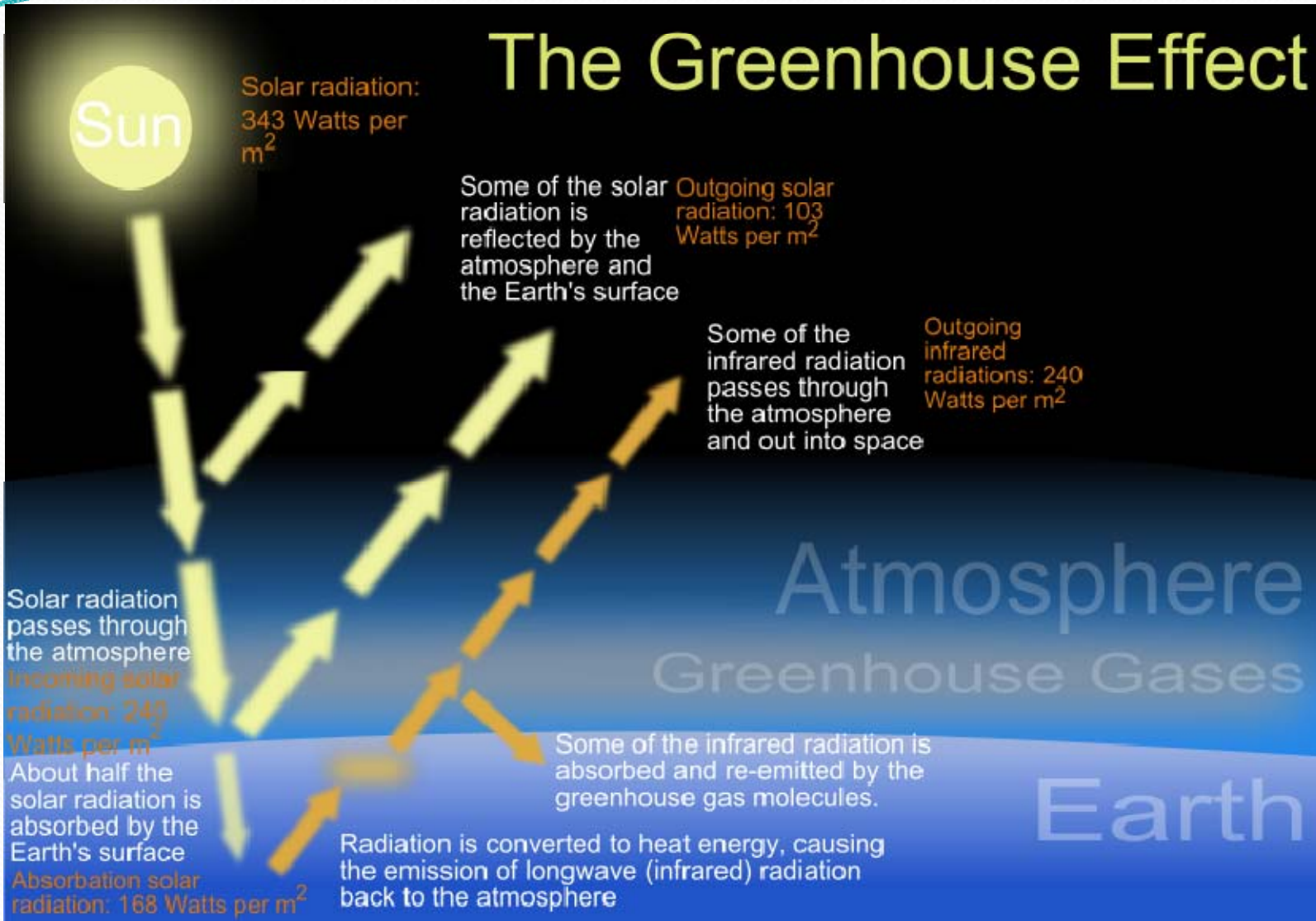


Greenhouse Gas Inventories

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The Greenhouse Effect



Introduction

On March 10, 2009 EPA proposed a mandatory greenhouse gas (GHG) reporting rule. Generally, the rule would require facilities in certain source categories with emissions above 25,000 metric tons of Carbon Dioxide equivalent (CO₂e)* to report their emissions of GHGs; however, some source categories would have to report even if their emissions were below that level.

*Carbon Dioxide equivalent or CO₂e is the base measure of a gases' Global Warming Potential (GWP). CO₂ has a GWP of 1 while Methane, for example, has a GWP of 21, so the 1 ton of Methane would equal 21 tons of CO₂e.

The GHGs that require reporting are:

- **Carbon Dioxide (CO₂)**,
Fuel combustion
- **Methane (CH₄)**,
Landfills
Oil & Gas production
- **Nitrous Oxide (N₂O)**,
Fuel combustion
- **Sulfur hexafluoride (SF₆)**,
Magnesium production
- **Hydroflouorocarbons (HFCs)**,
HFC manufacture
Semiconductor manufacturing
- **Perflourochemicals (PFCs), and other fluorinated gases.**
Aluminum production
Semiconductor manufacturing

When must you Report / Consequences of not Reporting

Facilities must report GHG emissions directly to EPA. CY2010 reporting was initially due March 31, 2011, but has been moved to September 30, 2011. Next year, the CY2011 report is due March 31, 2012.

Any violation of any requirement of this part shall be a violation of the Clean Air Act, including section 114 (42 U.S.C. 7414). A violation includes but is not limited to failure to report GHG emissions, failure to collect data needed to calculate GHG emissions, failure to continuously monitor and test as required, failure to retain records needed to verify the amount of GHG emissions, and failure to calculate GHG emissions following the methodologies specified in this part. Each day of a violation constitutes a separate violation.

Which Facilities are required to Report....

- 40 CFR Part 98 requires facilities to report if:
 - they emit 25,000 metric tons or more of GHGs per year (expressed as carbon dioxide equivalents) from stationary fuel combustion, or
 - they meet any other applicability requirements of the rule (per the Rule's General Provisions) such as being in a listed source category.
- Source Category Listings:
 - Subparts D through UU of the Rule
 - Electricity Generators; Various Manufacturers such as Adipic Acid Production; Ammonia Manufacturing, Lime Manufacturing, etc. and even Municipal Solid Waste Landfills (See Tables A-3 and A-4 of the Rule for the source listings)
 - Suppliers of GHG and Suppliers of Fuels (See Table A-5 of the Rule)

Which Facilities are required to Report....

- Stationary fuel combustion sources are defined as devices that combust any solid, liquid, or gaseous fuel generally to produce electricity, steam, useful heat, or energy for industrial, commercial, or institutional use; or to reduce the volume of waste by removing combustible matter. These devices include, but are not limited to:
 - boilers,
 - combustion turbines,
 - engines,
 - incinerators, and
 - process heaters.
- The rule excludes flares (unless otherwise required by another subpart), portable equipment, and emergency generators, emergency equipment, agricultural irrigation pumps, and combustion of hazardous waste (except for co-fired fuels).

Reporting Requirements

- Facilities with stationary fuel combustion units, but do not contain a source in any other source category covered by the rule, are not required to submit a report if their **aggregate** maximum rated heat input capacity from all stationary fuel combustion units **is less than 30 MMBTUH**.
- Facilities are required to submit annual emissions from each fuel combustion unit for:
 - carbon dioxide (CO₂),
 - methane (CH₄), and
 - nitrous oxide (N₂O)
- For each combustion unit, CO₂, CH₄, and N₂O emissions must be reported **separately** for each type of fuel combusted.
- Exclude carbon dioxide emissions from the combustion of **biomass**, but include emissions of CH₄ and N₂O from biomass combustion.

Calculation Methodologies

- EPA has prescribed four (4) calculation methodologies that can be used to calculate CO₂ emissions:
 - Tier 1 uses an emission factor that is multiplied by annual fuel use and a default heating value for that fuel.
 - Tier 2 uses an emission factor that is multiplied by annual fuel use and a measured heating value of that fuel. Units that combust MSW or other solid fuels and generate steam must use steam production (in place of fuel use) and an emission factor.
 - Tier 3 uses a calculation based on annual fuel use and measured carbon content of that fuel. For this tier, calculate emissions only for fuels that contribute 10 percent or more of the annual heat input to the unit.
 - Tier 4 requires a continuous emission monitoring system (CEMS).

Calculation Methodologies ...cont.

- Reporters are required to calculate GHG emissions only for specific fuels that are listed in the rule, except that units larger than 250 MMBTUH also must calculate GHG emissions for any fuel that provides 10 percent or more of the annual heat input to the unit.
- EPA cites that most combustion units can use an emission factor for CH₄ and N₂O emissions that is based on annual fuel use and the high heat value of fuel (using a default value prescribed in the rule if a measured heat value is not available).
- GHG can be determined by annual fuel usage derived from company records (e.g., billing data, steam generation, unit operating hours) or by direct measurement using flow meters, depending on the size of the unit and the type of fuel burned. Allowable measurements also include: high heating value, molecular weight, or carbon content of fuel. In these cases, fuel sampling and analysis must be conducted daily, weekly, monthly, quarterly, semi-annually, or by lot depending on the fuel burned.

GHG Inventories (Emissions)

- Calculate sum of six (6) GHG pollutants (by mass)

Or sum of three (3) pollutants: CO₂, NH₄, and N₂O
if combustion sources only

- Calculate sum of six (6) GHG pollutants (by CO₂e)

Or sum of three (3) pollutants: CO₂, NH₄, and N₂O
if combustion sources only

Local (common) Subject Facilities

- Owners/ operators of:
 - Electricity-generating units that are subject to the requirements of the Acid Rain Program are obligated to report to EPA the GHG mass emissions under 40 CFR Part 98, Subpart D.
 - EPA defines a subject “source category” as the following:
 - Electricity-generating units that are subject to the requirements of the Acid Rain Program; or
 - Electricity-generating units that are required to monitor and report to EPA carbon dioxide (CO₂) mass emissions year-round according to 40 CFR part 75.
 - This source category does not include portable equipment or emergency generators, as defined in §98.6.

Local Subject Facilities ...cont.

- Owners/ operators of:
 - Stationary Fuel Combustion Sources under 40 CFR Part 98, Subpart C.
 - EPA defines “Stationary fuel combustion sources ” as the following:
 - Devices that combust solid, liquid, or gaseous fuel, generally for the purposes of producing electricity, generating steam, or providing useful heat or energy for industrial, commercial, or institutional use, or reducing the volume of waste by removing combustible matter. Stationary fuel combustion sources include, but are not limited to, boilers, simple and combined-cycle combustion turbines, engines, incinerators, and process heaters.
 - This source category does not include portable equipment, emergency generators, Irrigation pumps at agricultural operations., flares, or electricity generating units that are subject to subpart D

40 CFR Part 98. Subpart D example

Actual CY2010 Air Pollutant Emissions			
CO ₂	CH ₄	N ₂ O	Total GHG Emissions
<i>(Metric Tons)</i>	<i>(Metric Tons)</i>	<i>(Metric Tons)</i>	<i>(Metric Tons)</i>
1,416.57	0.027	0.003	1,416.60

$25,990,000 \text{ scf} * 53.02 \text{ kg/mmbtu} * 1 \text{ mmbtu}/1,000,000 \text{ btu} * 1028 \text{ btu/scf}$
 $* 1 \text{ metric ton}/1,000 \text{ kg} = 1,416.57 \text{ Metric Tons}$

Actual CY2010 Fuel Usage	
Natural Gas	Diesel
<i>(scf)</i>	<i>(gallons)</i>
25,990,000	0

CY2010 Reporting Requirements
Is GHG Reporting to EPA Required?
<i>(Yes or No)</i>
Yes

GHG Emission Factors					
Natural Gas			Diesel Fuel		
CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>
53.02	0.001	0.0001	73.96	0.003	0.0006

40 CFR Part 98. Subpart C example

Actual CY2010 Air Pollutant Emissions			
CO ₂	CH ₄	N ₂ O	Total GHG Emissions
<i>(Metric Tons)</i>	<i>(Metric Tons)</i>	<i>(Metric Tons)</i>	<i>(Metric Tons)</i>
23,471	0.44	0.04	23,472

$$\begin{aligned}
 & [429,827,100 \text{ scf} * 53.02 \text{ kg/mmbtu} * 1 \text{ mmbtu}/1,000,000 \text{ btu} * 1028 \text{ btu/scf} \\
 & * 1 \text{ metric ton}/1,000 \text{ kg}] \\
 & + [4,301 \text{ gals} * 0.138 \text{ mmbtu/gal} * 73.96 \text{ kg/mmbtu} * 1 \text{ metric ton} / 1,000 \\
 & \text{kg}] = 23,471 \text{ Metric Tons CO}_2
 \end{aligned}$$

Actual CY2010 Fuel Usage	
Natural Gas	Diesel
<i>(scf)</i>	<i>(gallons)</i>
429,827,100	4,301

CY2010 Reporting Requirements
Is GHG Reporting to EPA Required?
<i>(Yes or No)</i>
No

GHG Emission Factors					
Natural Gas			Diesel Fuel		
CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>
53.02	0.001	0.0001	73.96	0.003	0.0006

40 CFR Part 98. Subpart C example

Actual CY2010 Air Pollutant Emissions			
CO ₂	CH ₄	N ₂ O	Total GHG Emissions
<i>(Metric Tons)</i>	<i>(Metric Tons)</i>	<i>(Metric Tons)</i>	<i>(Metric Tons)</i>
25,646	0.49	0.05	25,646

$$\begin{aligned}
 & [468,288,700 \text{ scf} * 53.02 \text{ kg/mmbtu} * 1 \text{ mmbtu}/1,000,000 \text{ btu} * 1028 \text{ btu/scf} \\
 & * 1 \text{ metric ton}/1,000 \text{ kg}] \\
 & + [11,949 \text{ gals} * 0.138 \text{ mmbtu/gal} * 73.96 \text{ kg/mmbtu} * 1 \text{ metric ton} / 1,000 \\
 & \text{kg}] = 25,646 \text{ Metric Tons CO}_2
 \end{aligned}$$

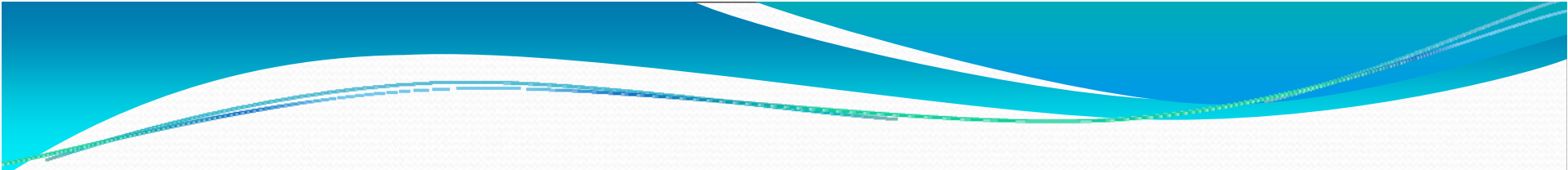
Actual CY2010 Fuel Usage	
Natural Gas	Diesel
<i>(scf)</i>	<i>(gallons)</i>
468,288,700	11,949

CY2010 Reporting Requirements
Is GHG Reporting to EPA Required?
<i>(Yes or No)</i>
Yes

GHG Emission Factors					
Natural Gas			Diesel Fuel		
CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>	<i>(kg/MMBTU)</i>
53.02	0.001	0.0001	73.96	0.003	0.0006

QUESTIONS ???





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