

**MEMORANDUM**

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**DATE**: November 21, 2014

**SUBJECT**: Data from U.S. GHG Inventory and GHGRP in the EPA Nonpoint Oil and Gas Emissions Estimation Tool

The purpose of this memo is to summarize information on use of data from EPA’s Inventory of Greenhouse Gas Emissions and Sinks (U.S. GHG Inventory) and EPA’s Greenhouse Gas Reporting Rule in the Nonpoint Oil and Gas Emission Estimation Tool (tool).

Where available, the tool utilizes activity and emission factor data directly from state and local agencies to calculate emissions. Where state input data are not available, nationally-averaged default data is used. In most cases, this data was derived from work done in 2012 by the Central States Air Resource Agencies (CenSARA) to develop an improved area source (nonpoint) oil and gas emissions inventory for their region. In order to supplement this data and provide more nationally averaged data, ERG and EPA analyzed information in the U.S. GHG Inventory and Subpart W of the Greenhouse Gas Reporting Rule for potential use in the tool. As a result of this analysis, data from these EPA sources were used in the tool to estimate emissions for several source categories. Specifically, data from these programs were used in the following source categories:

* Condensate Tanks;
* Liquids Unloading;
* Pneumatic Devices; and
* Well Completions.

A description of the input data for each of the categories is provided below. Note that this data has only been used for counties not covered under the CenSARA inventory efforts, or for those counties where states have not provided updated activity and emission factors to EPA.

**Condensate Tanks**

The following control parameters used in the U.S. GHG Inventory[[1]](#footnote-1) have been used in the tool as default data to estimate emissions from condensate tanks:

* 50% of condensate tanks are controlled; and
* For controlled tanks, the control efficiency is 80% (represents the combined overall control efficiency, combining capture and control).

**Liquids Unloading**

The 2013 U.S. GHG Inventory[[2]](#footnote-2) was updated to reflect a newly available data source on emissions from liquids unloading. Specifically, EPA analyzed a report issued in September of 2012 by the American Petroleum Institute (API) and America’s Natural Gas Alliance (ANGA) entitled “Characterizing Pivotal Sources of Methane Emissions from Natural Gas Production”. Using operator survey data presented in the report, EPA developed updated vent rates for liquids unloading activities based on U.S. Energy Information Administration (EIA) Supply Regions. Figure 1 below shows the six EIA Supply Regions used in the U.S. GHG Inventory.

Figure 1. EIA Supply Region Map

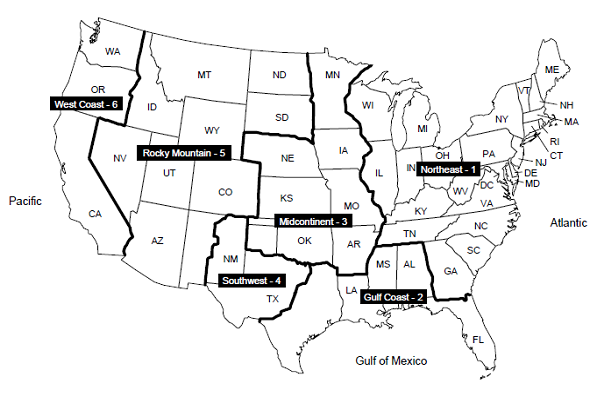


Table 1 below shows the vent rates by EIA Supply Region for each venting scenario used in the U.S. GHG Inventory.

Table 1. Liquids Unloading Vent Rates from the U.S. GHG Inventory

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EIA Supply Region** | **Wells venting with plunger lift (%)** | **Wells venting without plunger lift (%)** | **Vent Rate for Wells with Plunger Lift (scf/yr/well) a** | **Vent Rate for Wells without Plunger Lift (scf/yr/well) a** |
| North East | 4.3 | 11.26 | 314,626 | 166,174 |
| Midcontinent | 2.33 | 4.14 | 1,379,958 | 230,199 |
| Rocky Mountain | 12.88 | 1.52 | 154,300 | 2,579,444 |
| South West | 3.32 | 19.47 | 3,547 | 96,748 |
| West Coast | 7.59 | 6.80 | 345,343 | 304,048 |
| Gulf Coast | 2.32 | 7.08 | 70,021 | 300,592 |

a Whole gas vent rates.

In order to utilize this information within the structure and methodology used in the tool, a weighted vent rate was developed for all wells in a county. This is needed as the tool does not contain distinct counts of wells with plunger lifts, and wells without. Calculation of a weighted vent rate is accomplished using the data in Table 1. For example, the updated default liquids unloading vent rate for the North East EIA Supply Region is calculated as follows (using the 2011 value of 153,773 wells in the North East as shown in Table 2):



= 32,421 (scf/yr/well)

Table 2 shows the resultant updated default vent rates used in the tool (data from the West Coast Region has been used for the State of Alaska). As these are annual vent rates, where this information is used in the tool, the frequency of liquids unloading venting has been set equal to one event per year. Additionally, as these rates reflect some level of control (through the use of plunger lifts), where this information is used in the tool, a value of “NA” is used for the control method, and no additional reduction from use of controls has been applied. See the tool documentation for detailed information on the methodology used to estimate emissions for liquids unloading.

Table 2. Default Liquids Unloading Vent Rates for the Tool

| **EIA Supply Region** | **Gas Well Count** | **Default Vent Rate for all Wells (scf/yr/well) a** |
| --- | --- | --- |
| North East | 153,773 | 32,421 |
| Midcontinent | 87,193 | 41,659 |
| Rocky Mountain | 58,285 | 59,047 |
| South West | 41,919 | 18,956 |
| West Coast | 1,516 | 46,884 |
| Gulf Coast | 71,629 | 22,913 |

a Whole gas vent rates.

**Pneumatic Devices**

Subpart W of the Greenhouse Gas Reporting Rule[[3]](#footnote-3) prescribes bleed rates for low bleed, high bleed, and intermittent bleed devices that are to be used by reporters to estimate emissions. These rates, shown in Table 3 below, have been incorporated into the tool as default bleed rates for pneumatic devices used at oil and gas wells.

Table 3. Whole Gas Bleed Rates for Pneumatic Devices from Subpart W of the Greenhouse Gas Reporting Rule

|  |  |
| --- | --- |
| **Onshore petroleum and natural gas production** | **Bleed Rate (scf/hour/component)** |
| Low Bleed Pneumatic Devices | 1.39 |
| High Bleed Pneumatic Devices | 37.3 |
| Intermittent Bleed Pneumatic Devices | 13.5 |

The U.S. GHG Inventory utilizes per-well pneumatic device counts that are used in the tool. For gas wells, the total device counts in the U.S. GHG Inventory were used to derive default device counts by device type using the distribution between low, intermittent, and high bleed devices found in the CenSARA inventory and survey effort.

The updated default device counts are shown in Table 4 below for each EIA Supply Region. (Note that for oil wells, the total device counts by device type will be updated in future inventories as EPA has identified a calculation error for the oil well device counts shown in Table 4.)

Table 4. Pneumatic Device Counts for Oil and Gas Wells from the U.S. GHG Inventory

| **EIA Supply Region** | **Oil Well Device Counts** | | | **Gas Well Device Counts** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Low Bleed** | **High Bleed** | **Intermittent Bleed** | **Low Bleed** | **High Bleed** | **Intermittent Bleed** |
| North East | 0.762 | 0.762 | 0 | 0.144 | 0.222 | 0.120 |
| Midcontinent | 0.762 | 0.762 | 0 | 0.460 | 0.709 | 0.382 |
| Rocky Mountain | 0.762 | 0.762 | 0 | 0.434 | 0.669 | 0.360 |
| South West | 0.762 | 0.762 | 0 | 0.394 | 0.607 | 0.327 |
| West Coast | 0.762 | 0.762 | 0 | 0.297 | 0.458 | 0.247 |
| Gulf Coast | 0.762 | 0.762 | 0 | 0.206 | 0.318 | 0.171 |

**Well Completions**

Emissions from unconventional gas well completions are estimated in the tool using a default potential (uncontrolled) factor of 9,000 (MCF/completion) and information on controls. A potential factor is a national average estimate of the methane (CH4) that would be released from the completion or workover of a gas well with hydraulic fracturing, in the absence of controls. Potential methane is then adjusted to account for reductions from control technologies. This method is consistent with the 2013 U.S. GHG Inventory.[[4]](#footnote-4)

The vent rate for conventional gas well completions from the GHG Inventory was used in the tool, but revised to a potential (uncontrolled) factor to utilize this information within the structure and methodology used in the tool. The revised potential (uncontrolled) factor is 1,884 (ft3/completion). This factor is based on a controlled (flared) vent rate of 733 (ft3/completion) used in the U.S. GHG Inventory, back-calculated to reflect the following default control assumptions used in the tool:

* 28.43% of completions are flared;
* 98% flare control efficiency;
* 90% flare capture efficiency; and
* 36% of completions are “Green Completions” and have no emissions.

Therefore, the default uncontrolled vent rate is:



 = 1,884 (ft3/completion)

EPA has not developed a default emissions estimate for oil well completions for use in the tool. On April 15, 2014, EPA released for external peer review five technical white papers on potentially significant sources of emissions in the oil and gas sector (http://www.epa.gov/airquality/oilandgas/whitepapers.html). The white papers focus on technical issues covering emissions and mitigation techniques that target CH4 and volatile organic compounds (VOCs). EPA is currently assessing data on hydraulically fractured oil well completions and workovers. Like other sources in the tool, where state data on oil well completion emissions has been provided, this data has been used in the tool.

1. http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html [↑](#footnote-ref-1)
2. http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2013-Main-Text.pdf [↑](#footnote-ref-2)
3. http://www.epa.gov/ghgreporting/index.html [↑](#footnote-ref-3)
4. EPA’s estimation method for hydraulically fractured gas well completions and workovers has been updated in the most recent U.S. GHG Inventory to use technology-specific emission factors developed with data from GHGRP. The updated emission factors can be found in table A-126 on page A-186 of the following link: <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Annex-3-Additional-Source-or-Sink-Categories.pdf>. Future versions of the tool will reflect this update and will include further improvements in consistency of methods between NEI and GHG Inventory.  [↑](#footnote-ref-4)