Summary of Stakeholder Workshop on the U.S. GHG Inventory for Natural Gas Systems Held September 13-14, 2012 in Washington, DC

On September 13-14, 2012 EPA held a stakeholder workshop on key aspects of the estimates of greenhouse gas emissions from natural gas systems in the Inventory of U.S. Greenhouse Gas Emissions and Sinks (Inventory). At the workshop, EPA presented information on existing emissions methodologies and data and also presented options under consideration for updating and improving the Inventory, based on previous stakeholder comments on the Inventory estimates. Stakeholders presented information on new and upcoming data and analyses related to these estimates.

The workshop agenda and presentations are available on the EPA website: http://www.epa.gov/climatechange/ghgemissions/Sept2012stakeholderworkshop.html. A workshop attendee list is included as Attachment A to this report. The description below provides details of sessions and subsequent discussion.

Thursday, September 13, 2012

Open: Background on Natural Gas and GHG Inventory

To open the Workshop, EPA presented the context for United Nations Framework Convention on Climate Change (UNFCCC) reporting, schedule and progress, methodological approach, and results. Additionally, EPA presented background information on the Greenhouse Gas Reporting Program (GHGRP), integration of GHGRP data into the GHG Inventory, and considerations related to 40 CFR Part 98 subpart W (Petroleum and Natural Gas Systems). In the final presentation of this session, EPA provided information on natural gas in the GHG Inventory, including general methodology, calculation of national GHG emissions, emission factors and activity data sources, updates in the 2011 and 2012 Inventories and planned improvements in the 2013 Inventory.

Responding to stakeholder questions, EPA stated that 2013 will be the first year an updated methane global warming potential (GWP) of 25 will be used in the Inventory, and noted that there are no plans to change the integration time for determination of GWP from 100 years.[1] EPA also stated that New Source Performance Standard (NSPS) Subpart OOOO reductions will be addressed in development of future inventories, noting that the earliest Inventory that will include impacts is 2014 since reductions take effect beginning 2012. Stakeholders asked whether EPA is considering changing the methodology and/or format of the report which separates pre-reduction emissions, reductions, and net emissions. EPA stated that reductions will be discussed and clarified during presentations, and that Subpart W data may provide options to consider for alternative approaches such as calculating net emissions directly.

Session A: Production Sector

Overview of Production Sector in the GHG Inventory

EPA presented a brief overview of the current Inventory methodology and estimates of natural gas production sector emissions sources including fugitives, drilling and well completions, well workovers, liquids unloading, condensate tanks, blowdowns, upsets, etc. As noted below, more detailed discussions of the specific source categories emissions estimates and calculation methodologies were provided in the presentations that followed.

[1] The first inventory that will use the new GWP value for methane will cover the 1990-2013 time series, and will be submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in April 2015.

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Gas Well Counts

EPA presented background information, current data sources, and updates under consideration. Pioneer presented results of American Petroleum Institute/America's Natural Gas Alliance (API/ANGA) survey conducted in 2011, which aimed to gather activity data from conventional and unconventional natural gas production to improve its characterization of nationwide GHG emissions; and a gas well count comparison among the API/ANGA Survey, Subpart W database file, EPA National Inventory, and U.S. Department of Energy (DOE), Energy Information Administration (EIA) data.

In stakeholder discussions on current Inventory data, EPA clarified that, in the 2012 Inventory, the well coverage for hydraulically fractured natural gas wells in the 2012 Inventory is limited and was based on data from coalbed methane (CBM) and the Barnett Shale (omitting nearly 20 shale plays and all tightsands formations because the data were unavailable). EPA also explained that the GHG Inventory well counts data come from EIA, and said that well counts that appear in the 2009 GHGRP Technical Support Document (TSD) were for the year 2006, whereas the counts in the Inventory are for each year of the Inventory, with the most recent well counts being from 2010.

Liquids Unloading

EPA presented information on the methodology update from the 2010 to the 2011 Inventory, the current Inventory method, and updates under consideration. BP followed with a presentation of the results from the 2011 API/ANGA Survey, including comparison of these results to EPA assumptions and calculated methane emission factor. BP noted that the national emissions estimate calculated with the survey data was 93% lower than EPA's national estimate.

Stakeholders discussed assumptions used in liquids unloading calculations, including blowdowns after unloading, and venting associated with plunger lifts. Stakeholders agreed there is a need for further work and analysis to characterize emissions from liquids unloading.

Stakeholders also discussed uncertainty analyses. BP stated that the API/ANGA study did not include a formal error analysis. EPA stated that broadly across the Inventory, Monte Carlo intervals are developed for each source for each year; for methodologies like this, expert judgment of probability distribution for each source would be involved.

Well Completions and Workovers for Wells with Hydraulic Fracturing

EPA presented background information, information on its methodology prior to the 2011 Inventory, 2011 methodological updates, and updates currently under consideration. Noble presented results of the 2011 API/ANGA Survey, including a gas well completions count comparison between the API/ANGA Survey, EPA National Inventory, and IHS data. Noble also recommended dropping "conventional" and "unconventional" terminology. Chesapeake presented results of the 2011 API/ANGA Survey, including refracture rate comparison with EPA Inventory assumptions, and comparison of API/ANGA and EPA-calculated emissions by NEMS region. Chesapeake recommends use a refracture rate of about 1 percent (found by the API/ANGA survey and independently used in the NSPS Subpart OOOO impacts analysis) rather than 10 percent (found in the Inventory). EPA confirmed the 1% refracture rate used in the NSPS is the most recent estimate and will be used in the upcoming Inventory.

MIT presented an analysis of variability in well performance levels and its impact on fugitive emissions estimates, and also shared results of their estimation of total fugitive GHG emissions associated with the completion of wells in the main U.S. shale plays under various control scenarios in 2010. Devon provided an assessment of the difference in methane emissions when wells use and do not use reduced emission

completion technology. Devon stated there are differences in typical flowback duration, with the duration being less for wells that do not use reduced emission completion technology.

Stakeholders discussed the outcome of MIT's study, including comparison to emission factors used by EPA. MIT stated that the emission factors used in their study were similar to EPA's factors. Stakeholders also discussed a tradeoff between productivity and time allowed for flowback.

Stakeholders also asked EPA to clarify some aspects of the current and planned Inventories, such as how ongoing voluntary reductions that are not reported to Gas STAR could be addressed. EPA stated that the challenge remains how to identify and quantify these reductions. The stakeholders did not provide any immediate suggestions. Stakeholders also asked how the Inventory will calculate reductions as some Gas STAR activities become mandatory. Emissions reductions will occur throughout 2012 but will not be reflected in Gas STAR for the full year as a result of NSPS. EPA responded that they will continue to consider methods to take NSPS reductions into account in the Inventory, and that these reductions will first impact emissions calculations in the Inventory that will be released in 2014, with emissions estimates for 1990-2012. Stakeholders asked whether Subpart W data submitted in 2012 will include counts of completions using hydraulic fracturing. EPA responded yes, and that additionally, Subpart W will provide counts for liquids unloading. In addition, there were questions on how completion emissions from oil wells are accounted in the inventory. EPA responded that that the petroleum systems inventory component captures emissions from associated gas wells, but at this point does not differentiate between completions that do or do not involve hydraulic fracturing. Finally, in response to a question on the steps EPA is taking to be consistent with EIA, EPA stated that the data used for total well counts are from EIA.

Other Production Sources

EPA presented a methodology overview focused on pneumatic device vents, compressor exhaust, and shallow water offshore platforms.

A stakeholder questioned EPA's basis for subtracting reductions associated with gas starters from compressor exhaust emission. EPA stated they will further investigate this issue. EPA asked stakeholders for their views on its current data sources and methodologies. Multiple stakeholders responded that some of the assumptions are based on outdated 1992 data and these generally need to be updated to reflect current conditions. Stakeholders also discussed how tank emissions fit into this category. EPA stated that tanks in the production sector emitted 3.5 $MMTCO_2e$ in 2010.

Area-based Measurements

The National Oceanic and Atmospheric Administration (NOAA) presented their methodology and evaluation of results from methane detection and source attribution studies using a variety of ambient observations, i.e., from aircraft flyovers and fixed ground measurements. Broadly, for the Denver-Julesburg basin, NOAA noted that measured concentrations indicated a source of emissions that is about two times greater than what would be accounted for using traditional inventory methods.

In response to stakeholder comments, NOAA clarified some technical aspects of its study. A stakeholder asked whether isotopic analysis is required to differentiate between natural gas and other sources. NOAA responded that it is not.

Friday, September 14, 2012

Session B: Processing, Transmission and Storage, and Distribution Sectors

During the first session of the second day of the workshop, EPA presented overviews of the calculation methodologies used to develop the emissions estimates for the processing, transmission and storage, and distribution sectors. The presentations provided an overview of the sector-level emissions estimates and calculation methodologies with more detailed information on the major sources within each sector. EPA did not receive stakeholder requests to present information for any of these sectors.

In response to stakeholder questions, EPA noted that the subpart W activity data that will be available in future years may be used to improve or replace the current Inventory method of scaling the number of compressors from the single 1992 point estimate. While the GHGRP data verification will be ongoing as the 2013 Inventory is developed, EPA is prioritizing review of subpart W data for key Inventory sources, such as liquids unloading. Stakeholders also pointed out that future activity in energy could increase exports, and asked whether EPA has a plan to account for potential change in the count of terminals. EPA stated that every year the Inventory is updated with new activity data for this source. Some stakeholders expect emissions estimates for the distribution sector to decrease dramatically when new emission factors for piping are developed and used. Stakeholders also noted that gate station emissions are much lower than currently calculated in the Inventory. In response, EPA asked, if new factors were to be developed from industry data from this source, would these factors be applicable to only the newer stations, or might they be used across the entire time series. Stakeholders responded that factors should be applied across the entire time series.

In response to a stakeholder question, EPA characterized the basis for incorporating Gas STAR reductions in the Inventory and levels of program engagement, stating that the program partners represent 59 percent of the natural gas industry.

Stakeholders and EPA discussed the application of various recent studies to future Inventory development, including ambient emission monitoring studies. EPA stated that in terms of Inventory applications, using ambient monitoring studies would be challenging.

Session C: Upcoming Studies, Other Analyses

GTI presented information on a study to develop emission factors for pipeline leaks based on field testing. Oklahoma City University discussed the EPA's use of Bayesian methodology found in the Technical Support Document for New Source Performance Standards, highlighting the sensitivity of the EPA's results to the EPA's choice of a tight prior and assumption of a known variance. Novim presented background and opportunity for participation in a "meta" study on natural gas. EDF presented background and opportunity for participation in a natural gas study.

Closing of Workshop

Next Steps

As discussed at the workshop, EPA is moving forward with updates to the 2013 Inventory.

- EPA is implementing discussed updates to well counts (improving coverage of wells with hydraulic fracturing), completions counts (improving coverage of completions with hydraulic fracturing), and refracture rate (incorporating a refracture rate of 1%), consistent with NSPS analysis.
- EPA continues to review data on liquids unloading, such as the API/ANGA data presented at the workshop, to assess updates to liquids unloading estimates.

- EPA is prioritizing review of GHGRP data for key Inventory sources, including liquids unloading and well completions with hydraulic fracturing.

The first draft of the next Inventory will be released for expert review in late 2012. Please contact Leif Hockstad at hockstad.leif@epa.gov if you would like to be added to the expert review roster.

The second draft of the next Inventory will be made available for public comment in early 2013, at http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

EPA looks forward to reviewing information and data from new studies presented by stakeholders, as they become available.

- GTI data on pipelines (expected 2013)
- EDF data on natural gas systems (expected 2014)
- Novim data on natural gas systems

Attachment A
Workshop Attendee List

First Name	Last Name	Affiliation
Ramón	Alvarez	Environmental Defense Fund
Erica	Bowman	ANGA
Clifton (Cliff)	Brown	Novim
Susan	Burke	U.S. EPA
Carey	Bylin	U.S. EPA
Mariella	Cacho	ICF
Alma	Cedeno	ConocoPhillips
Christopher	Clavin	Institute for Defense Analyses
Brian	Cook	U.S. EPA
Diana	Connett	Hess Corporation
Bob	Cowden	
David	Cozzie	U.S. EPA
Kristine	Cruz	
Thomas (Tom)	Curry	M.J. Bradley & Associates
Jacob	Dearmon	Oklahoma City University
Mark	DeFigueiredo	U.S. EPA
Rachel	Degenhardt	Enhesa
Dawn	DeVries	Encana
Sarah	Dunham	U.S. EPA
Margo	Eaddy	U.S. EPA
Amy	Emmert	API
Russell	Evans	Oklahoma City University
Beth	Everage	Greater Houston Partnership
Linus	Farias	PG&E
Khalid	Farrag	Gas Technology Institute
Paula	Fields	Eastern Research Group, Inc. (ERG)
Charity	Fleenor	Penn Virginia Oil & Gas
Fiji	George	Shell Exploration & Production Company
Brian	Gillis	CHK
Tracy	Gionfriddo	Northeast Utilities
Vignesh	Gowrishankar	Natural Resources Defense Council (NRDC)
Christopher	Graham	Penn Virginia Corporation
John	Graham	Clean Air Task Force
Kevin	Greene	
Samantha	Gross	IHS CERA
John (Jay)	Gundlach	Aurora Flight Sciences
Paul	Gunning	U.S. EPA
Chia	Ha	
Ed	Hance	Pioneer Natural Resources

First Name	Last Name	Affiliation
Lauren	Haney	ExxonMobil Production Company
Matthew (Matt)	Harrison	URS
Lee	Hinman	Noble Energy, Inc.
Leif	Hockstad	U.S. EPA
Larry	Hunsaker	ARB
Kevin	Hurst	OSTP
Daniel	Irvin	
Bill	Irving	U.S. EPA
Danny	Jaap	ConocoPhillips
David	Jacobson	U.S. EPA
Linsay	Jenkins	American Gas Association
Gilbert (Gib)	Jersey	ExxonMobil Research and Engineering
Brian	Jones	
Anna	Karion	NOAA/Univ.Colorado
Suzie	Kocchi	U.S. EPA
Dina	Kruger	Kruger Environmental Strategies LLC
Pamela (Pam)	Lacey	AGA
Tony	Larusso	National Grid
Miriam	Levon	The LEVON Group, LLC
Perry	Lindstrom	Energy Information Administration
David	Lyon	Environmental Defense Fund
Alexander	Macpherson	U.S. EPA
Casey	MacQueen	Eastern Research Group, Inc. (ERG)
David	McCabe	Clean Air Task Force
Ezra	McCarthy	National Grid USA
Michelle	McCracken	SWN
Chris	Minnucci	SAIC
David (Dave)	Mobraaten	PECO
Bruce	Moore	U.S. EPA Office of Air and Radiation
Briana	Mordick	Natural Resources Defense Council (NRDC)
Marie	Moreau	Mobile Gas Service Corporation
Duane	Muller	Eastern Research Group, Inc. (ERG)
Michael	Obeiter	World Resources Institute
Francis	O'Sullivan	MIT Energy Initiative
Gabrielle (Gaby)	Petron	NOAA/University of Colorado
Alice	Prior	Dominion Resources Inc.
Thomas	Rader	Southwest Gas Corporation
Carrie	Reese	Pioneer National Resources
Karin	Ritter	API
Emily	Rodgers	Anadarko Petroleum Corporation
Jesse	Sandlin	Devon Energy Corporation
Zachary (Zack)	Schaffer	Chesapeake Energy

First Name	Last Name	Affiliation
Craig	Segall	Sierra Club
Arushi	Sharma	AGA
David	Shin	API
Theresa (Terri)	Shires	URS
Jason	Smith	America's Natural Gas Alliance
Gordon (Reid)	Smith	BP
Eric	Stricklin	ICF
Colm	Sweeney	
Webster	Tasat	CA Air Resources Board
Elizabeth	Tate	
Austin	Taylor	
Eben	Thoma	U.S. EPA
James	Tichenor	BLM
Corrie	Towns	Vector Pipeline
Maureen	Turman	NiSource
Suzie	Waltzer	U.S. EPA
Christopher	Weber	IDA Science and Technology Policy Institute
Steve	Weight	Questar Corporation
Melissa	Weitz	U.S. EPA
James	Whetstone	NIST
Kristine	Wiley	GTI
Gary	Young	IES