing Operations

For uncontrolled asphalt blowing operations, CH_4 emissions would be calculated using a facility-specific emission factor based on test data or, where test data are not available, a default emission factor provided in the rule. For controlled asphalt blowing operations, CO_2 emissions would be calculated by using a mass balance approach in which all of the CH_4 generated by the asphalt blowing operation is converted to CO_2.

Equipment Leaks

CH_4 emissions from equipment leaks would be calculated using either default emission factors or process-specific CH_4 composition data and leak data collected using the leak detection methods specified in EPA's Protocol for Equipment Leak Emission Estimates.

Storage Tanks

For storage tanks, the calculation methodology used to calculate the CH_4 emissions depends on the material stored. For storage tanks used to store unstabilized crude oil, facilities would use either: 1) the CH_4 composition of the unstabilized crude oil (based on direct measurement or product knowledge) and the measured gas generation rate; or 2) an emission factor-based method using the quantity of unstabilized crude oil received at the facility, the pressure difference between the previous storage pressure and atmospheric pressure, the mole fraction of CH_4 in the vented gas (using either a measured or a default value), and an emission factor provided in the rule. For storage tanks used to store material other than unstabilized crude oil, facilities would use either the TANKS Model (Version 4.09D) or a default emission factor provided in the rule for tanks storing material with a vapor-phase CH_4 concentration of 0.5 percent by volume or more.

Delayed Coking Units

CH_4 emissions from the depressurization of delayed coking vessels would be calculated using the method outlined below for other process vents. The emissions released during the opening of vessels for coke cutting operations would be calculated using the vessel parameters (height and diameter), the number of times the vessel was opened, and the mole fraction of CH_4 in the gas released (using a measured or a default value provided in the rule).

Other Process Vents

GHG emissions from other process vents would be calculated using the volumetric flow rate, the mole fraction of the GHG in the exhaust gas, and the number of hours during which venting occurred.

Uncontrolled Blowdown Systems

CH_4 emissions from uncontrolled blowdown systems would be calculated using either the mass balance method specified for process vents or a default emission factor and the sum of crude oil and intermediate products received from off site and processed at the facility.

Loading Operations

CH_4 emissions from loading operations would be calculated using the method in Section 5.2 of AP-*42: Compilation of Air Pollution Emission Factor*. Facilities would calculate CH_4 emissions only for loading materials that have an equilibrium vapor-phase CH_4 concentration equal to or greater than 0.5 percent by volume. Other facilities would report zero CH_4 emissions.

What Information Would Be Reported?

In addition to the information required by the General Provisions at 40 CFR 98.3(c), under the proposal, refineries would report the data used to identify emission units and calculate the GHG emissions (e.g., unit ID, unit type, feed input, GHG calculation method). In addition, facilities would report GHG emissions at the unit level for each catalytic cracking unit, coking unit, catalytic reforming unit, onsite and offsite sulfur recovery plant, coke calcining unit, and process vent.

For More Information

This series of information sheets is intended to assist reporting facilities/owners in understanding key provisions of the proposed rule. However, these information sheets are not intended to be a substitution for the rule. Visit EPA's Web site (www.epa.gov/climatechange/emissions/ghgrulemaking.html) for more information, including the proposed preamble and rule and additional information sheets on specific industries, or go to <www.regulations.gov> to access the rulemaking docket (EPA-HQ OAR-2008-0508). For questions that cannot be answered through the Web site or docket, call 1-877-GHG-1188.