

# Greenhouse Gas Reporting Program

## 40 CFR part 98

### Online Training



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Welcome to the U.S. Environmental Protection Agency's online training for the Greenhouse Gas Reporting Program (referred to as the GHGRP).

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# About This Training



- Six modules:
  - Introduction to the Rule
  - Applicability
  - Reporting, Monitoring, and Recordkeeping Requirements
  - Subpart C, Stationary Fuel Combustion Sources
  - Subpart D, Electricity Generation
  - Subpart HH, Municipal Solid Waste Landfills
- Resources for additional information

This training is made up of the following modules: an introduction to the rule; applicability; general reporting, monitoring, and recordkeeping requirements; specific requirements for stationary fuel combustion sources; specific requirements for electricity generation; and specific requirements for municipal solid waste landfills.

The final section of the training points you to resources for additional information.

## Disclaimer



This training is provided solely for informational purposes. It does not provide legal advice, have legally binding effect, or expressly or implicitly create, expand, or limit any legal rights, obligations, responsibilities, expectations, or benefits in regard to any person.

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We can now proceed to the first module of this training, which provides an introduction to the rule. Please click on the arrow button at the bottom of your screen to begin.

To skip to a different module, click on the module title on the left side of your screen.



## **Module 1. Introduction to the Rule**

This module provides some background about the GHGRP, including the purpose and key elements of the rule and an overview of its requirements.

## Overview: U.S. EPA GHG Reporting Program (GHGRP)



*Goal of GHGRP is to collect accurate and timely data on GHG emissions to inform future policy decisions.*

- Monitoring began in 2010 for most emission sources with first reports due by September 30, 2011.
- An additional 12 source categories will begin collecting data in 2011 and report in 2012.
- EPA estimates that about **10,000 facilities** will be reporting, accounting for 85-90% of U.S. GHG emissions.
- Reporting only, no control or use requirements.



The purpose of the GHGRP is to provide accurate and timely data essential for informing future climate policy decisions. For example, the data will help EPA, states, and the public better understand emissions from specific industries, emissions from individual facilities, factors that influence greenhouse gas emission rates, and actions that facilities could take to reduce emissions.

Data collection began in 2010 for most reporters. In 2011, an additional 12 source categories began collecting data, which will mean that some facilities in 2011 will begin collecting data on additional processes and—in addition—some facilities will begin collecting greenhouse gas data for the first time.

About 6,700 facilities reported their calendar year 2010 emissions, and more facilities will report for 2011 when all 41 industry sectors are reporting.

The regulation does not require control of greenhouse gases; it requires only that certain sources monitor and report their GHG information.

## Current Version of 40 CFR 98



Available in the electronic Code of Federal Regulations (eCFR) at:

[http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=6c812965b3fe4dfd2d7ef9e8cd1d4c2f&tpl=/ecfrbrowse/Title40/40cfr98\\_main\\_02.tpl](http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=6c812965b3fe4dfd2d7ef9e8cd1d4c2f&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl)

*This version of the regulation will contain all published rule updates.*

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40 CFR part 98 has undergone several revisions since initial publication in 2009. So, you should visit the Code of Federal Regulations website at this address to make sure that you obtain the latest copy of the rule that incorporates all revisions.

## Key Elements of the Rule



- Annual reporting of GHG by 41 source categories:
  - 33 types of direct emitters
  - 6 types of suppliers (e.g., fuel and industrial GHG)
  - Facilities that inject CO<sub>2</sub> underground for geologic sequestration, enhanced oil recovery, or any other purpose
- 25,000 metric tons CO<sub>2</sub>e or more per year reporting threshold for most sources; capacity-based thresholds where feasible
- Direct reporting to EPA electronically
- EPA verification of emissions data

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The key elements of the rule include the following:

- The rule requires reporting for facilities that directly emit greenhouse gases and for certain suppliers of products.
- *Facilities* must report direct emissions of greenhouse gases from the manufacturing processes and activities used to produce a product and from stationary combustion and miscellaneous use of carbonates.
- *Suppliers* do not report actual emissions from a facility. Suppliers report on the quantity of product placed into the economy and the emissions that would result if the products were completely released, combusted, or oxidized when used by their customers. The rule covers suppliers so that EPA can capture data on greenhouse gases that could be emitted from small facilities and sectors that are not required to report.
- Facilities that inject CO<sub>2</sub> underground for geologic sequestration, enhanced oil recovery, or any other purpose must also report under the rule.
- The reporting requirements for facilities and suppliers are contained in the regulation, 40 CFR part 98.
- In general, the GHGRP covers facilities that emit 25,000 metric tons of CO<sub>2</sub> equivalent or more per year. Exceptions to this are discussed in the module of this training on applicability.
- Facilities and suppliers will report directly to EPA, not through states.
- EPA will verify all emissions reports. Third-party verification is not required.

## What GHGs are reported?



- CO<sub>2</sub>
- CH<sub>4</sub> (methane)
- N<sub>2</sub>O (nitrous oxide)
- Fluorinated GHGs
  - HFCs (hydrofluorocarbons)
  - PFCs (perfluorocarbons)
  - NF<sub>3</sub> (nitrogen trifluoride)
  - SF<sub>6</sub> (sulfur hexafluoride)
  - Other fluorinated gases (except CFC and HCFC and gases <1 mm Hg @25° C)

The rule requires facilities to report annual emissions information for the principal greenhouse gases listed on this slide.

With respect to fluorinated greenhouse gases, the rule covers the specific gases listed here, plus any other fluorocarbons. However, the rule excludes ozone-depleting substances as defined at 40 CFR part 82, such as chlorofluorocarbons and hydrochlorofluorocarbons.

It also excludes low vapor pressure fluorocarbons, thereby excluding other fluorinated materials that will not readily volatilize to the air.



## What is CO<sub>2</sub>e?



- GHGs have varying heat-trapping ability and atmospheric lifetimes.
- Global warming potential (GWP) is a metric used to compare emissions among GHGs.
- The GWP of CO<sub>2</sub> is 1.0, and the GWP of other GHGs are expressed relative to CO<sub>2</sub>
  - For example, CH<sub>4</sub> has a GWP of 21. Each metric ton of CH<sub>4</sub> emissions would have 21 times as much impact on global warming (over a 100-year time horizon) as a metric ton of CO<sub>2</sub> emissions.
- Mass emissions x GWP = CO<sub>2</sub>e (metric tons).

Table A-1 of Subpart A lists GWPs.

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The rule requires reporting of annual emissions in metric tons of each gas and metric tons of carbon dioxide equivalent.

Carbon dioxide equivalent is a metric that accounts for the fact that greenhouse gases have varying heat-trapping abilities and atmospheric lifetimes. The “global warming potential” of each gas is used to compare the impact of different gases. Carbon dioxide has a global warming potential of 1, and the global warming potentials of other greenhouse gases are expressed relative to carbon dioxide—that is, as “CO<sub>2</sub> equivalent” or CO<sub>2</sub>e.

For example, methane has a global warming potential of 21. That means that, over a 100-year time horizon, each metric ton of methane would have 21 times the impact on global warming as a metric ton of carbon dioxide emissions.

Facilities must calculate their annual emissions in metric tons of CO<sub>2</sub> equivalent, by multiplying the mass emissions of each gas by the global warming potential of that gas. Adding together the resulting metric tons of CO<sub>2</sub> equivalent for all the gases gives the total facility greenhouse gas emissions as “CO<sub>2</sub> equivalent” or CO<sub>2</sub>e.

You can find a list of global warming potentials by gas in Table A-1 of subpart A of the rule.

OK. This concludes our introduction to the rule. The next module addresses rule applicability.



## **Module 2. Applicability**

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This module on applicability will help you determine whether you are required to report under the rule.

# Applicability for Direct Emitters Is Facility-Based



In most cases, a facility\* is defined as...

- Physical property, plant, building, structure, source, or stationary equipment;
- on contiguous or adjacent properties;
- in actual physical contact or separated solely by public roadway or other public right of way; and
- under common ownership or common control.

\*Military installations may be classified as more than one facility.

*The Onshore Petroleum and Natural Gas Industry Segment, Natural Gas Distribution Industry Segment of subpart W and Electric Transmission and Distribution Equipment source category have a definition of "facility" that differs from the subpart A definition.*

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Applicability for direct emitters of greenhouse gases is facility-based NOT at the corporate level. If a corporation owns or operates multiple facilities, you must evaluate **each facility** separately to determine if the rule applies, and report for only those facilities to which the rule applies. Each facility that is subject to the rule must submit its own annual emissions report.

The rule defines a facility as any physical property, plant, building, structure, source, or stationary equipment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas.

Under this definition, a facility cannot be separated into multiple facilities based solely on having different industrial groupings at the site. The facility incorporates **all** equipment on contiguous or adjacent properties that is under common ownership or control. The designation of the facility boundary in your air permit has no bearing on the facility definition for this reporting rule.

A military installation may be classified as more than one facility for equipment that is owned and operated by separate branches of service.

Also, be aware that a different facility definition applies for onshore petroleum and natural gas production and natural gas distribution in subpart W, and for electrical transmission and distribution equipment use in subpart DD. You should review the definition of facility in these subparts.

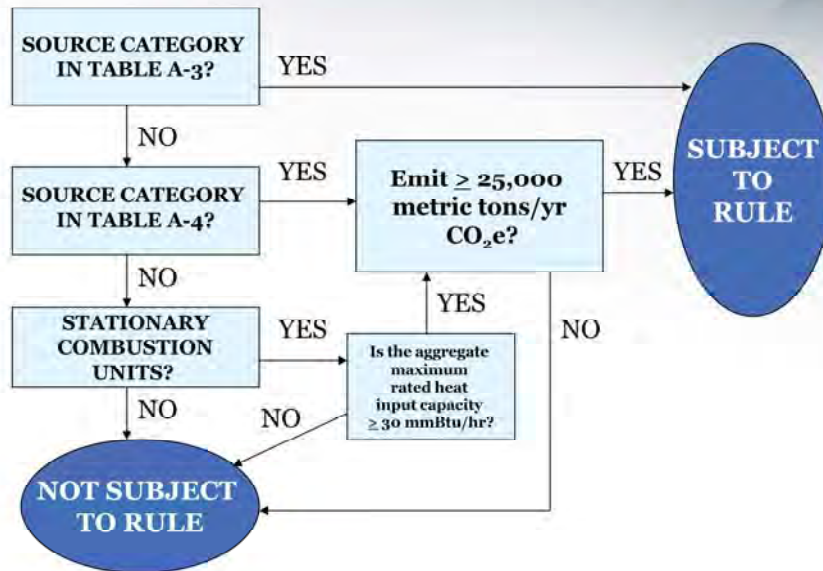
## Assessing Applicability to the Rule



- A facility can have multiple source categories.
- You must evaluate each source category to assess applicability.
- If rule applies, report emissions for all source categories for which methods are provided in the rule.

Once you establish the facility boundary, applicability depends on the source categories that are present. The rule defines three types of source categories, which will be discussed in detail in a moment: The so-called “all-in” source categories, the threshold categories, and the stationary fuel combustion sources. If you have multiple source categories on site, you do not designate your facility as being a single source category (for example, based on determining the predominant operation). Rather, you must evaluate each source category to assess applicability. Keep in mind that a facility with multiple source categories can become subject to the rule because of just one category. But if you are subject to the rule, then your greenhouse gas report must cover ALL source categories for which methods are provided in the rule—not just the source category that triggered applicability.

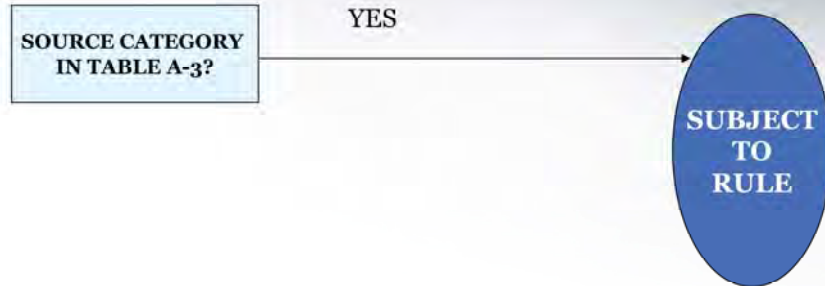
# Does the rule apply to my facility? Overview



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The rule prescribes three criteria for determining whether you must report emissions, shown in the three boxes in the left-hand column of this diagram. You must assess each of these three criteria. If any one applies to the facility, then you must submit an annual greenhouse gas report. We will look at the three criteria one at a time.

## Does the rule apply to my facility? “All-in” Source Categories



First, Table A-3 in subpart A of the rule has a list of source categories known as “all-in” source categories. If your facility has any of these source categories, then you are automatically subject to the rule, regardless of your emissions level.



## Table A-3: All-in Source Categories

### **Applicable in Year 2010**

Electricity Generation if report CO<sub>2</sub> year-round through Part 75

Adipic Acid Production

Aluminum Production

Ammonia Manufacturing

Cement Production

HCFC-22 Production/  
HFC-23 Destruction Processes

Lime Manufacturing

Nitric Acid Production

Petrochemical Production

Petroleum Refineries

Phosphoric Acid Production

Silicon Carbide Production

Soda Ash Production

Titanium Dioxide Production

Municipal Solid Waste Landfills  
generating methane  $\geq$  25,000 metric tons CO<sub>2</sub>e

Manure Management Systems\*

### **Applicable in Year 2011**

Carbon Dioxide Injection

Electrical Equipment Use

Electrical Equipment Manufacturing

Geologic Sequestration

Underground Coal Mines

*\*EPA will not be implementing subpart JJ of 40 CFR part 98 due to a Congressional restriction prohibiting the expenditure of funds for this purpose.*

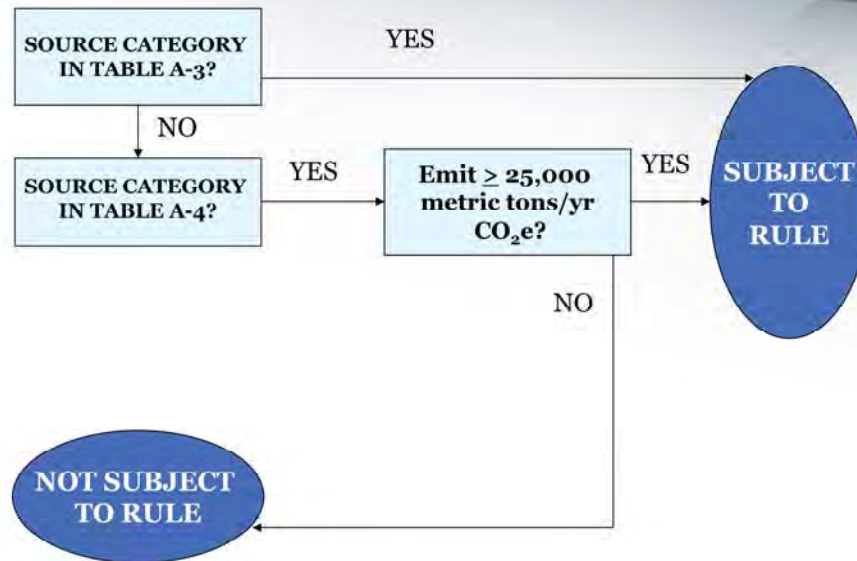
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Here is the list of the “all-in” source categories, which are defined in each subpart of the rule, as are any exemptions that may apply.

For example, the category of electricity generation includes only facilities with units that report CO<sub>2</sub> mass emissions year-round through part 75, such as units in the Acid Rain Program or the Regional Greenhouse Gas Initiative. On the other hand, if you have a generating unit that that supplies power to your facility, or if you sell electricity on grid or to another customer, the unit is not part of this category. Instead, it is treated as a general stationary combustion unit under subpart C, which has different applicability criteria.

So you need to refer to both Table A-3 in subpart A and the definition of the source category in each subpart when assessing applicability. Table A-3 shows the source categories for which annual emissions for calendar year 2010 must be reported, and the additional categories that must be included for calendar year 2011 and beyond.

## Does the rule apply to my facility? Threshold Source Categories



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If you do not have a source category in Table A-3, you next look to see if you have a source category in Table A-4, known as a “threshold source category.” If you do, you are subject to the rule if your facility emits 25,000 metric tons per year or more of CO<sub>2</sub> equivalent from stationary fuel combustion, miscellaneous carbonate use, and all source categories listed in Table A-4 in subpart A of the rule.





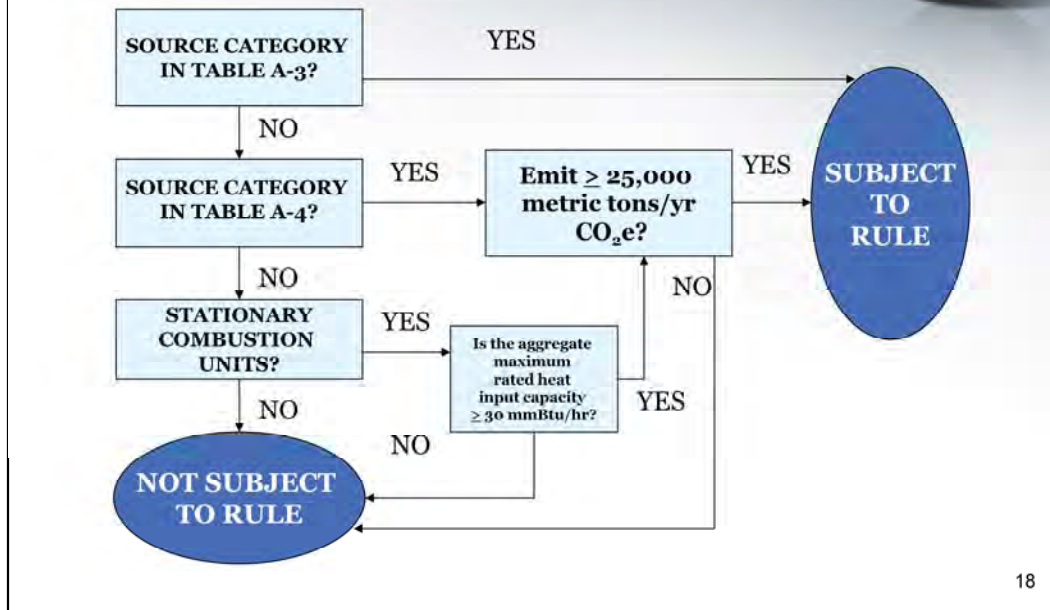
**Table A-4: Threshold Source Categories\***

<b><u>Applicable in Year 2010</u></b>	<b><u>Applicable in Year 2011</u></b>
Ferroalloy Production	Electronics Production
Glass Production	Fluorinated GHG Production
Hydrogen Production	Industrial Wastewater
Iron and Steel Production	Treatment
Lead Production	Industrial Waste Landfills
Pulp and Paper	Magnesium Production
Manufacturing	Petroleum and Natural Gas
Zinc Production	Systems

*\* ≥25,000 metric tons CO<sub>2</sub>e per year from all source categories, combustion units, and miscellaneous use of carbonates.*

This slide shows the threshold source categories that are applicable starting in reporting year 2010 and the additional categories that apply starting in year 2011. It is important to note that the threshold of 25,000 applies at the facility level, not to each source category. So if a facility contains more than one of these source categories, you include emissions from ALL source categories on site PLUS emissions from all stationary combustion units PLUS emissions from miscellaneous use of carbonates. This total is what you compare to the 25,000 metric tons per year threshold.

## Does the rule apply to my facility? Stationary Fuel Combustion Sources



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Finally, if you have no source categories in Tables A-3 or A-4, you must consider the third criterion, emissions from stationary fuel combustion sources.

If you emit 25,000 metric tons per year of  $\text{CO}_2\text{e}$  or more from all stationary fuel combustion sources on site, then your facility is subject to the rule. You must include emissions from all stationary combustion units (as defined in the rule) regardless of unit size, such as space heaters, ovens, and water heaters.

EPA wanted to provide a simple way for small facilities to know that they are not subject to the rule. The rule specifies that if the heat input capacity of all units on site is less than 30 million Btus per hour and you have no applicable source categories in Tables A-3 or A-4, the rule does not apply and no emission calculations are needed to determine applicability.

But, if the aggregate maximum heat input capacity of all units on site equals or exceeds 30 million Btus per hour, then you must estimate emissions to see if emissions equal or exceed 25,000 metric tons per year.

## What combustion units will emit 25,000 MT CO<sub>2</sub>e per year?



Fuel	Design Capacity <sup>1</sup> (mmBtu/hr)	Annual Fuel Use
Coal	30	10,800 tons
Fuel Oil	35	2.3 million gallons
Natural Gas	50	460 million ft <sup>3</sup>

<sup>1</sup>Assuming full utilization and 8,760 hours/yr.

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This table gives you an idea of the range of unit sizes that can emit 25,000 metric tons per year of CO<sub>2</sub>e.

The design capacity shown in the second column is very conservative, because it assumes full capacity utilization and operation at 8,760 hours per year. So, facilities that contain combustion units that in aggregate are of this capacity or less (and are burning the fuels shown) would not be subject to the rule.

The third column shows annual fuel use, which is probably a better applicability gauge because it shows the actual amount of fuel that would need to be burned to emit 25,000 metric tons per year of CO<sub>2</sub>e.

## How do I estimate emissions for applicability purposes?



- Estimate actual emissions
- Use applicable equations in the rule
- Monitoring data not required—use available company records
- Simplified methods allowed for combustion sources
- Include CO<sub>2</sub> transferred off-site
- Exclude CO<sub>2</sub> emissions from biomass combustion
- Exclude research and development activities
- Include an F-GHG only if listed in Table A-1 of rule

*If you are close to 25,000 MT CO<sub>2</sub>e/yr based on available records, it may be prudent to monitor.*

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For facilities that are subject to the 25,000 metric tons per year threshold, the rule has specific instructions in subpart A for how to calculate emissions to determine applicability. Keep the following points in mind:

Applicability is based on actual emissions, not potential to emit. Therefore, for processes that are not operated at full capacity, you estimate emissions from the actual operation of the unit during the reporting year.

To estimate emissions for applicability purposes, you must use the emission calculation equations in each applicable subpart. But to provide the emission inputs to the equations, you are not required to monitor—instead, you can use available company records and the likely operating scenario for the reporting year that would lead to the highest greenhouse gas emissions estimate.

Examples of company records include production goals from the company's business plan, process knowledge, engineering estimates, and vendor data.

The rule allows simplified methods of estimating emissions from stationary fuel combustion sources. You can use any of four calculation methodologies specified in subpart C of the rule. The simplest of the four methods, "tier 1," is based on annual fuel use and a default emission factor provided in the rule.

If you capture carbon dioxide for transfer off-site, you must include this CO<sub>2</sub> in your estimate.

You may exclude carbon dioxide from biomass combustion to determine applicability, but you must include emissions of methane and nitrous oxide.

You should refer to the definition of "research and development" in subpart A, to see if any of your equipment qualifies for this exemption. For equipment associated with geologic sequestration of carbon dioxide, additional provisions in subpart RR apply.

For applicability purposes, you need to include only those fluorinated greenhouse gases listed in Table A-1 of the rule.

For most facilities, emissions calculated using available company records are likely to be either significantly above or below the 25,000 metric tons CO<sub>2</sub>e per year threshold. However, if you estimate emissions close to the threshold, it would be prudent for you to monitor because, if your actual emissions exceed the threshold during the year, you are legally obligated to submit an annual GHG report.

You do not need to notify EPA if you determine that you are not subject to the rule. In addition, there is no specific recordkeeping requirement for documenting non-applicability, but you might want to keep documentation in case you are audited. Also, remember that if not subject to the rule, you need to reassess applicability every year if there are changes in your processes that increase emissions.

# Applicability Tool



To help determine if facilities must report...

- Indicate reporting year
- Check-off list of source categories
- Combustion calculator
- Municipal landfill calculator
- Electronics Manufacturing calculator
- Petroleum and Natural Gas Production calculators

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<http://www.epa.gov/climatechange/emissions/GHG-calculator/index.html>

\* *Calculators provide conservatively high emission estimates.*

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To help you with the applicability determination process, EPA has prepared a web-based applicability tool.

To use this applicability tool, you first select the reporting year and then check-off source categories that are used at the facility. The tool will sort out the all-in versus threshold sources for you, and it has a built-in emission calculator for combustion, a methane generation calculator for municipal landfills, and links to downloadable calculators for some additional source categories (for example, electronics manufacturing, and petroleum and natural gas production).

Based on the information that you provide, the tool will tell you whether your facility is subject to the rule, and if so, which source categories you must report.

The tool generates a results page that you can retain on file as documentation of your applicability assessment. You can also run the tool to assess how a planned future change to your facility might affect applicability.

In general, the calculators in the tool can provide conservatively high estimates of emissions for some facilities. However, this tool is provided as a guide only, **and is not legally binding**. It will not provide accurate estimates under all operating conditions. Facilities that are subject to the emissions threshold have the obligation to report if actual emissions are 25,000 metric tons CO<sub>2</sub>e or more in any reporting year.

The tool can be found at the web address listed on the slide.

## What suppliers are covered?



- All producers of:
  - Petroleum products
  - Coal-based liquids
  - Industrial GHGs (F-GHG and N<sub>2</sub>O)
  - CO<sub>2</sub>
- Exporters of 25,000 metric tons CO<sub>2</sub>e per year or more
- Importers of 25,000 metric tons CO<sub>2</sub>e per year or more
- Natural gas and natural gas liquids
  - All fractionators
  - Local gas distribution companies that deliver 460 million ft<sup>3</sup> per year
- Importers and exporters of fluorinated GHGs in pre-charged equipment or closed-cell foams equivalent to 25,000 metric tons CO<sub>2</sub>e per year (starting in 2011 reporting year)

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For suppliers, the rule applies to producers and to importers and exporters of certain products that would release GHG emissions when released, combusted or oxidized. Producers of petroleum products, coal-based liquids, industrial greenhouse gases, and carbon dioxide must report at the facility level. All production facilities must report. There is no production or emissions threshold.

For exporters and importers, applicability is determined at the corporate level. The rule covers anyone who exports these products in quantities of 25,000 metric tons CO<sub>2</sub>e per year or more at the **corporate** level. The same applies to imports.

So, for example, a petroleum refinery could be required to report both direct emissions from refinery processes and also the quantity of carbon dioxide in the petroleum products supplied.

For natural gas and natural gas liquids, the rule covers all fractionators and local gas distribution companies that deliver 460 million ft<sup>3</sup> per year or more.

In 2011, suppliers must begin collecting data on the imports and exports of equipment pre-charged with fluorinated GHGs or containing fluorinated GHGs in closed-cell foams (e.g., refrigerators and electrical switchgear).

OK. This concludes the module on applicability. The next module addresses reporting, monitoring, and recordkeeping requirements.



## **Module 3. Reporting, Monitoring, and Recordkeeping Requirements**

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This module covers the general reporting, monitoring, and recordkeeping requirements of the rule, including the schedule.

# What are the reporting requirements?



- **Subpart A: General Provisions**
  - Applicability provisions
  - Schedule
  - Reporting and recordkeeping requirements common to all reporters
  - Definitions
  - Report submission procedures
  - Other (e.g., calibration procedures, monitoring plan)
- **Subparts C-UU: Source-Specific Requirements**
  - Definition of source category
  - GHG to report
  - Calculation methods
  - Monitoring and QA/QC
  - Missing data procedures
  - Reporting and recordkeeping elements unique to each subpart

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When you go to part 98, you will find that it has 41 subparts.

Subpart A of part 98 contains general reporting and recordkeeping requirements that apply to all facilities and suppliers subject to the rule. It also spells out the applicability provisions, the reporting schedule, and definitions. The general items that everyone must report and the definitions of subpart A are not repeated in the individual source category sections of the rule, so it is important to look at subpart A as well as at the individual source category subparts.

Subpart A also contains other overarching requirements. For example, there are flow-meter accuracy and calibration provisions in subpart A that apply when specified by an applicable subpart. But the specific types of monitoring equipment needed are defined in the source category subparts.

Subparts C through UU contain specific requirements for each of the source categories covered by the rule. You must follow all of the subparts that pertain to your facility. For example, if your facility produces adipic acid and has fuel combustion sources, you need to read subpart C, general stationary fuel combustion sources, and subpart E, adipic acid production.

Each subpart defines the specific source category it covers and contains the monitoring methods, equations to calculate emissions, and specific data elements to be reported or recorded for that source category.



## General Monitoring Approaches



- **Continuous emission monitoring systems (CEMS)**
  - Required if already used (e.g., NSPS, Acid Rain Program) and meet specified criteria
  - Optional for other sources
  
- **Source category-specific GHG calculation methods**
  - Monitor process parameters, fuel use
  - Calculate GHG using equations in applicable subparts
  - Example approaches (varies by source category)
    - Mass balance calculation
    - Site-specific emission factors
    - Default emission factors

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The rule contains a mixture of direct emissions measurement and source-specific calculations.

The rule requires continuous emission monitoring systems (or CEMS) to monitor CO<sub>2</sub> emissions only where CEMS are already installed and other conditions are met. If you don't already have CEMS for other rules, you are not required to install them for this rule. However, facilities that are not required to use CEMS can choose to install them voluntarily. The CEMS requirements will be further explained in a module on combustion.

Most facilities will use source category-specific calculation methods using the equations in the applicable subpart. Many of the calculations are based on data that facilities already collect, such as raw material usage, production, or fuel use.

## Best Available Monitoring Methods



- Best available monitoring methods (BAMM) may be used during part of the first year for some source categories:
  - Use emission estimation equations provided in the rule
  - Obtain equation inputs using best available monitoring method (e.g., current monitoring methods, engineering calculations, company data)
- Must begin following all applicable monitoring and QA/QC requirements when the BAMM period expires, unless an extension is approved by EPA

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Some facilities that need to install flow meters or other monitoring instruments might not be able to do this by the date required by the rule, which is by January 1, 2010 or 2011 depending on the source category. In such cases, facilities can use best available monitoring methods for a specified period of time until the monitors are installed and calibrated. Under BAMM, you would still use the equations provided in the rule to calculate emissions, but you could use the best information you have available to obtain the inputs to the equations. For example, you could use current monitoring methods, engineering calculations, or company records. After the allowable time period for using BAMM, you must begin complying with all monitoring requirements of an applicable subpart.

Depending on the subpart, BAMM is allowed for all or part of the first reporting year. In some situations, facilities can use BAMM for longer periods of time—if approved by EPA on a case-by-case basis. See section 98.3(d) and (j) of subpart A and the monitoring section of each subpart for details on how BAMM applies for each source category.

## Schedule for Monitoring and Reporting: *Reporting Year 2010*



1/1/10	Start collecting data using required methods in each subpart or best available monitoring methods
12/31/10	Complete 2010 data collection
8/1/11	Submit certificate of representation
9/30/11	Submit GHG report for reporting year* 2010
Ongoing	Submit corrected report 45 days after each discovery (unless extension is requested)
Ongoing	Submit annual reports on 3/31 each year**

\* Reporting year is the year in which the data are collected (e.g., reporting year 2010 data are contained in the report submitted on September 30, 2011).

\*\* When March 31 falls on a weekend, the report is due the first business day of April.

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For 29 source categories, monitoring began on January 1, 2010.

Each facility or supplier must submit a certification of representation that identifies the “designated representative” who will be certifying the annual reports.

The first annual greenhouse gas reports were due September 30, 2011 and covered calendar year 2010.

The final rule has provisions for submitting corrected reports if EPA or the reporter finds a substantive error. Corrected reports must be submitted within 45 days after the error is discovered or after being notified by EPA.

## Schedule for Monitoring and Reporting: Reporting Year 2011



1/1/11	Start collecting data using required methods in each subpart or best available monitoring methods
12/31/11	Complete 2011 data collection
4/2/12	Submit annual GHG report (if facility has none of the new 2011 source categories*)
7/30/12	Submit certificate of representation (only if you did not submit report in 2011)
9/28/12	Submit GHG report (if facility has any of the new 2011 source categories**)
Ongoing	Submit corrected report 45 days after each discovery (unless extension is requested)
Ongoing	Submit annual reports on 3/31 each year***

\* Subparts I, L, T, W, DD, FF, II, QQ, RR, SS, TT, and UU.

\*\* Notify EPA by April 2, 2012 if submitting your second annual report and you are submitting your report on September 28, 2012.

\*\*\*When March 31 falls on a weekend, the report is due the first business day of April.

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For reporting year 2011, data collection began on January 1, 2011. If you are not reporting on any of the new 2011 source categories, then your annual report is due on March 31, 2012. But if you are reporting on any of the new 2011 source categories, then your report is not due until September 28, 2012. Facilities and suppliers that are submitting their second annual GHG report in 2012 and that are reporting on one or more of the new 2011 subparts must notify EPA by April 2, 2012 that they are not required to submit their annual GHG report until September 28, 2012. If you are a new reporter that did not submit a report for reporting year 2010, you are required to submit a certificate of representation no later than 60 days prior to the submission date for the initial GHG report, or July 30, 2012. If you submitted a report in 2011, for your 2010 emissions, you do not need to register again unless you want to modify your certificate of representation.

In future years, the annual report will be submitted on March 31 for emissions from all subparts.

# What do facilities report?



- Identifying information, parent companies, NAICS code(s)
- Annual GHG emissions excluding biomass CO<sub>2</sub>, metric tons CO<sub>2</sub>e
- Annual CO<sub>2</sub> emissions from biomass combustion, metric tons
- Annual emissions of each GHG for each source category, metric tons each gas
- Other emissions data required by an applicable subpart (e.g., by unit or process line)
- Verification data required by each subpart (e.g., data used to calculate emissions)
- Description of best available monitoring methods used
- Data elements for which a missing data procedure was used
- Certification by the “designated representative”

 *Facilities for which the rule does not apply are not subject to any reporting or recordkeeping requirements. Further, facilities are not required to submit verification or notify EPA that they are not subject to the rule. However, it may be prudent to retain a record of your emission computations in the event that you may be audited. 29*

This slide summarizes the contents of the annual report that apply to all facilities. For details, see section 98.3(c) of subpart A of the rule and the reporting sections of the other subparts that apply to your facility.

Subpart A requires you to report total facility greenhouse gas emissions in units of metric tons of CO<sub>2</sub> equivalent. CO<sub>2</sub> from biomass combustion is reported separately.

You must also report emissions of each gas broken out for each source category at the facility. So, if you have multiple source categories at a facility, you need to report greenhouse gas emissions broken out for each of the categories separately. If a source category emits multiple gases, you report metric tons per year of each gas.

You also report more detailed emissions information—for example, by individual process unit or process line—if required by the applicable subparts. For example, subpart C generally requires you to report stationary combustion emissions for each combustion unit, such as each boiler, but has provisions that will allow many facilities to report combined emissions for groups of combustion units. So, you need to look carefully at the individual source category subparts to understand the specific emission reporting requirements and breakouts for your facility.

Similarly, all reporters must report data needed for emissions verification. The specific data elements to be reported are listed in each subpart. However, EPA has deferred reporting of inputs to emissions equations for a limited period of time, as is explained later.

The bullet referring to a description of best available methods applies only to the years in which use of best available monitoring methods is allowed by the relevant subpart.

## What do suppliers report?



- Identifying information, parent company, NAICS code(s)
- Annual quantity from all supply categories, metric tons CO<sub>2</sub>e
- Annual quantity from each supply category, metric tons of each gas
- Other data required by an applicable subpart
- Verification data required by each subpart
- Description of best available monitoring methods used
- Data elements for which a missing data procedure was used
- Certification by the “designated representative”

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This list shows what *suppliers* report, which is very similar to what facilities report. The main difference is that instead of facility emissions, suppliers are reporting on the quantities of products (for example, fuels or industrial gases) that they supply into the economy and the CO<sub>2</sub> equivalent that would be emitted assuming that the fuel products they supply are completely combusted or that the industrial gases they supply are completely released into the air. For details, see section 98.3(c) of subpart A and the reporting sections of the applicable supplier subparts.

## What is not reported?



- Indirect emissions (e.g., electricity use)
- Mobile source emissions\* (e.g., fleet emissions, off-road equipment)
- Emission offsets

\* *Except for portable non-self-propelled equipment on a well pad or associated with a well pad for onshore petroleum and natural gas production under subpart W.*

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This slide provides some examples of items that might be reported under some other greenhouse gas programs but are not required by this rule.

First, the EPA greenhouse gas reporting rule focuses only on actual emissions released from each facility. Therefore, it does not include indirect emissions. For example, industrial facilities that purchase electricity from the grid do not report on indirect emissions from the generation of the electricity at a utility plant.

Similarly, facilities do not report emissions from their vehicle fleets. Mobile source emissions are addressed through reporting by fuel producers and by motor vehicle and engine manufacturers. The only exception is that subpart W requires onshore petroleum and natural gas production facilities to report greenhouse gas emissions from portable non-self-propelled equipment associated with a well pad.

Also, if you have offset projects, you do not report them or deduct them from your facility emissions.

## Retain These Records for 3 Years



- List of all units, operations, processes, and activities for which GHG emission were calculated
- All data used to calculate the GHG emissions for each unit, operation, process, and activity, categorized by fuel or material type
- The annual GHG reports
- Missing data computations
- Written GHG Monitoring Plan
- Certification and QA tests
- Maintenance records for measurement equipment
- Other data required by applicable subparts

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This slide lists the types of records all reporters must keep, as specified in subpart A. Additional source category-specific records are contained in subparts C through UU. You are required to keep these records for 3 years.

You can keep records in either hard copy or electronic format, either on site or off site, as long as the records can be quickly made available to EPA if EPA requests them for inspection and review.



# Monitoring Plan



- Identifies responsibilities (i.e., job titles) for data collection
- Explains processes and methods used for data collection
- Describes QA/QC procedures for monitors
- May rely on references to existing corporate documents (e.g., existing QA plans, standard operating procedures)

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One of the recordkeeping requirements is a monitoring plan. Each facility or supplier must prepare a written plan describing the processes and methods you are using to collect the data elements required by the rule and who is responsible for data collection. You keep the monitoring plan as a record, and it does not need to be submitted unless EPA requests it for inspection.

The monitoring plan includes the first three items listed on this slide, which are described in a little more detail in section 98.3(g) of subpart A of the rule.

The plan can refer to and rely on existing documents that many facilities already have, such as standard operating procedures, documents, or existing QA plans that contain the required information. This reduces the effort to prepare the plan and avoids duplicative documents for your facility.

Also note that if you change or improve your monitoring and QA/QC procedures over time, you need to update your monitoring plan accordingly. For example, if you use best available monitoring methods, the Monitoring Plan must document these methods and then be revised when you comply with the monitoring requirements of the applicable subparts.

## General Monitor Calibration Requirements [40 CFR 98.3(i)]



- Calibrate flow meters and other required measurement devices (e.g., weighing devices) by April 1, 2010 (unless previous calibration still active) or by date specified in each subpart.
  - May postpone until next maintenance outage if calibration requires a process or unit shutdown
  - For 2011 source categories, calibrate by date the measurement device must be installed, unless the subpart provides a different date
- Calibrate using manufacturer's specifications, industry consensus standard, or method in rule subpart. Describe in monitoring plan.
- Recalibrate at frequency specified in subpart. If not specified, use manufacturer's recommendations or industry consensus practice.

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General monitor calibration requirements are included in section 98.3(i) of subpart A and in the rule subparts. For the 2010 source categories, measurement devices were generally required to be calibrated by either April 1, 2010, or by another date specified in the relevant subpart. If the measurement device was previously calibrated and that calibration is still valid, then the facility can wait until the next periodic recalibration. If calibration requires a process or unit shutdown, the rule allows you to postpone calibration until the next maintenance shutdown.

Flow meters and other measurement devices should be calibrated using the methods specified in the relevant rule subpart, manufacturer standards, or industry consensus standards. The method chosen to calibrate measurement devices should be explained in the monitoring plan.

You must recalibrate measurement devices at the frequency specified in the relevant subpart. However if the subpart does not provide a frequency, then recalibrate at the frequency contained in the manufacturer's recommendations or follow industry consensus practices.

## General Monitor Calibration Requirements [40 CFR 98.3(i)] (continued)



- Flow meters measuring liquid or gaseous fuel feed rates, process stream flow rates, or feedstock flow rates must meet accuracy specifications in 98.3(i) if specified by the subpart
  - No more than 5% calibration error for most flow meters
  - Other values specified for orifice, nozzle, and venturi flow meters
- Calibration and accuracy requirement do not apply to:
  - Company records
  - Best available information
  - Part 75 methodologies
  - Fuel billing meters (unless company combusting fuel owns meters)
  - Flow meters used exclusively for unit startup

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Flow meters must meet the accuracy specification contained in section 98.3(i) of subpart A only if this requirement is specified by the relevant subpart. If this requirement applies, the calibration accuracy must be within 5 percent error for most flow meters; however, different percents are specified for orifice, nozzle, and venturi flow meters.

The calibration requirements do not apply to several types of measurements. They do not apply if you are using “company records,” or “best available information” as allowed by some subparts. For example, subpart C allows the use of company records to determine fuel use for combustion units performing tier 1 or tier 2 calculations. The calibration requirements of 98.3(i) do not apply when you are allowed to use company records, but you must document whatever calibration procedures you use in your monitoring plan.

Electricity-generating units using Acid Rain Program methodologies in 40 CFR part 75 are not required to follow the subpart A calibration requirements.

The calibration requirements do not apply to fuel billing meters unless you own them or if calibration is otherwise required by another subpart of the rule. In addition, these fuel billing meters are also exempt from the GHG monitoring plan and recordkeeping provisions.

The requirements do not apply to flow meters used only during unit startup.

Furthermore, these general calibration requirements do not apply if there are conflicting specific requirements in an individual source category subpart. In such cases, the individual subpart overrides the subpart A calibration requirement.

## When can I stop annual reporting?



- Notify EPA by March 31 of the year after you meet one of the following conditions:
  - If annual reports demonstrate CO<sub>2</sub>e <25,000 metric tons/yr for 5 consecutive years.
  - If annual reports demonstrate CO<sub>2</sub>e <15,000 metric tons/yr for 3 consecutive years.
  - If you shut down all processes/units/supply operations covered by the rule. (Does not apply to municipal waste landfills, industrial landfills, and underground coal mines)
- You must resume reporting in future year if conditions are no longer met

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Once you have started to report under the rule, there are three “exit ramps” that allow you to stop reporting. These provisions to stop reporting apply to all facilities and suppliers, regardless of whether applicability was triggered by a threshold or “all-in” source category.

To stop reporting, you must meet one of the three conditions listed here, and you must also notify EPA that you intend to stop reporting.

The first way to stop reporting is if the annual reports you submitted under the rule show that emissions were less than 25,000 metric tons of CO<sub>2</sub> equivalent per year for 5 years. In this case, you need to keep records of emissions for each of the 5 years (rather than the normal 3-year record retention).

Second, you can stop reporting if you emit less than 15,000 metric tons of CO<sub>2</sub> equivalent per year for 3 years.

Third, you can stop reporting if you close all of the processes covered by the rule. However, this third provision does not apply to municipal solid waste landfills, industrial waste landfills, or underground coal mines because these sources continue to emit methane for many years after they close.

If you reopen closed processes or start emitting more than 25,000 metric tons of CO<sub>2</sub> equivalent per year in a future year, you must resume reporting.

# How will emissions be verified?



- Self certification
  - Designated representative certifies report
  - Rule requires one designated representative (DR) and allows one alternate designated representative (ADR) for each facility and supplier
- EPA verification
  - Reports submitted through an electronic system
  - Built-in calculation and completeness checks for reporters
  - Electronic QA and consistency checks
  - EPA data and report review and follow-up with reporters
  - On-site audits

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Emissions reports are verified through self-certification by the reporter and EPA verification.

Each facility or supplier must have one and only one designated representative who certifies the report. Each can also have one alternate designated representative. While the designated representative does not need to be an employee at the reporting facility, the DR must be appointed by the owners and operators of the facility by a legally binding agreement.

The data that are reported will be used by EPA to verify the emissions, using a combination of electronic data quality assurance checks, review of individual reports, and on-site audits of individual facilities. The electronic reporting system—described on the next couple slides—will have built-in range checks and completeness checks at the point of data entry by the reporter. EPA will also conduct validation using algorithms and statistical analysis to identify potential errors and will review individual reports.

EPA intends to communicate with the reporter if it finds probable errors in reviewing the reports. If the report is determined to contain a “substantive error,” the reporter would then follow the procedures in the rule to correct and resubmit the report.

# Electronic Reporting System



- All reporting under the GHG Reporting Program will be electronic.
- Web-based system for facility/supplier reporting to EPA
  - Web-forms will guide reporters through data entry and submission.
  - Includes a mechanism to submit file directly using Extensible Markup Language (XML) format.
  - XML schema is available on the EPA website.
- For updates on the data system, training schedule, and to view the XML schema:

<http://www.epa.gov/climatechange/emissions/data-reporting-system.html>

*Note: Subparts LL and MM must report using the Office of Transportation and Air Quality Fuels Registration (OTAQREG) system.*

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Under the rule, you must submit your report directly to EPA in an electronic format using EPA's Electronic Greenhouse Gas Reporting Tool (e-GGRT) [*pronounced egret, like the bird*], except for reporting under Subparts LL and MM, which must be done using the Office of Transportation and Air Quality Fuels Registration (OTAQREG) system.

e-GGRT provides two methods for you to submit the annual report. First, you can use user-friendly web forms that will guide you through entering and submitting data for each source category at your facility. However, if you prefer to perform a batch data upload to the system, e-GGRT also provides a standard Extensible Markup Language (XML) format. You might find this option useful if you have your own electronic data system that contains all the required data elements.

Further information on the reporting tool, the XML schema, and training opportunities are available at the EPA web address listed on this slide.

# e-GGRT User and Facility Registration



**e-GGRT Help**

- About e-GGRT
- Climate Change Home Page
- Applicability Tool for the Mandatory Greenhouse Gas Reporting Rule

### About the e-GGRT One-time User Registration Process

**SHOULD YOU REGISTER TO USE e-GGRT?**

You will need to create an e-GGRT user account, if you plan to register or represent a Facility or Supplier affected by EPA's Mandatory Greenhouse Gas Reporting Rule.

If you are uncertain, the **Applicability Tool** may help you assess whether your facility is required to report greenhouse gas (GHG) emissions. Note that information tailored to Suppliers and other affected entities can also be found there.

**You are already registered if:**

- You have a CDX Account. CDX and e-GGRT are integrated so that both will work with your existing CDX account.

Login to e-GGRT with your username and password.

- 1. Determine Eligibility
- 2. Print Challenge Questionnaire
- 3. Electronic Signature Agreement
- 4. Print Summary

**Start Using e-GGRT**

EPA will not activate your account until your ESA has been received and processed. An account activation notice will be sent to the email address you used for registration. You will then be able to use e-GGRT.

**BEGIN REGISTRATION**

- On screen directions explain each step of user registration. Additional context sensitive help links

You must also use e-GGRT to register your facility or supplier and the designated representative prior to the first reporting date. e-GGRT contains on-screen directions and additional context-sensitive help links to assist first-time users. The slides earlier in this presentation on schedule indicate the dates for registering and submitting the certificate of representation and the dates for submitting annual reports.

## Confidential Business Information (CBI)



- EPA will protect any data determined to be CBI in accordance with regulations in 40 CFR Part 2, subpart B.
- EPA publishes determinations of which data elements are CBI in the Federal Register and associated memos. See the GHGRP website.
- Emissions data collected under CAA sections 114 and 208 cannot be considered CBI.
- EPA has deferred the deadline for reporting data elements that are inputs to emission equations to better assess implications of their collection and public release. See Tables A-6 and A-7 of 40 CFR subpart A for a list of deferred data elements.

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Data determined to be confidential business information, or CBI, will be protected as required by existing statutes and will NOT be publicly released. For this rule, EPA publishes in the Federal Register their determinations of which data elements required by the Reporting Rule will be treated as confidential. You can find these notices, memos listing the CBI determinations for each data element, and other information about the treatment of CBI in the CBI section of the GHGRP website.

The Clean Air Act is clear that emission data collected under sections 114 and 208, which are the authorities for this rule, cannot be held confidential. EPA has proposed that data elements that are used as inputs to emission equations for direct emitters meet EPA's long-standing definition of emission data. EPA is deferring the reporting deadline for inputs so that we can better assess the business effects of their potential public release. Facilities affected by the deferral still need to report their emissions by the schedule specified in the rule, but e-GGRT will not collect data elements that are inputs to emission equations. Facilities are still required to maintain onsite records of these inputs, along with all reported data. Tables A-6 and A-7, located in subpart A of the rule, provide a list of the deferred data elements.



# GHG Data Publication



- The data reported to the GHGRP is available on the website. (See EPA's ghgdata website at <http://ghgdata.epa.gov>.)



- EPA will publish only non-CBI data
  - CBI data will be aggregated to shield sensitive information
- The GHGRP data publication tool will
  - Display facilities on a map
  - Create charts, graphs, and lists
  - Download data
  - Leverage social media



EPA ghgdata website landing page.

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EPA will publish all GHG emissions data collected through the Greenhouse Gas Reporting Program on the web. Data categorized as CBI will not be published at the individual facility or supplier level.

EPA's GHGRP data publication tool, which can be accessed through the home page of the GHGRP website, will display reporting facilities on national or regional maps and will allow users to search and download data. Also, the system is being designed to leverage social media.

OK. This concludes the module on reporting, monitoring, and recordkeeping requirements. The next module covers the section of the rule that addresses emissions from stationary fuel combustion sources.



## **Module 4. Subpart C: Stationary Fuel Combustion Sources**

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This module covers requirements under Subpart C of the rule, General Stationary Fuel Combustion Sources.

## What units are covered?



- Devices that combust solid, liquid, or gaseous fuel for:
  - 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
- Examples:
  - Boilers
  - Stationary internal combustion engines
  - Process heaters
  - Combustion turbines
  - Incinerators
  - Other stationary fuel combustion equipment (e.g., control devices)
- Covers any fuel combustion device, unless specifically exempted

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The scope of subpart C is quite broad. It covers practically any fuel burned in a device that combusts fuel for producing electricity, generating steam, or producing useful heat or energy for industrial, commercial, or institutional uses; or for reducing the volume of waste. Examples include boilers, stationary internal combustion engines, process heaters, combustion turbines, and incinerators.

Subpart C covers all uses of combustion devices, except residential uses (for example, apartment buildings). However, emissions from residential buildings owned by institutions (such as universities and military bases) would be included as part of the annual report because they are considered to be institutional use. The rule covers essentially any type of fuel combustion device, unless specifically exempted.

## **Subpart C Does Not Apply to These:**



- Portable equipment
- Emergency generators and emergency equipment
- Agricultural irrigation devices
- Flares, unless otherwise required by another subpart
- Electricity generating units subject to subpart D
- Hazardous waste combustion (exemption does not apply to co-fired fuels listed in Table C-1 or units using CEMS to quantify CO<sub>2</sub> mass emissions)
- Pilot lights

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The devices listed on this slide are exempted from subpart C: portable equipment, emergency generators, and emergency equipment; agricultural irrigation devices; flares; electricity generating units covered by subpart D of the rule; hazardous waste combustion; and pilot lights.

The rule has specific definitions in subpart A for what qualifies as portable equipment and emergency equipment. So be sure to review those definitions.

Note that flares are generally exempt from reporting by subpart C, but some other subparts require reporting of flare emissions and may refer to methods in subpart C for estimating flare emissions. So not all flares are exempt from reporting. They are just not covered by subpart C unless required to be reported by another subpart.

For hazardous waste combustion units, reporting is not required unless the unit has a continuous emission monitoring system (CEMS), or the unit combusts a fuel listed in Table C-1; in the latter case, only GHG emissions from the fuel in Table C-1 is reported and GHG emissions from waste combustion is not reported.

# Applicability



Three ways for subpart C to apply:

- Facility contains a source category in Table A-3, or
- Facility contains a source category in Table A-4 and emits 25,000 metric tons CO<sub>2</sub>e/year from stationary fuel combustion, miscellaneous use of carbonates, and all applicable source categories,\* or
- Facility emits 25,000 metric tons CO<sub>2</sub>e/year from all stationary fuel combustion units (facilities with maximum aggregate heat input capacity of less than 30 mmBtu/hr will emit less than 25,000 metric tons CO<sub>2</sub>e/year)

\*Exception: Onshore petroleum and natural gas production facilities and natural gas distribution facilities report emissions from stationary combustion sources under subpart W.

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You are required to estimate and report GHG emissions from stationary fuel combustion units under subpart C if any one of the following conditions apply:

If the facility is subject to the rule because it contains a source category listed in Table A-3 of subpart A, or because it contains a source category in Table A-4 and emits 25,000 metric tons CO<sub>2</sub>e per year or more, then the combustion units are subject to subpart C.

*Example:* A facility that is subject to the rule because it contains an ammonia manufacturing operation would report emissions from all stationary fuel combustion units regardless of the size of the fuel combustion units, the use of the units, or the level of emissions of any particular unit.

If a facility does not contain any source categories listed in Tables A-3 or A-4, then subpart C applies if the facility emits 25,000 metric tons CO<sub>2</sub>e per year in combined emissions from all stationary fuel combustion sources on site.

*Example:* A manufacturing facility does not contain any other processes that are subject to part 98 but has three oil-fired process heaters. Subpart C applies if the GHG emissions from all three units combined exceed 25,000 metric tons CO<sub>2</sub>e per year.

As a screening mechanism for small facilities, if the aggregate maximum rated heat input capacity of the stationary fuel combustion units at a facility is less than 30 mmBtu/hr, then the emissions are less than 25,000 metric tons CO<sub>2</sub>e per year and an emissions calculation is not necessary to determine applicability.

## What GHGs are reported?



- CO<sub>2</sub> from fossil fuel and biomass
  - Four different methods (tiers) for calculating CO<sub>2</sub> emissions
  - Different Tiers are used based on unit size, fuel type, other factors
  - Separately estimate CO<sub>2</sub> from sorbent used for acid gas control (unless CO<sub>2</sub> is measured with CEMS)
  - A fifth alternative is provided for estimating CO<sub>2</sub> from certain units reporting heat input to EPA year-round under part 75 [98.33(a)(5)]
- CH<sub>4</sub> and N<sub>2</sub>O
  - Emission factors

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The rule requires reporting of three greenhouse gases—carbon dioxide, methane, and nitrous oxide—from combustion of fossil fuel and biomass. The rule specifies four methods for calculating CO<sub>2</sub> emissions, referred to as calculation “tiers” by the rule. You may be able to choose among two or more of the tiers, depending on unit size, fuel type, and other factors.

The rule generally requires to separate reporting of biogenic CO<sub>2</sub> emissions from biomass fuels, municipal solid waste (MSW), and tires. However, separate reporting of biogenic CO<sub>2</sub> emissions from combustion of tires is optional.

The rule also requires separate reporting of carbon dioxide from sorbent use for acid gas control, if you are not using a CEMS. If you are using a CEMS, sorbent emissions are included in the CEMS data and do not need to be separately reported.

As an alternative to the four tiers, subpart C allows certain units that are subject to the part 75 continuous monitoring rule to use heat input data that are reported under part 75 to determine CO<sub>2</sub> emissions. Eligible units include oil and gas peaking units, low mass emitting units, and others.

For methane and nitrous oxide, there are several equations provided in the rule that use methane and nitrous oxide emission factors. The method that you use depends on which CO<sub>2</sub> tier you use, and the equations generally use the same data that you collect for estimating CO<sub>2</sub> emissions.

# CO<sub>2</sub> Emission Calculation Tiers



Tier	For this fuel...	Measure these parameters...	And use a default factor for...
1	60 fuels <sup>1</sup>	Annual fuel use	HHV CO <sub>2</sub> emission factor
2	60 fuels <sup>1</sup> MSW	Annual fuel use HHV Steam generation	CO <sub>2</sub> emission factor CO <sub>2</sub> emission factor
3	Solid/liquid Gas	Annual fuel use Carbon content Annual fuel use Carbon content Molecular weight	--
4	All	CO <sub>2</sub>	--

<sup>1</sup>Any of the fuels listed in Table C-1 of subpart C, except MSW units that generate steam.

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This chart shows the parameters that you measure for each of the four tiers.

For Tiers 1, 2, and 3, you plug different measured parameters into the equations provided. Tier 4 is use of a continuous emissions monitoring system.

Tier 1 is the simplest. The only parameter you measure is fuel use. For each fuel, you use a default high heat value by fuel and a default CO<sub>2</sub> emission factor provided in the rule.

Tier 2 requires you to measure both fuel use and high heat value (HHV). This tier uses the same CO<sub>2</sub> emission factor as in Tier 1. Municipal solid waste units that generate steam must measure steam generation instead of HHV. If the MSW unit does not generate steam, they do not use Tier 2 and must use either Tier 1 or 4.)

Tier 3 requires you to measure fuel use and carbon content, and if you are burning a gaseous fuel, you also measure molecular weight.

Tier 4 is the direct measurement of CO<sub>2</sub> emissions using a CEMS.

So, the lower tiers require you to measure less. The higher tiers require more measurements, but they provide a more accurate emission estimate.

## Tier 1 Monitoring: Fuel Use



### Use “company records”

- Direct measurements of fuel consumption by gravimetric or volumetric means
- Tank drop measurements
- Engineering calculations (e.g., using generation or unit operating hours)
- Fuel billing records
- Other

Must maintain records of methods used

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How you monitor depends on which tier method you use.

For Tier 1, you monitor only fuel use. The rule allows you to use company records, which are defined very broadly in the rule to provide substantial flexibility in how you determine fuel use. Fuel billing records, including natural gas use in therms or millions of BTUs, qualify as company records.

There are no restrictions on the methods that you can use to monitor fuel use, but you must use a credible method that would stand up to an audit. You must document the methods that you use in your monitoring plan, and you must maintain precise records to document the fuel use estimates.



## Tier 2 Monitoring: HHV



- Fuel use
  - Company records
- High heating value of fuel. Minimum sampling frequency:
  - Natural gas: Semiannual
  - Coal and fuel oil, and other solid and liquid fuels delivered in lots: Each fuel lot (shipment or delivery)
  - Other liquid fuels, fossil fuel-derived gas fuels, and biogas: Quarterly
  - Other solid fuels (except MSW): Weekly sample and monthly analysis

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For Tier 2, in addition to fuel use, you measure high heat value (HHV). Again, you can use company records to determine fuel use.

High heat value is determined by fuel sampling and analysis. This can be conducted by the facility or by the fuel supplier, as long as the supplier uses proper methods at the specified frequency of sampling, as shown in this slide. Sampling is less frequent for more homogeneous fuels like natural gas, and is weekly for fuels that can have more variable emissions.

For coal and fuel oil, and other solid and liquid fuels delivered in lots (e.g., wood pellets, other solid biomass, coke), the term “lot” is defined relatively broadly to include multiple deliveries from the same fuel source in a given calendar month.

The rule has special provisions for sampling liquid fuels; for example, continuous “drip” sampling and sampling after each delivery to a tank.

For other solid fuels (except MSW), weekly fuel sampling and monthly analysis of a composite sample are required.

## **Tier 3 Monitoring: Fuel Carbon Content**



- Fuel use
  - Solid fuel: Company records
  - Liquid fuel: Flow meter, billing meter, or tank drop measurements
  - Gaseous fuel: Flow meter or billing meter
- Minimum fuel sampling frequency (carbon):
  - Same as for Tier 2, except
  - Other gaseous fuels: Daily (if equipment in place) or weekly

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For Tier 3, the method of measuring fuel use varies by fuel. For solid fuel, you can use company records. For liquid or gaseous fuel, you must use measurements, but the rule provides some flexibility.

If you use a flow meter, you are subject to the flow meter calibration provisions of subpart A, including a 5 percent accuracy requirement. The calibration provisions do not apply to flow meters used for Tier 1 and Tier 2; or to billing meters, as long as the fuel supplier and unit burning the fuel do not have common owners.

Carbon content is determined by fuel sampling and analysis, and the sampling frequency for Tier 3 is exactly the same as in Tier 2 for high heat value. In addition, Tier 3 can apply to gaseous fuels not covered by Tier 2, and sampling frequency for these fuels is weekly, unless online monitoring equipment (e.g., gas chromatograph) is already in place for daily sampling and analysis.

## Tier 4 Monitoring (CEMS)



Install CO<sub>2</sub> and volumetric flow rate monitor

- O<sub>2</sub> monitor may be used in some situations
- Calculate hourly mass emission rates
- Sum to quarterly and annual emissions

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Tier 4 generally requires the use of a continuous CO<sub>2</sub> emissions monitor, but the rule provides some flexibility provisions.

You can use an oxygen concentration monitor instead of a CO<sub>2</sub> concentration monitor if two conditions are met: One, if the stack contains only products of combustion (that is, contains no emissions from other processes or from a flue gas desulfurization system); and two, if certain fuels listed in part 75 are burned. These fuels are coal, petroleum coke, tire-derived fuel, oil, natural gas, propane, butane, and wood (including bark and residue).

## Use of Tier 1 (measure fuel use only)



Tier 1 may be used in these situations:

- Unit  $\leq 250$  mmBtu/hour & fuel listed in Table C-1\*
- Units of any size:
  - Municipal solid waste (MSW) unit that does not produce steam
  - MSW unit burning  $\leq 1,000$  tons MSW per year
  - MSW and/or tires provides  $\leq 10\%$  annual heat input
  - Natural gas if consumption is obtained from billing records that are expressed in therms or mmBtu
  - Biomass fuels listed in Table C-1 \*

\*If HHV data are available at the minimum required frequency, Tier 2 must be used.

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This slide and the next four present the restrictions on the use of the four tiers. The tiering criteria are applied to each fuel burned in a unit. As such, a unit could qualify to use a different tier for each fuel burned. And reporters always have the option to use a higher tier than the minimum allowed.

Tier 1 can be used in the following situations.

For a unit equal to or less than 250 million BTUs per hour, you can use Tier 1 for any of the 60 fuels listed in Table C-1 of the rule.

You can use Tier 1 for a unit of any size for the following fuels:

- Municipal solid waste combustion units that do not generate steam,
- MSW units that generate steam but burn no more than 1,000 tons MSW per year,
- MSW and/or tires, provided that no more than 10 percent of total annual heat input is from these fuels combined. See 98.33(b) for more information on combined firing of MSW and tires.
- Tier 1 also can be used in a unit of any size for natural gas if consumption is obtained from billing records and expressed in therms or million Btu.
- Tier 1 can be used for any of the ten biomass fuels listed in Table C-1.

The exception to these conditions is that you must use Tier 2 if you have data for the high heat value of the fuel—for example, if provided by the fuel supplier.

## Use of Tier 2 (measure fuel use & HHV)



Tier 2 may be used in 2 situations:

- Unit  $\leq 250$  mmBtu/hour and fuel listed in Table C-1 (60 fuels)
- Natural gas, distillate fuel oil, or biomass fuels in unit of any size

Tier 2 must be used if HHV data are available at the minimum required frequency

MSW unit that produces steam must use Tier 2

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Tier 2 may be used for any of the fuels in Table C-1 for units of 250 million BTUs or less.

It also can be used for natural gas and distillate oil in a unit of any size. Distillate oil refers to fuel oil number 1, number 2, or number 4.

However, Tier 2 must be used if you routinely perform sampling and analysis for high heat value, or if you routinely receive high heat value sampling and analysis results from the fuel supplier at the minimum frequency specified by the rule.

If a municipal solid waste unit generates steam, Tier 2 must be used, unless one of the previously mentioned provisions allowing Tier 1 apply. Tier 2 provides a separate equation for calculating CO<sub>2</sub> emissions based on pounds of steam generated. The steam generation approach may also be used in place of measuring high heat values for any other solid fuel combusted in units that generate steam.

## Use of Tier 3 (measure fuel use & carbon content)



Tier 3 must be used in 2 situations:

- Unit >250 mmBtu/hour for any fuel listed in Table C-1, except:
  - Natural gas, distillate fuel oil, and biomass fuels
  - MSW
  - If Tier 4 is required
- Unit > 250 mmBtu/hour and a fuel not listed in Table C-1, only if:
  - The fuel provides 10% or more of annual heat input to the unit, and
  - Tier 4 is not required

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Tier 3 is essentially for larger units that are not required to use continuous emissions monitoring systems. If your unit is larger than 250 million BTUs per hour and is not required to use Tier 4, then you **MUST** use Tier 3 for any fuel listed in Table C-1 except natural gas, distillate oil, biomass fuels listed in Table C-1, and municipal solid waste. The latter fuels may use Tiers 1 or 2.

Tier 3 cannot be used for the combustion of municipal solid waste. For municipal solid waste, you must use either Tier 1, 2, or 4 as applicable.

Tier 3 also is required for fuels **NOT** listed in Table C-1 if burned in units larger than 250 million BTUs per hour and if the fuel provides 10 percent or more of the annual heat input to the unit, and Tier 4 is not required. If the fuel is not listed in Table C-1 and provides less than 10 percent of the annual heat input, reporting GHG emissions from that fuel is not required.

## Use of Tier 4 (CEMS) (large units)



For large units, required if ALL six requirements are met:

1. Unit has a CEMS that is required by regulation or permit.
2. Unit >250 mmBtu/hr, or >600 tons per day of MSW.
3. Solid fossil fuel or MSW is primary fuel.
4. Unit operated >1,000 hours in any calendar year since 2005.
5. CEMS has a gas monitor of any kind or a stack gas volumetric flow rate monitor
6. Monitors undergo periodic QA testing under part 75, NSPS, or State program.

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For units that are larger than 250 million BTUs per hour, or greater than 600 tons per day of MSW, a unit must use tier 4—a continuous emissions monitoring system—only if all six of the conditions shown on this slide are met. Note that you are not required to install a CEMS unless a CEMS is required by another program. However, you also can *choose* to install a CEMS.

One of the six conditions is that solid fossil fuel or MSW must be the primary fuel burned. This condition means that the solid fossil fuel or MSW must provide the greatest amount of heat input to the unit during the year. Another condition (number five on this slide) is that the existing CEMS must have a gas monitor of any kind or a stack gas volumetric flow rate monitor installed. For example, this condition is met if you have a NO<sub>x</sub> monitor. In this example, if all of the other 5 conditions are met, then you must upgrade the system to install a CO<sub>2</sub> monitor and a volumetric flow rate monitor.

## Use of Tier 4 (CEMS) (small units)



For small units, required if ALL six requirements are met:

1. Unit has a CEMS that is required by regulation or permit.
2. Unit  $\leq 250$  mmBtu/hr, or  $\leq 600$  tons per day of MSW.
3. Solid fossil fuel or MSW is primary fuel.
4. Unit operated  $>1,000$  hours in any calendar year since 2005.
5. CEMS has a CO<sub>2</sub> monitor and a stack gas volumetric flow rate monitor.
6. Monitors undergo periodic QA testing under part 75, NSPS, or State program.

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For units smaller than 250 million BTUs per hour or 600 tpd of MSW, the six conditions are the same except for number 5. Under number 5, the unit must have both a CO<sub>2</sub> analyzer and a flow meter already in place to be required to use Tier 4. If multiple units share a common stack and one unit meets the requirements to use Tier 4, then Tier 4 must be used for all units sharing that common stack.



## Pollution Control Units



- Hazardous waste combustors
  - Use a CO<sub>2</sub> CEMS if already present
  - Otherwise, report only fuels listed in Table C-1
- Pollution control units  $\leq 250$  MMBtu/hour
  - Report only fuels listed in Table C-1
- Pollution control units  $> 250$  MMBtu/hour
  - Report fuels listed in Table C-1, and
  - Any other fuel that provides  $\geq 10\%$  annual heat input to the unit

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The rule in some cases can require reporting of greenhouse gas emissions from emission control devices, such as thermal oxidizers or incinerators.

- For hazardous waste combustors, we have already discussed that emissions must be reported only for any co-fired fuels listed in Table C-1, unless the unit has a CO<sub>2</sub> CEMS.
- In some cases, a process off-gas may be combusted in a thermal oxidizer, boiler, or process heater (for example, to comply with a NESHAP; that is, a national emissions standard for a hazardous air pollutant). If the combustion unit is 250 million BTUs per hour or less, then you would report only from those fuels listed in Table C-1 and not from the process off-gas.
- In units larger than 250 million BTUs per hour, you must report the fuels listed in Table C-1 and the process off-gas if the off-gas provides more than 10 percent of the annual heat input to the unit.

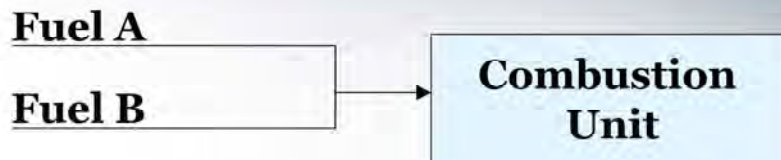
Take this example: In a unit of 250 million BTUs per hour or less, you could use Tier 1 for the natural gas burned and the process gas would not be reported.

If the unit is larger than 250 million BTUs per hour, you could use Tier 2 for natural gas. You would use Tier 3 for the process off-gas if the gas provided more than 10 percent of the annual heat input.

So, control devices are not categorically exempt from the rule, but emissions would be reported under certain circumstances.

# Blended Fuels (1)

Fuels blended onsite at reporting facility



1. Measure the quantity of each fuel separately.
2. Apply the appropriate tier to each fuel.
3. The fact that fuels are blended prior to combustion is of no consequence (i.e., report emissions from each fuel separately).

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If you are burning a mixed fuel (such as a mixture of oil and biodiesel, or a mixture of different grades of coal), then the approach for calculating GHG emissions depends on the circumstances.

If you mix the fuel on-site, and the quantity is measured before mixing, then you can estimate the GHG emissions from each component of the blend as if it were a separate fuel and the fact it is blended is of no consequence. This is true whether you are using tiers 1, 2, or 3.

## Blended Fuels (2)

Fuels received at facility as blend



Pre-mixed Fuel



**Combustion  
Unit**

### Tier 1

1. Estimate relative portion of each fuel using best available information.
2. Calculate a heat-weighted average CO<sub>2</sub> emission factor.
3. Calculate a fuel-weighted default HHV of the blend.
4. Apply tier equation.

### Tier 2

Same as Tier 1 except use a measured HHV of the blend in Step 3

### Tier 3

Measure the carbon content (and molecular weight for gases) of the mixed fuel (treat the blend as the “fuel type”)

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If you receive a pre-mixed fuel or mix it on-site without measuring the quantities, then the approach depends on which tier you are using.

- If you use Tier 1, you must use the best available information to determine the composition of the mix. Once you determine the composition, you would determine a heat-weighted average CO<sub>2</sub> emission factor for the mixture, using the default HHV for each component in the blend. You determine a fuel-weighted default HHV, and then use the Tier 1 equation in the rule.
- If you use Tier 2, then you follow the same procedure except that you use the measured HHV in Step #3. You should refer to 98.34(a)(3) for special considerations in determining these inputs and for how to exclude components in the blend that are not fuels listed in Table C-1.
- If you use Tier 3, you can treat the blended fuel as the fuel type and determine the carbon content and (for gases) molecular weight of the blended fuel.

## What must be reported?



- Biogenic CO<sub>2</sub>, non-biogenic CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>
- Reporting is at unit level (each fuel) with some exceptions (see 98.36(c)):
  - Aggregate units  $\leq 250$  mmBtu/hr by fuel
  - Units served by common fuel pipe
  - Units sharing common stacks using a CEMS
  - Attribute all emissions to large units when they use at least 95% of a commonly metered liquid or gas fuel.
- Verification data specified at 98.36(e)

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In general, the rule requires you to report data for each unit and for each fuel burned in each unit.

However, the rule provides several options to avoid the burden of metering the fuel use to all units and reporting GHG emissions for each unit.

First, you can aggregate all units that are 250 million BTUs per hour or less, if those units use the same tier calculation methodology for each commonly combusted fuel and do not use Tier 4. So, for example, you can group together all units that use Tier 2 and all units that use Tier 3 for each fuel. If the facility has all small units using Tier 1 for each fuel, you could group them together and essentially report at the facility level for each fuel.

Second, even if the units are larger than 250 million BTUs per hour, you can aggregate all units that burn a common fuel and are served by a common fuel supply pipe. In this case, you would use the highest tier that applies to any of the units you are combining. If a portion of the fuel is diverted to a unit with a CEMS to measure CO<sub>2</sub> emissions, or to a process or unit not subject to subpart C, you may still use the common pipe option by using company records to subtract out the portion of fuel that is diverted.

Third, you can aggregate units that share a common stack using a CEMS. In this case, you can aggregate all the emissions that go through the stack and you do not have to report for individual units or break the emissions out by fuel type.

Fourth, you can attribute all GHG emissions to large units (including units subject to subpart D or other units subject to part 75) when they share a common liquid or gas fuel supply with small units (e.g., space heaters, hot water heaters), if the large units account for at least 95 percent of the fuel usage.

## Requirements for Biomass



- Biomass CO<sub>2</sub> emissions are not considered in determining applicability, but are reported separately if a facility is subject to the rule
- CH<sub>4</sub> and N<sub>2</sub>O emissions from biomass combustion are considered in applicability determinations and are reported
- Estimate biogenic GHG emissions for fuels listed in Table C-1, and for non-Table C-1 fuels if the unlisted fuel contributes >10% of annual heat input in a unit >250 mmBtu/hr
  - Wood and wood residuals
  - Agricultural byproducts (non-food parts of crops)
  - Peat
  - Solid byproducts (other plant matter, animal materials/waste, etc.)
  - Biogas (captured methane)
  - Ethanol
  - Biodiesel
  - Rendered animal fat
  - Vegetable oil
- MSW and tires are considered partially biogenic

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If you burn biomass fuels, MSW, or tires, remember that biogenic CO<sub>2</sub> emissions are not considered in determining applicability, but you must separately report biogenic emissions if you are subject to the rule for any reason.

Methane and nitrous oxide emissions from biomass combustion must be counted both for determining applicability and for the annual emissions report.

You must report biogenic CO<sub>2</sub> for each of the nine biomass fuels listed in the rule, and for any other unlisted biomass fuel that contributes more than 10 percent of the annual heat input to a unit that is larger than 250 million BTUs per hour.

MSW and tires are both considered partly biogenic and are addressed by specific provisions for estimating biogenic and non-biogenic CO<sub>2</sub> emissions, which is covered in subsequent slides.

## Calculating Biogenic CO<sub>2</sub> from Mixed Biomass and Fossil Fuels



- If no CEMS
  - Part 98 equation for applicable tier for each biomass fuel and company records for amount of biomass combusted
- If use CEMS
  - Part 98 equation for applicable tier (as above), or
  - Equations using F-factors, or
  - ASTM D7459-08 and D6866-06a (quarterly)
- If you are monitoring heat input year-round under part 75 (optional method)
  - Estimate heat input from the biomass fuels using part 75 data reports or best available information, and use Table C-1 emission factors to calculate biogenic CO<sub>2</sub>

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If you burn mixed fuels with biomass, then you must report emissions from the biomass and fossil fraction by following one of three procedures:

If you are not using CEMS, you can use company records, such as engineering calculations, to determine the relative mix of biomass and fossil fuel burned. Then, you can use the applicable tier calculation method to calculate biogenic CO<sub>2</sub> emissions for each biomass fuel. For example, you must use Tier 3 if the unit is larger than 250 million Btu per hour, the biomass fuel is not listed in Table C-1, and the biomass fuel represents 10 percent or more of the annual heat input to the unit, as described earlier in the presentation.

If you are using CEMS, you have three options:

1. Use the applicable tier calculation methodology to estimate the biogenic CO<sub>2</sub> emissions, or
2. You can use the F-factors (expressed as scf CO<sub>2</sub>/million Btu) from part 75 to subtract out the fossil fuel portion of the CO<sub>2</sub> emissions to estimate the biogenic CO<sub>2</sub> emissions. This method is allowed only if the stack gas contains no emissions from process gas or sorbents.
3. As a third option, you can sample and analyze the fuel or stack emissions using ASTM test methods every quarter to determine the fossil fuel and biogenic fractions.

If you report emissions under part 75, you have the additional option to estimate emissions from biomass fuels using annual heat input from biomass fuels, based either on your part 75 electronic data reports or using best available information (e.g., fuel feed rates, fuel heating values, or engineering analysis).

## Calculating Biogenic CO<sub>2</sub> from Tires



If burning tires, reporting biomass is optional

- Use Tier 1, 2, 3, or 4 (as applicable) for total CO<sub>2</sub> and ASTM D7459-08 and D6866-06a (quarterly), or
- Tier 1 and default value of 20% for biogenic fraction if MSW and tires (combined)  $\leq 10\%$  annual heat input

If you are burning tires, reporting biogenic CO<sub>2</sub> emissions is optional.

If you choose to report biogenic CO<sub>2</sub> emissions, you will use Tiers 1, 2, 3, or 4 as applicable to determine total CO<sub>2</sub> emissions, and then use the ASTM methods quarterly to determine the fossil and biogenic fractions.

Alternatively, if the combustion of tires and MSW in the unit (combined) accounts for no more than 10 percent of the annual heat input to the unit, you may use Tier 1 and assume that the tires are 20 percent biogenic.

## Calculating Biogenic CO<sub>2</sub> from MSW



### If burning MSW

- Tier 1, 2, or 4 (CEMS), as applicable, for total CO<sub>2</sub> and ASTM D7459-08 and D6866-06a (quarterly)

OR

- Tier 1 and default value of 60% for biogenic fraction if  $\leq 1,000$  tpy MSW, or MSW and tires (combined)  $\leq 10\%$  annual heat input

If you are burning municipal solid waste, you would use Tier 1, 2, or 4 (a CEMS) to determine total CO<sub>2</sub> emissions, and then test quarterly using ASTM methods to determine the split between fossil fuel and biomass.

Alternatively, if the unit combusts no more than 1,000 tons per year of MSW, or if combustion of tires and MSW in a unit (combined) accounts for no more than 10 percent of the annual heat input to the unit, you may use Tier 1 and assume that the MSW is 60 percent biogenic.



## CH<sub>4</sub> and N<sub>2</sub>O Calculation Methods



If you use this tier for CO <sub>2</sub>	Measure these parameters <sup>1</sup>	And use a default factor for
Tier 1 or Tier 3	Annual fuel use	HHV CH <sub>4</sub> emission factor N <sub>2</sub> O emission factor
Tier 2 Fuel Option (Eq. C-9a)	Annual fuel use HHV	CH <sub>4</sub> emission factor N <sub>2</sub> O emission factor
Tier 2 Steam Option (Eq.C-9b)	Annual steam generation (converted to annual heat input)	CH <sub>4</sub> emission factor N <sub>2</sub> O emission factor
Tier 4	Annual heat input	CH <sub>4</sub> emission factor N <sub>2</sub> O emission factor

<sup>1</sup> Use same values as used for CO<sub>2</sub> calculations.

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The rule specifies methods for calculating methane and nitrous oxide emissions from stationary fuel combustion. The method you select for calculating methane and nitrous oxide emissions depends on the tier you used for calculating CO<sub>2</sub> emissions. In general, for each fuel combusted in a unit, you would use the same measured data that you use for calculating CO<sub>2</sub> emissions (e.g., fuel use or steam output) to calculate methane and nitrous oxide emissions.

You need to calculate and report methane and nitrous oxide emissions only for the fuels that are listed in Table C-2. Table C-2 provides methane and nitrous oxide emission factors in kg per million Btu.

## What is reported for each unit?



- Unit identification number
- Type of unit (code)
- Rated capacity
- Each fuel type burned
- Tier methodology used for CO<sub>2</sub>
- For Tier 1-3
  - CO<sub>2</sub> emissions in metric tons for each fuel
  - CH<sub>4</sub> and N<sub>2</sub>O emissions for each fuel (metric tons and CO<sub>2</sub>e)
  - Biogenic CO<sub>2</sub> for all fuels combined
- For Tier 4
  - Total CO<sub>2</sub> emissions measured by the CEMS
  - Biogenic CO<sub>2</sub> emissions
  - Non-biogenic CO<sub>2</sub> emissions
  - CH<sub>4</sub> and N<sub>2</sub>O emissions for each fuel (metric tons and CO<sub>2</sub>e)
- CO<sub>2</sub> sorbent emissions (if not using CEMS)
- Verification data
- Different reporting requirements may apply to units reporting under the alternative reporting options provided in 98.36

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This slide lists the information you must report for each unit. In addition to this information, you must report the verification data listed in section 98.36(e), which varies according to the tier calculation methodology that you use.

Currently, EPA has deferred reporting of the data elements that are inputs to equations used to calculate emissions because of concerns about confidentiality of the data. However, sources must still maintain records of those data elements for verification and may need to report them in the future. To find out more, visit the Confidential Business Information page on the reporting rule web site listed in the For More Information portion of this training.

OK. This concludes the module on stationary fuel combustion sources. The next module covers the section of the rule that addresses emissions from electricity generation.



## **Module 5. Subpart D: Electricity Generation**

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This module covers requirements under Subpart D of the rule, Electricity Generation.

## Applicability



- Electric Generating Units (EGUs) that are required to monitor and report CO<sub>2</sub> mass emissions year-round to EPA according to 40 CFR Part 75
  - Acid Rain Program
  - Other units reporting CO<sub>2</sub> emissions under Part 75 (e.g., RGGI)
- EGUs not meeting the criteria specified above must report emissions under subpart C as applicable

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Subpart D does not cover all electricity generators. It covers only electricity-generating units that are required to monitor and report CO<sub>2</sub> mass emissions year-round according to 40 CFR part 75; for example, units in the Acid Rain Program, NO<sub>x</sub> Budget Trading Program, and the Regional Greenhouse Gas Initiative. All other electricity-generating units that are not subject to subpart D must report under subpart C, as applicable.

For example, unless it is subject to part 75, a distributed generation unit that supplies electricity for a facility is not subject to subpart D, even if the unit sells electricity on the grid or to another facility. Such units would be subject to subpart C, provided that the facility meets the applicability requirements for subpart C.

## How does the GHGRP affect your part 75 reporting?



Not at all!!

- Same monitoring
- Same QA requirements
- Same reporting
- Same schedule

The GHG reporting rule does not change any of the requirements for your reporting under part 75. Part 75 units continue to monitor and report emissions to the part 75 electronic tracking system using the same methods as always, and on the same schedule.

## What is reported under GHGRP?



Annual CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions  
(metric tons/year) from:

- Part 75 EGUs
- EGUs that do not report under part 75
- All other stationary combustion units at the facility
- Any other applicable source category in part 98

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What is different is that a facility with a part 75 unit must submit an additional report to EPA under the GHG reporting rule. Under part 98, you must report the annual mass emissions of CO<sub>2</sub>, nitrous oxide, and methane for each part 75 unit, for each non-part 75 electricity-generating unit, and for each stationary fuel combustion unit that does not generate electricity. You must also report emissions from any other source category that applies to the facility. For example, you would also report under subpart PP if you capture CO<sub>2</sub> for underground injection or sequestration.

## How do I calculate GHG emissions?



- Part 75 units
  - Convert annual part 75 CO<sub>2</sub> emissions to metric tons/year
  - Use Eq. C-10 in subpart C for CH<sub>4</sub> and N<sub>2</sub>O emissions (uses cumulative heat input monitored under part 75)
- EGUs not under Part 75
  - Use appropriate tier method in subpart C
- Other stationary combustion units
  - Use appropriate tier method in subpart C

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To estimate greenhouse gas emissions, part 75 units convert their cumulative annual CO<sub>2</sub> mass emissions from short tons to metric tons. Nitrous oxide and methane emissions must be estimated by using the cumulative annual heat from the part 75 electronic data reports and emission factors provided in Table C-2 of subpart C.

For all other combustion units, you should estimate emissions of CO<sub>2</sub>, nitrous oxide, and methane by following the applicable requirements of subpart C.

## Missing Data Requirements



- Acid Rain Program units and units that report through part 75 must follow part 75
- All other combustion units must follow subpart C

Acid rain program units and units that report through part 75 must follow the missing data requirements specified in part 75. All other combustion units must follow the missing data procedures in subpart C.



## Report Content for Part 75 Units



- Unit or stack identification
- For each monitoring location:
  - Annual CO<sub>2</sub> for all fuels combined
  - Annual CO<sub>2</sub> for all biomass fuels (starting in reporting year 2011)
  - Part 75 methodology used for CO<sub>2</sub>
  - Annual CH<sub>4</sub> and N<sub>2</sub>O for each fuel (metric tons CO<sub>2</sub>e)
- For the source category:
  - Annual non-biogenic CO<sub>2</sub> and biogenic CO<sub>2</sub>
  - Annual CH<sub>4</sub> and N<sub>2</sub>O in tons

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This slide lists the data that must be reported for subpart D. In addition to the identification information in subpart A, subpart D units report the emissions information in section 98.36(d) of subpart C. For each monitoring location, subpart D units must report total annual CO<sub>2</sub> emissions for all fuels combined. Starting in reporting year 2011, these units must begin reporting biogenic CO<sub>2</sub> as well. Methane and nitrous oxide emissions are reported in CO<sub>2</sub>e for each fuel type at each monitoring location.

In addition, at the facility level, CO<sub>2</sub> emissions for all subpart D units are aggregated and reported at the source category level for non-biogenic emissions and biogenic emissions. Methane and nitrous oxide emissions are reported for each fuel type in tons of each gas.

All non-subpart D units on site must follow the reporting requirements of the general provisions and each applicable subpart.

OK. This concludes the module on electricity generation. The next module covers the section of the rule that addresses emissions from municipal solid waste landfills.



## **Module 6. Subpart HH: Municipal Solid Waste Landfills**

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This module covers the requirements for municipal solid waste landfills under the Greenhouse Gas Reporting Program.

## Which landfills must report?



- **Municipal solid waste landfills**
  - Definition in 40 CFR 98.6
  - Excludes RCRA Subtitle C or TSCA hazardous waste landfills, C&D waste landfills, and industrial waste landfills
  - Industrial landfills covered by separate subpart TT, begin data collection in 2011, and submit first report in 2012
- **Accepted waste since January 1, 1980**
  - Covers both open and closed MSW landfills
- **Methane generation  $\geq 25,000$  metric tons CO<sub>2</sub>e/yr**
  - Applicability based on generation, not actual emissions

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Subpart HH applies only to landfills that meet the definition of “municipal solid waste landfill” in 40 CFR 98.6 (which is in subpart A of the rule). Landfills that accept only construction and demolition wastes are excluded, and so are industrial landfills and RCRA Subpart C and TSCA hazardous waste landfills. However, industrial landfills are covered under a separate Subpart (TT) and must begin collecting data in 2011 and submit their first report under subpart TT in 2012.

The rule covers both open and closed MSW landfills that accepted waste since January 1, 1980, if they meet the methane generation criteria.

You are subject to the rule if your landfill generates methane equivalent to 25,000 metric tons or more of CO<sub>2</sub>e per year. It is important to realize that for this subpart, applicability is based on generation, not actual emissions, so for purposes of determining applicability, you do not get to subtract the methane you collect and destroy.

## How do I determine applicability?



- Applicability is based on equations in the rule
- EPA online applicability tool may be used for screening purposes
  - <<http://www.epa.gov/climatechange/emissions/GHG-calculator>>
    - Includes a simplified calculator for screening purposes.
- If methane generation is close to 25,000 metric tons CO<sub>2</sub>e for 2010, perform more detailed calculations
  - Use equations in the rule
  - Use available data as input to the equations to estimate 2010 generation

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Applicability is determined using the equations in the rule. For screening purposes, you can use EPA's online applicability tool, which includes a simplified calculator for landfills. However, if the resulting methane generation is at all close to 25,000 metric tons CO<sub>2</sub>e per year, or you have reason to believe your landfill might exceed this threshold, then you should perform more detailed calculations using the equations discussed in upcoming slides.

If your landfill was below the 25,000 metric ton threshold in 2010 but is still accepting waste, you should reassess applicability in 2011 and future years, since your methane generation will continue to increase.

# Which equations do I use to determine applicability?



Landfills without gas collection systems (GCS)	Combination of Eq. HH-1 (Gas generation model equation similar to LandGEM and IPCC) AND Eq. HH-5 (Adjusts HH-1 modeled generation for soil oxidation)
Landfills with GCS	Method 1. Same as above
Use 2 methods. If <b>either</b> result exceeds threshold, the landfill must report	Method 2, Combination of Eq. HH-4 (calculates methane recovery from measured GCS flow and CH <sub>4</sub> concentration) AND Eq. HH-7 (calculates generation using methane recovery from HH-4 and assumed gas collection efficiency, and adjusts for soil oxidation)

**Note:** IPCC model or LandGEM can be used to calculate Eq. HH-1 using site-specific annual waste quantities and default values from Table HH-1.

This chart identifies which equations in the rule you must use to determine applicability. Throughout this module, all equation numbers refer to equations that are in subpart HH of the rule.

For landfills *without* gas collection systems, you use equation HH-1, which is a first-order decay model that predicts methane generation. This equation is similar to the LandGEM and IPCC models you might be familiar with. In fact, you can use either IPCC or LandGEM software, with the default values specified in the rule, to perform the equation HH-1 calculation. Just be aware that LandGEM is designed for bulk waste, so if you wanted to perform material-specific calculations, you would need to run LandGEM separately for each waste material and then sum the results.

After using equation HH-1, you use equation HH-5 to adjust your modeled generation for soil oxidation. This accounts for the fraction of methane that is oxidized as it passes through the soil covering of the landfill and is therefore not emitted as methane.

For landfills *with* gas collection systems, you must use two methods to determine applicability. If *either* method shows that methane generation exceeds the threshold, then you must report emissions.

The first method is exactly the same as for landfills without gas collection systems.

The second method uses equation HH-4 to calculate methane recovered (that is, collected) from the landfill, based on measurements of the gas flow rate and percent methane in the gas collection system. Then equation HH-7 is used to calculate gas generation from the measured gas recovery by using a collection efficiency to account for uncollected gas that escapes through the landfill surface, and adjusting for soil oxidation.

## GHGs to Report



- Report 3 items:
  - CH<sub>4</sub> generation and emissions from the landfill (HH)
  - CH<sub>4</sub> destruction from collection and combustion (HH)
  - CH<sub>4</sub>, CO<sub>2</sub> and N<sub>2</sub>O from combustion devices (reported under subpart C)
- What do I report for landfill flares?
  - Subpart HH calculations and reporting includes CH<sub>4</sub> destruction in flares and CH<sub>4</sub> emitted from flares
  - CO<sub>2</sub> and N<sub>2</sub>O from flares is not reported under HH or C

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Under subpart HH, you must report methane generation and emissions. If you collect and destroy landfill gas, you must also report methane destruction under subpart HH.

You must also report methane, carbon dioxide, and nitrous oxide emissions from combustion devices burning landfill gas and other fuels. These emissions are reported under subpart C, which covers stationary fuel combustion sources.

Flares are treated differently from other combustion devices. The subpart HH equations and reporting include methane destruction and emissions from flares burning landfill gas. You do *not* need to report CO<sub>2</sub> or N<sub>2</sub>O emissions from flares, because these emissions are not covered under the flare equations for subpart HH, and flares are exempt from subpart C.

## Who reports emissions from LFG-fired engines, boilers, etc.? (single facility)



- “Facility” = any physical property, plant, building, structure, source, or stationary equipment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas
- If the landfill and combustion devices are part of a single “facility,” submit single report with:
  - CH<sub>4</sub> generation and emissions from the landfill (including CH<sub>4</sub> emitted by combustion devices)
  - CH<sub>4</sub> destruction from gas collection and combustion system
  - CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions from combustion devices under subpart C (CO<sub>2</sub> and N<sub>2</sub>O for LFG, all 3 pollutants for fossil fuels)

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To determine who reports emissions from landfill gas-fired engines, turbines, and boilers, you need to look at the definition of “facility” in section 98.6 of the rule. The definition includes the concept that a facility is the equipment on contiguous or adjacent property that is under common ownership or common control.

*If* the landfill and combustion device are co-located and have any shared ownership or operational control, then they are part of a single facility and must submit a single report. The owners and operators must select a single designated representative to report both the landfill and combustion emissions. For all combustion devices other than flares, you would report greenhouse gas emissions from burning landfill gas and other fuels using the equations and factors in subpart C.

## Who reports emissions from LFG-fired engines, boilers, etc.? (separate facilities)



- If the landfill and the combustion devices are at separate facilities:
  - Landfill facility reports CH<sub>4</sub> generation and emissions from the landfill; CH<sub>4</sub> destruction. (For gas sent off-site for destruction, assume DE=1.)
  - Facility with the combustion devices reports emissions of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O using subpart C methods *if* their facility is subject to the rule. (Can use Table C-1 and C-2 “biogas” default factors for LFG.)

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If the landfill and combustion devices are determined to be at separate facilities, either because they are at separate locations or because they have separate owners and are not under common control, then separate reports would be submitted. For example, some landfills pipe their landfill gas to off-site manufacturing plants that use the gas in boilers or engines at the manufacturing plants.

In such a case, the landfill facility would report methane generation, emissions, and destruction.

The facility with the combustion devices would report emissions from the combustion devices *if* their facility independently meets the applicability criteria for the greenhouse gas reporting rule. (See the “Applicability” module of this training for further information on applicability for sources other than landfills. Facilities reporting combustion emissions follow subpart C. Landfill gas is considered a “biogas,” so you would use the biogas default factors in Tables C-1 and C-2 to perform these calculations.)



## How do I calculate emissions if I don't have a gas collection system?



### Landfills without GCS use Eq. HH-5:

$$\text{Methane emissions and methane generation} = G_{\text{CH}_4} \text{ (modeled methane generation from Eq. HH-1)} \times (1 - \text{OX})$$

Where OX = 10% soil oxidation factor

#### Eq. HH-1. First order decay model

$$G_{\text{CH}_4} = \left[ \sum_{x=S}^{T-1} \left\{ W_x \times MCF \times DOC \times DOC_F \times F \times \frac{16}{12} \left( e^{-k(T-x-1)} - e^{-k(T-x)} \right) \right\} \right]$$

If waste composition is known, calculate using material-specific DOC and k. Otherwise, use bulk waste or modified bulk waste factors in rule Table HH-1.

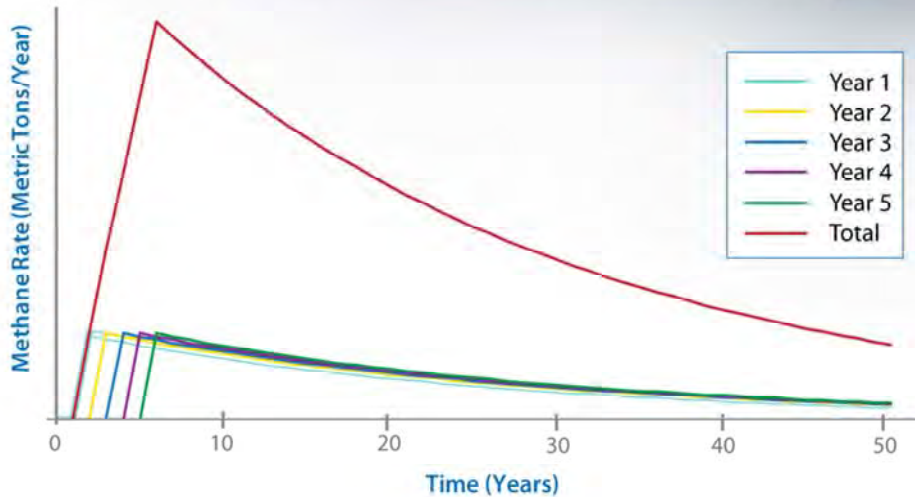
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Now that we have briefly covered who should submit reports and what greenhouse gases they must report, the next series of slides will provide detailed information on how to calculate MSW landfill emissions under subpart HH.

For landfills *without gas collection systems*, methane emissions are the same as methane generation, and the two equations mentioned earlier are used. Equation HH-5, which is shown along the top of this slide, calculates emissions by adjusting modeled methane generation for soil oxidation. A 10 percent soil oxidation factor is used for all landfills.

The modeled methane generation that feeds into equation HH-5 is calculated using equation HH-1, which is shown in the box. This equation will look familiar to you if you have used the LandGEM or IPCC models. It is a first-order decay equation that accounts for the methane generated as the waste in the landfill is decomposed by bacteria that produce methane. Under this model, waste disposed in the landfill during a given year generates the highest amount of methane the year immediately after it is disposed of. In future years, methane generated from that waste exponentially declines, but some methane still continues to be emitted for many years as the waste continues to decompose. As shown by the summation sign in this equation, to estimate methane generated by the landfill in the current year (year T), you perform this calculation for the waste deposited each year from the start year (S) to the year before the calculation year (year T minus 1) and sum the results together. We'll go through the other terms in this equation shortly.

## Methane Generation Curve for 5 Years of Waste



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This slide illustrates the concept we just discussed. The amount (in metric tons per year) of methane generation is shown on the vertical axis and time (in years) is shown on the horizontal axis. You can see the separate curves for the waste deposited each year for 5 years. The upper curve shows the summation of these values, which is the methane generation for the entire landfill. For the landfill as a whole, methane generation increases each year that the landfill is active and receiving waste, and then declines after the landfill closes.

## Data Needed for Eq. HH-1 (modeled methane generation)



Must determine or measure	In units of	Using the following methods
S = Start year of calculation (year LF opened or 1960)	NA	Available records
MCF=Methane correction factor	Fraction	Use the default value of 1, unless there is active aeration of waste within the landfill during the reporting year, in which case use an alternative value between 0.5 and 1
DOC= Degradable organic carbon	Fraction Metric tons C/metric ton waste	Use bulk waste, modified bulk MSW, or material-specific default values from Table HH-1
DOC <sub>F</sub> =Fraction of DOC dissimilated	Fraction	Use default value of 0.5
F=Fraction by volume of CH <sub>4</sub> in landfill gas	Fraction	From measurement data on a dry basis, if available, or use default value of 0.5
k=Rate constant	Yr <sup>-1</sup>	Use bulk waste, modified bulk MSW, or material-specific default values from Table HH-1. If using bulk waste k-values, select most applicable value for the majority of the past 10 years based on amount of precipitation plus recirculated leachate.

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This slide defines the terms in equation HH-1 and summarizes how they are measured.

The start year for the calculation is the year the landfill opened. However, if the landfill opened before 1960, use 1960 as the start year (S) in equation HH-1.

MCF is the methane correction factor. Most landfills operate under anaerobic conditions and the MCF is 1, which is the default value. However, if there is active aeration of the waste within the landfill during the reporting year, you can select an alternative value between 0.5 and 1 based on site-specific aeration parameters.

DOC is degradable organic carbon. If you have waste composition data for the materials in Table HH-1 of the rule (such as food waste, paper, or wood) then you should use the material-specific DOC values in Table HH-1, which will result in a more accurate estimate of methane generation. Otherwise, use the bulk waste default factors or the modified bulk MSW factors. The modified bulk MSW approach allows you to quantify and distinguish between inert waste, C&D waste, and other bulk MSW excluding the inert and C&D waste.

k is the rate constant. Use the material-specific, bulk waste, or modified bulk waste default values of k in Table HH-1 of the rule. If you are using the bulk waste approach, the k factors depend on the annual precipitation and whether the landfill recirculates leachate. Select the most applicable k value for the majority of the past 10 years based on the amount of precipitation plus recirculated leachate.

## Data Needed for Eq. HH-1 (modeled methane generation) (continued)



Must determine or measure	In units of	Using the following methods
$W_x$ = quantity of waste disposed in year X (for each year since start year of calc)	Metric tons, as received (wet waste)	<p>For reporting year and all future years determine <math>W_x</math> using one of the following*:</p> <ol style="list-style-type: none"> <li>1) Landfills with scales in place                             <ul style="list-style-type: none"> <li>- Use scales to weigh loads both before and after off-loading OR</li> <li>- Use scales to weigh loads before off-loading and tare vehicle/container weights after off-loading</li> </ul> </li> <li>2) Landfills without scales                             <ul style="list-style-type: none"> <li>- Use working capacity for each vehicle/container, e.g. determine volumetric capacity of each container, use average density of waste as received, &amp; record number of loads by type of vehicle/container</li> </ul> </li> </ol> <p>For years prior to 2010, determine <math>W_x</math> using one of the methods above or through tipping fee receipts or other company records. For prior years for which quantities are not available, estimate <math>W_x</math> using one of 3 methods:</p> <ol style="list-style-type: none"> <li>1) Assume all prior years are the same as the first year for which waste data are available</li> <li>2) Eq. HH-2: calc for each year based on population served and per capita waste disposal rate specified in Table HH-2</li> <li>3) Eq. HH-3: use a constant annual average calculated from landfill capacity and number of years waste was received</li> </ol>

\* For loads other than cars, light-duty trucks, and loads that cannot be measured with scales due to physical or operational limitations.

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$W_x$  is the metric tons of waste disposed in the landfill in year x. For 2010 and future years, if weigh scales are in place at the landfill, you must use direct measurement of each individual load received to calculate annual waste disposal. However, you do not need to weigh individual cars, light-duty trucks, and loads that cannot be measured with scales due to physical or operational limitations. The rule has procedures to estimate the amount of waste from these types of vehicles.

If the landfill does not have scales, you can calculate the annual waste disposal by multiplying the working capacity of each type of container/vehicle and the number of loads received.

For years prior to 2010, you can use tipping fee receipts or other annual records you have available. If you do not have any annual records, then you can use any of the three methods provided in the rule to estimate annual waste disposal. The three methods are summarized on the second row of this slide.

This completes your calculations for landfills without gas collection systems.

## How do I calculate emissions if I have a gas collection system?



- Calculate emissions in two ways and report *both* results:
  1. Calculate modeled  $\text{CH}_4$  generation the same way as landfills without GCS, subtract the amount of  $\text{CH}_4$  recovered by the GCS, and adjust for destruction efficiency of collected gas and soil oxidation of uncollected gas.
  2. Determine  $\text{CH}_4$  recovered by the GCS, apply a gas collection efficiency to account for emissions of uncollected gas, and adjust for destruction efficiency of collected gas and soil oxidation of uncollected gas.

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For landfills *with gas collection systems*, you must calculate methane emissions in two ways and report *both* results.

The first way is to calculate modeled methane generation the same way as for landfills without gas collection systems, using the equation HH-1 we just discussed. Then you subtract the amount of methane recovered by the gas collection system, adjust for destruction of collected gas, and adjust for soil oxidation of uncollected gas.

The second way is to determine methane recovered by the gas collection system and apply a gas collection efficiency to account for emissions of uncollected gas. For example, if you know the amount of gas collected and you assume a collection efficiency of 75 percent, then the equation will account for the other 25 percent of the gas that is not collected and is emitted through the landfill surface. You then adjust for destruction of the collected gas and for soil oxidation of the uncollected gas.

## Inputs Needed for the Two Emission Calculation Methods



Method 1: Subtract recovery from CH<sub>4</sub> generation

Eq. HH-6 to  
calculate  
emissions

- Modeled methane generation from Eq. HH-1. (use recovery from Eq. HH-4 if it is larger)
- Methane recovered by GCS from Eq. HH-4
- Destruction efficiency
- Soil oxidation factor

Method 2: Determine recovery and apply collection efficiency

Eq. HH-8 to  
calculate  
emissions

- Methane recovered by GCS from Eq. HH-4
- CE from Table HH-3 or 0.75
- Destruction efficiency
- Soil oxidation factor

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This slide identifies the inputs needed for the two emission calculation methods for landfills with gas collection systems.

For the *first calculation method*, which basically subtracts methane recovery from modeled methane generation, you use equation HH-6 in the rule. For equation HH-6, you need to know the four inputs to the equation that are listed in this slide as bullets on the right.

As shown in the first bullet, you need to know the modeled methane generation from equation HH-1. However, in the unusual cases where the measured recovery by the gas collection system is larger than the modeled methane generation, you use the methane recovery instead of the modeled generation as your input to equation HH-6. It is logical that the landfill must generate at least as much methane as you recover from it.

In addition, for equation HH-6, you need to input the methane recovery from equation HH-4. Assuming you destroy the methane that is recovered, for example, by combusting it, you need to know the destruction efficiency. And the fourth input shown is the soil oxidation factor.

For the *second calculation method*, which is based on determining gas recovery and applying a collection efficiency, you use equation HH-8 of the rule. You need the inputs shown in the bullets to the right of equation HH-8. These include the methane recovered by the gas collection system, the collection efficiency (or CE), the destruction efficiency, and the soil oxidation factor.

The next slides will show how to determine each of the needed inputs.

## Measuring CH<sub>4</sub> Recovered: Overview



- CH<sub>4</sub> recovered by GCS must be determined for both emission calculation methods
  - Continuously monitor gas flow
  - Monitor CH<sub>4</sub> concentration continuously OR measure weekly (allows use of handheld meters)
  - Adjust measurements for temperature, pressure, and moisture
  - See 98.343(b) & Eq. HH-4 for details
- Measure in GCS header prior to destruction device or treatment equipment
  - Knockout pots, compressors, blowers, etc. are not treatment
- Measure CH<sub>4</sub> concentration near the flow monitor or at a location representative of flow monitor location

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Methane recovery is used for both calculation methods. To calculate methane recovery, you continuously monitor gas flow in the gas collection system. You monitor the methane concentration either continuously or weekly. The weekly option allows for the use of handheld meters. You adjust these measurements for temperature, pressure, and moisture as needed. For details, see section 98.343(b) of the rule and equation HH-4.

The location for measuring gas flow and concentration is in the gas collection system header prior to the destruction device or treatment equipment. There have been several questions about what is meant by treatment equipment in this rule. EPA has posted an FAQ stating that knockout pots, compressors, and blowers are not considered treatment equipment, so you do not have to measure prior to these. You can make measurements either before or after these types of equipment, as long as both flow and concentration are measured in the same relative location (either both before or both after).

## Measuring CH<sub>4</sub> Recovered: Details



Must determine or measure	In units of	Using the following methods and calibration*
Volumetric flow rate of LFG recovered and routed to destruction device	acfm per day (per week if measuring CH <sub>4</sub> concentration weekly rather than continuously)	Continuous gas flow monitor calibrated using methods in 98.344(c) or manufacturer's specified methods.
Temperature and pressure (if flow monitor doesn't automatically correct for these)	See Eq. HH-4 term descriptions	Type of monitor not specified. But must be calibrated as specified by manufacturer and document procedures used to ensure accuracy and document estimated accuracy per 98.344(d) and (e).
Methane concentration	Volume percent [if CH <sub>4</sub> concn. and flow are measured on different bases (wet vs dry) then correct for moisture]	<ol style="list-style-type: none"> <li>1. If you have a continuous CH<sub>4</sub> monitor, you must use it and compute daily average CH<sub>4</sub> concentrations. Monitor must use one of the analysis methods in 98.344(b) and be calibrated per 98.344(b).</li> <li>2. Otherwise, meter the CH<sub>4</sub> concentration at least weekly at a location near or representative of the flow monitor location per 98.343(b)(2)(ii).</li> </ol>

\*Per 98.3(i)(1), devices must be calibrated to an accuracy within the appropriate error range for the specific measurement technology, based on an applicable operating standard, including but not limited to manufacturer's specifications and industry standards.

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This table provides some additional details on the measurement methods for gas flow and methane concentration in order to determine methane recovery.

As shown in the first row of the table, flow rate is measured continuously in units of actual cubic feet per minute (or acfm) and then averaged on a daily basis, although flow can be averaged on a weekly basis if methane concentration is done weekly. You must calibrate the flow meter using methods in section 98.344(c) or the manufacturer's specified methods. You must calibrate the monitor every 2 years or at the manufacturer's specified frequency.

As shown in the second row, temperature and pressure must be monitored unless the flow meter automatically corrects for these.

As shown in the last row, methane concentration is expressed as a volume percent. Regarding moisture correction, if flow and concentration are measured on the same basis (either both wet or both dry), then no moisture correction is needed.

There are two methods for measuring methane concentration. If you currently have a continuous methane monitor, you must use it and compute daily average methane concentration. You can monitor using any of the analysis methods in section 98.344(b) of the rule. These include various gas chromatography methods or using EPA Methods 25A or 25B to measure total organics and correcting for non-methane organics. The second option (if you don't have a continuous methane monitor) is to meter the methane concentration at least weekly. Various portable hand-held monitors are available, and you would calibrate them according to the manufacturer's specifications.



## Determining Destruction Efficiency



- Destruction efficiency must be determined for both emission calculation methods
  - Use combustion device manufacturer's specified destruction efficiency or 0.99 (whichever is less)
  - If gas is transported off-site for destruction, use 1.0 because none of the recovered gas is emitted at the landfill
- Also determine fraction of hours the gas destruction device was operating during the year

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Destruction efficiency must be determined for both emission calculation methods. The destruction efficiency is the manufacturer's specified efficiency or 99 percent, whichever is less. If the landfill gas is transported offsite for destruction, use 1.0 (which is 100 percent) for destruction efficiency. This accounts for the fact that all of the recovered gas is sent to another facility and none of it is emitted at the landfill facility.

In addition to efficiency, you must determine the fraction of hours the destruction device was operated during the year. This is the annual operating hours of the destruction device divided by the annual operating hours of the gas collection system. However, if the gas was destroyed in a backup flare during all periods when the primary combustion device was not operating, then assume a fraction of 1.0.

## Determining Soil Oxidation



- Methane generation must be adjusted for soil oxidation for both emission calculation methods
- Default value of 10% must be used

The default soil oxidation factor of 10 percent must be used for both emission calculation methods.

## Determining Collection Efficiency



- Collection efficiency must be determined for the second emission calculation method (collection efficiency is applied to CH<sub>4</sub> recovered to account for uncollected gas)
- Select collection efficiency (CE) from Table HH-3 based on landfill cover type and presence of active collection system
  - If areas within the landfill differ in terms of cover type or presence of collection system, determine CE for each area and determine overall weighted CE for landfill per equation in Table HH-3
- If area by cover type is not available, use CE = 0.75

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Collection efficiency must be determined for the second emission calculation method. As you recall, under the second method, a collection efficiency is applied to the measured methane recovery to account for uncollected gas.

You select a collection efficiency that is appropriate for your landfill from Table HH-3 of the rule. If areas within the landfill differ regarding cover type or presence of a gas collection system, then determine the collection efficiency of each area and calculate a weighted average using the equation in Table HH-3 of the rule. The collection efficiencies range from 0 percent for areas of a landfill with no gas collection system to 95 percent for areas with final soil cover of 3 feet or thicker of clay and/or geomembrane covers and an active gas collection system.

If area by cover type is not available, then assume 75 percent collection efficiency. This is the end of the discussion of calculation equations.

## Missing Data Calculation Procedures



- CH<sub>4</sub> content and gas flow rate
  - Average of QA'd values immediately before and after missing data period
  - If no “after” value by end of year, use “before” value
  - If no “before” value available, use first QA'd value measured after the missing data period
- For missing daily waste disposal quantity
  - Average value for that day of the week as measured the week before and after the missing daily data

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Because the rule requires you to report the annual quantity of emissions, you must account for emissions during periods when properly measured and calibrated data are not available, such as periods when a monitor is not operating or is not functioning properly.

For periods when properly measured values of methane concentration or gas flow are not available, use the average quality-assured values immediately before and after the missing data period.

If you are missing daily waste disposal values (starting in calendar year 2010), use the average value for that day of the week as measured the week before and after the missing daily data.

## What must be reported by all landfills?\*



- Information required by 98.3(c) of subpart A
- Whether landfill is open or closed
- First year it accepted waste
- Last year it accepted waste or planned closure year
- Capacity
- Whether leachate is recirculated during the reporting year and its typical frequency over the past 10 years
- Whether scales are present
- Waste disposal quantity for each year
- Method used to determine waste disposal quantity

\* EPA has deferred reporting of subpart HH data elements that are inputs to emission equations for calendar years 2010 and 2011 until March 31, 2013. See 76 FR 53057, August 25, 2011, and the GHGRP website "Confidential Business Information" page for list of deferred data elements.

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What data must be included in annual reports submitted by all landfills subject to subpart HH?

First, you must include all of the general information required in section 98.3(c) of subpart A, such as facility identification information and other information described in the Module on Reporting, Monitoring, and Recordkeeping Requirements.

In addition, you must report the information in section 98.346 of subpart HH, which is summarized in this slide and the slides that follow. As you can see in this slide, several basic landfill characteristics that affect methane generation must be reported.

However, for calendar years 2010 and 2011, EPA has deferred reporting of subpart HH data elements that are inputs to emission equations. The deferred input data elements must be retained as records and must be reported by March 31, 2013. For example, the first year the landfill accepted waste and the waste disposal quantity for each year, which are inputs to equation HH-1, do not have to be reported until March 2013. For landfills that estimate annual waste disposal quantity using equation HH-3, the inputs to that equation (specifically, the last year waste was accepted and the landfill capacity) are also deferred. See Federal Register volume 76, page 53057, dated August 25, 2011, or Table A-6 of rule subpart A for a list of the specific data elements for which reporting has been deferred. The Federal Register notice and a memo listing deferred data elements is on the "Confidential Business Information" page of EPA's Greenhouse Gas Reporting Program website.

## What must be reported by all landfills?\* (continued)



- Waste composition for each waste category listed in Table HH-1 that is used to calculate methane generation
- For each waste type used to calculate generation in Eq. HH-1, report degradable organic carbon (DOC), methane correction factor (MCF), fraction of DOC dissimilated ( $DOC_F$ ) and rate ( $k$ )
- If an MCF value other than the default was used, details about the active aeration of the landfill
- Fraction of  $CH_4$  in landfill gas and how it was determined
- Surface area containing waste
- Cover types
- Surface area associated with each cover type
- Modeled methane generation rate (Eq. HH-1)

\* EPA has deferred reporting of subpart HH data elements that are inputs to emission equations for calendar years 2010 and 2011 until March 31, 2013. See 76 FR 53057, August 25, 2011, and the GHGRP website "Confidential Business Information" page for list of deferred data elements.

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This slide shows several additional data that must be reported by all landfills. Note that the level of detail of waste composition information reported depends on whether you use the bulk waste, modified bulk waste, or material-specific waste composition method for equation HH-1. This list also includes other inputs to equation HH-1 and the modeled methane generation rate resulting from equation HH-1.

## What else do landfills *without* gas collection systems report?\*



- Annual methane emissions, metric tons (from Eq. HH-5)
- Whether passive vents and/or passive flares are present

\* EPA has deferred reporting of subpart HH data elements that are inputs to emission equations for calendar years 2010 and 2011 until March 31, 2013. See 76 FR 53057, August 25, 2011, and the GHGRP website "Confidential Business Information" page for list of deferred data elements.

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Landfills *without* gas collection systems have two additional items to report: the annual methane emissions from equation HH-5 and an indication of whether passive vents and/or passive flares are present at the landfill.

## What else do landfills with gas collection systems report?\*



- Total flow of landfill gas collected for destruction
- CH<sub>4</sub> concentration of gas collected for destruction
- Monthly average temperature and pressure (or statement monitor internally corrects for these)
- Whether flow and CH<sub>4</sub> concentration are measured on different bases (wet vs. dry) and if so, monthly average moisture content
- Whether destruction occurs at the landfill facility or off-site; if at landfill, operating hours of primary destruction device and backup device and DE used
- Annual quantity of methane recovered (Eq. HH-4)

\* EPA has deferred reporting of subpart HH data elements that are inputs to emission equations for calendar years 2010 and 2011 until March 31, 2013. See 76 FR 53057, August 25, 2011, and the GHGRP website "Confidential Business Information" page for list of deferred data elements.

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However, landfills *with* gas collection systems have several additional items to report. These include the flow and concentration measurements used to calculate gas recovery, how the gas is destroyed, and the annual quantity of methane recovered from equation HH-4.



## What else do landfills with gas collection systems report?\*

(continued)



- Description of gas collection system
  - Manufacturer, capacity, number of wells
  - Surface area, waste depth, and cover type for areas within the landfill (as specified in Table HH-3)
  - Estimated gas collection efficiency
  - Annual operating hours of collection system
  - Whether passive vents and/or passive flares are present
- Methane generation calculated two ways:
  - Modeled CH<sub>4</sub> generation adjusted for soil oxidation (Eq. HH-5)
  - CH<sub>4</sub> generation calculated from methane recovered and collection efficiency (Eq. HH-7)

\* EPA has deferred reporting of subpart HH data elements that are inputs to emission equations for calendar years 2010 and 2011 until March 31, 2013. See 76 FR 53057, August 25, 2011, and the GHGRP website "Confidential Business Information" page for list of deferred data elements.

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Landfills with gas collection systems must also report information about the gas collection system—for example, the surface areas and cover types that are used to estimate collection efficiency. They must also report the methane generation calculated in both of the two ways listed earlier in this module.

## What else do landfills with gas collection systems report?\*

(continued)



- Generation value used as input to methane emission calculation in Eq. HH-6 and how it was determined (e.g., from Eq. HH-1 or HH-4)
- Methane emissions calculated using Eq. HH-6 ( $\text{CH}_4$  generation minus  $\text{CH}_4$  recovered, adjusted for soil oxidation and destruction efficiency)
- Methane emissions calculated using Eq. HH-8 (based on  $\text{CH}_4$  recovered and collection efficiency, adjusted for soil oxidation and destruction efficiency)

\* EPA has deferred reporting of subpart HH data elements that are inputs to emission equations for calendar years 2010 and 2011 until March 31, 2013. See 76 FR 53057, August 25, 2011, and the GHGRP website "Confidential Business Information" page for list of deferred data elements.

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Landfills with gas collection systems must also report emissions calculated in both of the two ways discussed earlier in this module.

## What must be recorded?



- Information required by 98.3(g) of subpart A
- Calibration records for all monitoring equipment
- Methods or manufacturers specifications used for calibrations
- Records of measurements made to determine tare weights and working capacities by vehicle/ container type if used to determine annual waste quantities

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You must keep records of the information required by 98.3(g) of subpart A. Further information on subpart A is contained in the module on Reporting, Monitoring, and Recordkeeping Requirements. You must also keep calibration records for all monitoring equipment, including the methods or manufacturer's specifications used for calibrations. You must also keep records of measurements made to determine tare weights and working capacities of vehicle/container types if these were used to determine annual waste quantities.

You can find resources for additional information at the end of this online training. Note that several documents addressing frequently asked questions about landfills are available on EPA's GHGRP website.

This module concludes the online training on the Greenhouse Gas Reporting Program. We hope you've found the information useful. Feedback to EPA is always welcomed.

Note that the brief section that immediately follows this concluding module points to resources for additional information.



## **For More Information**

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EPA has developed a number of tools and documents to assist in understanding and complying with the greenhouse gas reporting rule. These resources are intended for informational and instructional purposes only. Facility owners or operators and suppliers are responsible for determining how they would be affected by the requirements of the rule.

# Technical Assistance



- Online applicability tool: Assists potential reporters in assessing whether they are required to report
- Technical assistance materials (e.g., Information Sheets, Monitoring Checklists, FAQs)
- Trainings and webinars
- Information on the electronic greenhouse gas reporting tool (e-GGRT)
- RSS available to announce new outreach materials

For complete list of materials and training schedule, see:  
[www.epa.gov/climatechange/emissions/ghgrulemaking.html](http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)

■? If links from this presentation fail to launch, add the presentation url to the allowed web addresses in your pop-up blocker settings.

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Technical assistance is available on EPA's website. For instance, an online applicability tool will help you determine whether you are covered by the rule.

In addition, you can find a variety of technical materials, including information sheets, checklists, and responses to frequently asked questions to help you comply with the rule. Also, you can sign up for upcoming trainings and webinars, as well as download materials from previous sessions.

There is also information on the electronic greenhouse gas reporting tool, known as e-GGRT [pronounced "egret," like the bird].

And, you can sign up for EPA's RSS feed to be notified of new materials as they become available.

## Additional Information



- [www.epa.gov/climatechange/emissions/ghgrulemaking.html](http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)
  - Preamble and rule
  - Technical background documents on source categories
  - Comment response documents
  - Link to rulemaking docket
  - Technical assistance materials

The website has other information to help you understand the rule, including all of the technical background documents that supported the rule.

About 40 volumes of EPA responses to public comments on the rule are also available on the website. These documents are organized by source category and other general topics. Between these documents and the final rule preamble, you can review EPA's responses to thousands of public comments received and gain insight into questions you might have on how to interpret the rule for your facility.

# Online Help Center



- The website's Rule Help Center page functions as a gateway to information and assistance

**Rule Help Center**

Greenhouse Gas Reporting Program | Rulemaking Notices | Resources by Subpart

Training and Testing Opportunities | Timeline | Proposed Rules | Data Reporting System

Rule Help Center

**Fact Sheet**

**Mandatory Reporting of Greenhouse Gases (40 CFR part 99)**

**Rule Overview**

- On October 30, 2009, the U.S. Environmental Protection Agency (EPA) published a rule for the mandatory reporting of greenhouse gases (GHG) from large GHG emissions sources in the United States. Implementation of 40 CFR part 99 is required by the Greenhouse Gas Reporting Program (GGRP).
- This comprehensive, nationwide emissions data will provide a better understanding of the sources of GHGs and will guide development of the policies and programs to reduce emissions. The publicly available data will allow reporters to track their own emissions, compare them to similar facilities and aid in identifying cost-effective opportunities to reduce emissions in the future.
- 40 CFR part 99 applies to direct greenhouse gas emitters, fossil fuel suppliers, industrial gas suppliers, and facilities that report CO<sub>2</sub> underground for sequestration or other reasons. In general, the threshold for reporting is 25,000 metric tons in mass of carbon dioxide (CO<sub>2</sub>) equivalent per year. Reporting is at the facility level, except for certain suppliers of fossil fuels and industrial greenhouse gases.
- An estimated 83-89 percent of the total U.S. GHG emissions from approximately 12,000 facilities are covered by this final rule.
- Most small businesses would fall below the 25,000 metric ton threshold and are exempted to reduce GHG emissions to EPA.
- 40 CFR part 99 requires reporting by 41 industrial categories. For calendar year 2010, facilities in 30 categories are required to report. An additional 11 categories have emissions for calendar year

**Rule Help Center**

- Frequently Asked Questions
- Applicability Tool
- General Fact Sheet (PDF) (4 pp, 50K)

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The Help Center page of EPA's program website provides access to a wealth of information about the rule as well as a means of obtaining further assistance. Linked resources to get you directly to additional information include:

- General information about the rule, including a general fact sheet.

# Online Help Center



- The website's Rule Help Center page functions as a gateway to information and assistance.

**Rule Help Center**

Greenhouse Gas Reporting Program | Rulemaking Notices | Resources by Subpart

Proposed Rules | Data Reporting System | **Rule Help Center**

EPA has developed a number of tools to help you comply with the Greenhouse Gas Reporting Program. These tools are intended for informational and educational purposes and are not intended to be used as a substitute for the requirements of Part 98. The tools are intended to help you understand the requirements of Part 98. Compliance with all Federal requirements is the sole responsibility of each facility or source.

**Resources by Subpart**  
The [Resources by Subpart](#) page provides information on the sheets, checklists, technical support documents, and other resources for each rule subpart.

Rule Section	Subpart	Initial Reporting Year
98.10	<a href="#">Subpart A</a> —General Provisions	
98.20	Subpart B—(Reserved)	
98.30	<a href="#">Subpart C</a> —General Stationary Fuel Combustion Sources	2010
98.40	<a href="#">Subpart D</a> —Electricity Generation	2010
98.50	<a href="#">Subpart E</a> —Adipic Acid Production	2010
98.60	<a href="#">Subpart F</a> —Aluminum Production	2010

- Resources by subpart, including (for most subparts) proposed and promulgated rules, technical support documentation, response to comments documentation, an information sheet, and a monitoring checklist.



# Online Help Center



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**Rule Help Center**

Greenhouse Gas Reporting Program | Rulemaking Notices | Resources by Subject

Training and Funding Opportunities | Timeline | Proposed Rules | Data Reporting System

**Rule Help Center**

EPA has developed a number of resources to assist in understanding and implementing the Greenhouse Gas Reporting Program. This page is intended for informational purposes only. For more information, please contact your local EPA office.

Federal Register Rulemaking Notices			
Federal Register Date	Citation	Action	Description
Pending	Pending	Proposed Rule	Technical Revisions and Clarifications to Subpart A, Subpart I, and Subpart W Prepublication Preamble and Rule (PDF) (2.8 pp, 311K)
08/25/2011	76 FR 53057	Final Rule	Action to defer reporting of certain data elements Preamble and Rule (PDF) (12 pp, 275K)
08/23/2011	76 FR 52659	Notice	Access by EPA Contractors to Confidential Business Information (CBI) Related to the Greenhouse Gas Reporting Program Notice (PDF) (4 pp, 192K)

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- Rulemaking notices, providing a chronological list of all Federal Register notices affecting any aspect of Part 98 rulemaking and implementation.

# Online Help Center



- The website's Rule Help Center page functions as a gateway to information and assistance.

**Rule Help Center**

Greenhouse Gas Reporting Program | Rulemaking Notices | Resources by Subpart

Proposed Rules | Data Reporting System | **Rule Help Center**

EPA has developed a number of tools and documents to assist in understanding complying with the Greenhouse Gas Reporting Program. Please note that these are intended for informational purposes only and do not constitute a legal opinion. Compliance with the requirements of Part 98 is the responsibility of the user.

### GHG Reporting Program Frequently Asked Questions (FAQs)

A printer-friendly version of the FAQs (PDF) (73 pp, 752K, [About PDF](#))

- [e-GGRT \(General\)](#)
- [e-GGRT Confidential Business Information \(CBI\)](#)
- [e-GGRT Facility Registration](#)
- [e-GGRT Sandbox Testing](#)
- [e-GGRT User Registration](#)
- [e-GGRT XML Reporting](#)
- [Subpart A: General Provisions](#)
- [Subpart C: General Stationary Fuel Combustion Sources](#)
- [Subpart D: Electricity Generation](#)
- [Subpart L: Fluorinated Gas Production](#)
- [Subpart O: HFC-22 Production and HFC-22 Destruction](#)
- [Subpart P: Hydrogen Production](#)

- Frequently asked questions—hundreds of them—organized by topic in lists and in a database that you can easily search by topic (by subpart, for instance) or keywords.

# Online Help Center



- The website's Rule Help Center page functions as a gateway to information and assistance.

The screenshot displays the EPA Rule Help Center website. At the top, there are navigation tabs: "Greenhouse Gas Reporting Program", "Rulemaking Notices", and "Resources by Subject". Below these, there are sub-tabs: "Proposed Rules", "Data Reporting System", and "Rule Help Center". The main content area is titled "Applicability Tool" and includes an "Assessment Worksheet for an Active MSW Landfill". The worksheet contains instructions and a table for inputting data.

**Rule Help Center**

Greenhouse Gas Reporting Program | Rulemaking Notices | Resources by Subject

Proposed Rules | Data Reporting System | Rule Help Center

EPA has developed a number of tools complying with the Greenhouse Gas Reporting Program. The tools are intended for informational and advisory purposes. Compliance with all Federal rules is the sole responsibility of each facility owner.

**Applicability Tool**

**Assessment Worksheet for an Active MSW Landfill**

**Instructions:** Use this worksheet to assess whether your active MSW landfill is subject to the rule.

Is the active landfill's capacity less than 250,000 metric tons?

Does your operation have landfill gas recovery and collect 900 metric tons CH<sub>4</sub> or more per year?

**Calculate the active MSW landfill's estimate of adjusted CH<sub>4</sub> generation (i.e., the adjusted CH<sub>4</sub> generation for calendar year 2011).**

**Instructions:** Enter values below and then select the Calculate button.

Calculation Variables	Value	Unit of Measure
Quantity of waste in place through 2010	<input type="text"/>	Metric tons
Year landfill opened*	<input type="text"/>	Calendar year
Adjusted CH <sub>4</sub> Generation for Calendar Year 2011		Metric tons CO <sub>2</sub> e

Calculate Next »

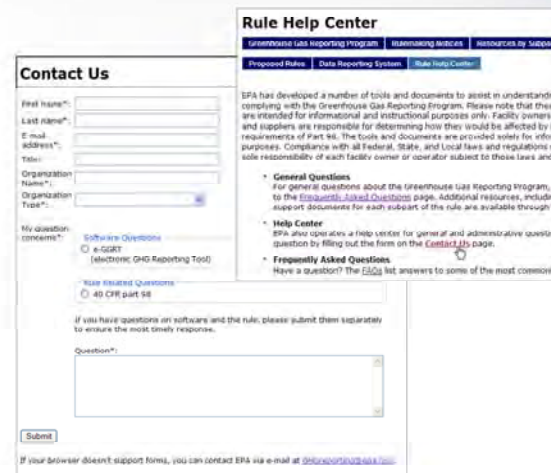
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- The Applicability Tool, a website with branching logic and online emission calculators for helping facility owners or operators assess rule applicability.

# Online Help Center



- The website's Rule Help Center page functions as a gateway to information and assistance.



The screenshot displays the EPA Rule Help Center interface. On the left is a 'Contact Us' form with fields for First Name, Last Name, E-mail address, Title, Organization Name, and Organization Type. Below these are radio buttons for 'My question concerns:' with options for 'Software Questions' (e-GHRT, Electronic GHG Reporting Tool) and 'Rule Related Questions' (40 CFR part 98). A text area for 'Question\*' is provided, along with a 'Submit' button. On the right, the 'Rule Help Center' header includes navigation links for 'Greenhouse Gas Reporting Program', 'Emissions Indices', 'Resources by Subject', 'Proposed Rules', 'Data Reporting System', and 'Rule Help Center'. The main content area contains introductory text about EPA's tools and documents, and three sections: 'General Questions' (linking to the Frequently Asked Questions page), 'Help Center' (linking to the Contact Us page), and 'Frequently Asked Questions' (linking to the FAQ list).

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- And an e-mail helpline form you can use to contact EPA with your questions about the GHGRP. (If you use the helpline form, it's important to be very explicit in your questions and provide specific details on your facility, so that EPA can provide an appropriate answer. At the same time, be careful not to submit any sensitive or otherwise confidential business information, since anything you submit via the helpline may be available to the public. Also be sure to check off whether you have a software-related question about the reporting tool or a technical question about rule requirements.

We hope you find the GHGRP information on EPA's website useful. Same for the information in this online training. Remember, feedback to EPA is always welcomed.