December 2014

Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2013: Potential Revisions to Liquids Unloading Methodology for Natural Gas Systems

Overview of Methodology in 2013 and 2014 Inventories

Data from a 2012 report published by the American Petroleum Institute (API) and America's Natural Gas Alliance (ANGA)[1] were used beginning with EPA's 1990-2011 Inventory released in 2013 ("2013 Inventory") to develop regional activity data and regional emission factors for gas well liquids unloading activities in natural gas systems. For more information, see memo *Overview of Updates to the Natural Gas Sector Emissions Calculations for the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*, available at http://epa.gov/climatechange/Downloads/ghgemissions/fact-sheet-oil-and-gas-estimates-in-2013-inventory.pdf.

Analysis for Potential Updates for 2015 Inventory

In preparation for the 2015 Inventory, EPA compared liquids unloading emissions data for 2011 and 2012 from the 2014 Inventory to data reported to GHGRP as of August 18, 2014. As shown in Table 1, there were significant regional differences between the Inventory emissions estimates and the data reported to the GHGRP for the same year. For example, liquids unloading emissions reported to GHGRP in the Rocky Mountain and South West NEMS regions are over twice as high as emissions for these regions in the Inventory. In contrast, Inventory emissions for the North East and Mid-Continent regions are more than five times as high as GHGRP emissions for these regions. EPA is considering options to address the differences between the Inventory and GHGRP.

As discussed in the "Planned Improvements" section of the 2014 Inventory, EPA investigated the impact of using national-average data from the API/ANGA report as opposed to the regional data. Table 2 compares four sets of data on liquids unloading. The first column presents the data from year 2012 in the 2014 Inventory and is based on regional activity and emission factors developed from the API/ANGA study. The second column of data is the information reported under the GHGRP for year 2012 (as of August 18, 2014). The third column is the result of replacing regional emission factors for year 2012 in the Inventory with national-average emission factors for liquids unloading with and without plunger lifts that were developed from the API/ANGA study. The fourth column replaces the regional proportions of wells venting during liquids unloading with the national-average proportions that were reported in the API/ANGA study in addition to using national-average emission factors. For the national average proportions of wells venting during liquids unloading, the wells vented with plunger lifts were tracked separately from the wells vented without plunger lifts.

Table 1. Comparison of 2014 Inventory and GHGRP Emissions from Liquid Unloading

	Methane Emissions (MT CO_2e)*				
NEMS Region	**GHGRP 2011 Emissions**	**Inventory 2011 Emissions**	**GHGRP 2012 Emissions**	**Inventory 2012 Emissions**	**GHGRP 2013 Emissions**
North East	407,027	2,077,962	603,649	2,115,336	350,790
Mid-Continent	245,585	1,798,774	292,158	1,790,352	126,146
Rocky Mountain	4,558,417	1,857,979	3,510,830	1,837,101	2,585,559
South West	1,334,024	304,100	943,095	304,888	849,077
West Coast	153,111	44,541	26,846	43,392	92,619
Gulf Coast	634,323	747,532	539,133	748,132	431,051

[1] "Characterizing Pivotal Sources of Methane Emissions from Natural Gas Production" (September 2012). Available online: http://www.api.org/~/media/Files/News/2012/12-October/API-ANGA-Survey-Report.pdf

TOTAL	**7,332,489**	**6,830,887**	**5,915,710**	**6,839,201**	**4,435,241**

*Methane GWP=25

Table 2. National Emissions Estimates for Liquids Unloading

Region	Methane Emissions (MT CO_2e)*			
	2012 Emissions (In 2014 Inventory)	GHGRP 2012 Emissions	Inventory 2012 Emissions Using National Average EFs	Inventory 2012 Emissions Using National Average EFs and Activity Assumptions
North East	2,115,336	603,649	2,967,625	2,669,870
Mid-Continent	1,790,352	292,158	843,800	1,814,631
Rocky Mountain	1,837,101	3,510,830	1,552,525	1,401,015
South West	304,888	943,095	1,110,200	696,792
West Coast	43,392	26,846	37,175	35,208
Gulf Coast	748,132	539,133	860,250	1,291,289
TOTAL	**6,839,201**	**5,915,710**	**7,371,575**	**7,908,807**

*Methane GWP=25

Moving from regional-level to national-level emission factors and activity factors did not improve regional consistency with the GHGRP emissions.

EPA anticipates that for future Inventories, it may be possible to calculate updated emission factors and/or activity data using GHGRP data that will be reported starting in 2015. Data currently available through GHGRP include total methane emissions from liquids unloading at the sub-basin level for each reporter. Data that would allow EPA to develop an updated approach for liquids unloading using GHGRP data include data on the number of wells venting for liquids unloading included in each reporter's emissions total, and the number of those wells with and without plunger lifts.

Request for Stakeholder Feedback

- EPA seeks feedback on alternative approaches and data sources to bring the Inventory into better agreement with the regional trends seen in the GHGRP data.
- EPA seeks feedback on inconsistency between the API/ANGA survey results and the GHGRP data for the Rocky Mountain, North East, and Mid-Continent NEMS regions.
- A recently released study (Allen et al. 2014) measured emissions from liquids unloading.[2] EPA seeks feedback on how data from the study may be used to update emissions estimates for this source.

[2] Allen et al. (2014) *Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States: Liquid Unloadings*. Environmental Science and Technology. Available at http://pubs.acs.org/doi/abs/10.1021/es504016r.