Interstate Natural Gas Association of America

February 17, 2016

Via email (ghginventory@epa.gov and weitz.melissa@epa.gov)

Ms. Melissa Weitz
Climate Change Division
Office of Atmospheric Programs (MC-6207A)
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

RE: Response to EPA Request for Review of Revisions under Consideration for the Transmission and Storage Segments in the "Inventory of U.S. Greenhouse Gas Emissions and Sinks"

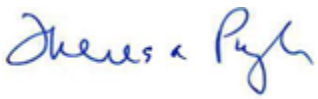
Dear Ms. Weitz:

The Interstate Natural Gas Association of America (INGAA) appreciates the opportunity to submit these comments to the Environmental Protection Agency (EPA or the Agency) on updates under consideration for the transmission and storage (T&S) segment in the annual Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI). EPA solicited comments in a January 20, 2016 email, which provided an internet link to a related memo, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: Revisions under Consideration for Natural Gas Transmission and Storage Emissions" (EPA Memo). INGAA appreciates that you allowed additional time for its submittal on February 17, 2016.

INGAA member companies primarily operate in the transmission and storage segment of the natural gas sector. Our 25 members represent the vast majority of the interstate natural gas transmission pipeline companies in the United States, operating approximately 200,000 miles of pipelines and serving as a vital link between natural gas producers and consumers. INGAA and its members have been actively engaged with EPA on GHG-related projects dating back to the EPA/Gas Research Institute project in the early 1990s. Those projects still serve as a primary reference for EPA GHGI estimates.

If you have any questions or wish to discuss these comments further, please contact Theresa Pugh, VP, Environment and Construction Policy at 202/216-5955 or tpugh@ingaa.org.

Sincerely,



Theresa Pugh

cc: Paul Gunning, U.S. EPA
Alexis McKittrick

Response to EPA Request for Review of Revisions under Consideration for the Transmission and Storage Segments in the "Inventory of U.S. Greenhouse Gas Emissions and Sinks"

INGAA agrees that updates to the GHGI emission estimation methods are warranted, as operations and emissions have changed since GHG estimates currently used by EPA were developed. However, time constraints for this letter preclude a detailed response to all of the related issues. Key INGAA comments are provided in a bullet list summary, followed by INGAA's response to each of the fourteen items where EPA requested comment. As discussed below and communicated to EPA in recent discussions, a project by the Pipeline Research Council International (PRCI) is compiling and analyzing measurement data from surveys completed to comply with Subpart W of the GHG Reporting Program (GHGRP). The Subpart W data are an important resource that should be utilized to improve emission estimation methods. INGAA will work with PRCI to share the project report with EPA when it is available, and INGAA requests that EPA integrate Subpart W measurement results into the next GHGI.

EPA should integrate emission factors based on T&S segment Subpart W measurements

- EPA is soliciting feedback on whether to use recent information to update emission estimation methods for emissions from leak. The updates for compressor and other leaks presented in EPA's Memo primarily rely on two studies[12] published by Colorado State University (CSU) in 2015 (collectively referred to as CSU Studies).
- Compressor emission factors from CSU Studies can be relied on as an interim step for the 2016 GHGI (which presents 2014 emissions), but a significantly larger data set is available from measurements conducted at T&S compressor stations subject to Subpart W of the GHG Reporting Program (GHGRP).
- The EPA Memo presents preliminary Subpart W data and associated emission factors. INGAA member companies have submitted thousands of equipment and component measurements since 2010 under the GHGRP. The preliminary Subpart W data cited in the EPA Memo indicate that actual emissions may be significantly less than the values that EPA is proposing. Therefore, INGAA recommends that EPA use the CSU Study data as well as final 2011-2014 Subpart W data for preparation of the 2017 GHGI.
- INGAA members are participating in a research project with the PRCI to compile and analyze Subpart W data.

[1] Subramanian, R.; Williams, L.L.; Vaughn, T.L.; Zimmerle, D.; Roscioli, J.R.; Herndon, S.C.; Yacovitch, T.I.; Floerchinger, C.; Tkacik, D.S.; Mitchell, A.L.; Sullivan, M.R.; Dallmann, T.R; Robinson, A.L. Methane Emissions from Natural Gas Compressor Stations in the Transmission and Storage sector: Measurements and Comparisons with the EPA Greenhouse Gas Reporting Program Protocol. Environmental Science and Technology, 49, 3252-3261. 2015.

[2] Zimmerle, D.J.; Williams L.L.; Vaughn, T.L.; Quinn, C.; Subramanian, R.; Duggan, G.P.; Willson, B.; Opsomer, J.D.; Marchese, A.J.; Martinez D.M.; Robinson, A.L. Methane Emissions from the Natural Gas Transmission and Storage System in the United States. Environmental Science and Technology, 49, 9374-9383. 2015

- The PRCI report will be available in the second quarter of 2016 and is based on review of 2011 through 2013 *measurement* data collected from INGAA and PRCI members.
- Initial review indicates compressor emission factors (EFs) are lower and more representative than EPA historical EFs and the EFs from the CSU Studies.
    - These EFs are based on thousands of measurements at hundreds of facilities over several years. CSU Study results are an acceptable interim step for GHGI updates, but Subpart W data should be used in subsequent reports.
    - The PRCI project completed a thorough review of available information on measurement methods to ensure that the dataset includes high quality measurement data. This includes elimination of some data that appears to result in *low bias* in measurements (e.g., "false zeroes"). By excluding this data, the PRCI EFs are marginally higher than they would be if that data were included (i.e., using the "complete" Subpart W dataset without this quality assurance step would result in *lower* compressor EFs.)
- PRCI and INGAA commit to working with EPA on PRCI data validation so that further improvements can be integrated into the EFs in the next GHGI.

- INGAA offers an overview of example results that will be discussed in detail in the PRCI report. Detailed discussion is precluded because compressor emissions factors are complicated, and limited time was available to provide these comments. For example, a compressor emission factor provides a single numerical value indicative of emissions from a typical unit. However, that EF is a compilation of emissions from several emission sources (i.e., compressor seals, isolation valves, blowdown valves). In addition to the different leak sources, the EF also must assume "typical" annual hours of operation in three different modes: operating, standby-pressurized mode, or not operating and de-pressurized. Thus, a thorough response requires nuanced analysis of many variables that impact the EF. That analysis is not provided here, but will be included in the PRCI report. Some general trends comparing historical estimates to more current data follows:
    - The historical EPA EFs over-estimate compressor emissions compared to both the CSU Studies and the PRCI analysis of Subpart W data;
    - For reciprocating compressors, current data on rod packing emissions are similar to or lower than EPA historical data, depending on the reporting year. PRCI analysis of Subpart W data indicated higher emissions in the initial reporting year than in subsequent years.
    - For centrifugal compressors, current data on wet seal degassing vent emissions are lower than EPA historical data.
    - PRCI analysis of the Subpart W data indicates that isolation and blowdown valve emissions are significantly lower than EPA historical data and also lower than results from CSU Studies.
    - Subpart W data results in composite emission factors for compressors that are significantly lower than EPA historical data and generally lower than results from CSU Studies, depending on how infrequent "large leaks" are addressed. The large leak or "super emitter" issue is discussed further below.

- PRCI analysis includes EFs that integrate large leaks (i.e., "super emitters") into emission factors. The PRCI report will assess the implications of the leak size on the resulting EFs. For example, the report will present EFs that consider all measurements, and will also present separate emission factors that consider a subset of the data – e.g., EFs that exclude larger leaks. In addition, different thresholds can be considered for the definition of a large leak. This could result in discussion regarding the appropriate EF to use in different scenarios, such as depending on whether a regular leak survey is conducted.
    - The PRCI report will likely recommend that "super emitter" emissions should be addressed through integration into appropriate emission factors rather than creating a separate emission estimation method. As discussed in the next bullet, the PRCI report will also discuss the size and frequency of large leaks.

EPA should not introduce new methods to estimate "super emitter" emissions at this time

- It is premature to introduce new methods to estimate "super emitter" emission based solely on the CSU Studies.
    - The CSU Studies provide very limited data: two "large leaks" including one leak associated with a short-duration maintenance event; the other is associated with a compressor isolation valve. For the former case, limited operating time associated with the maintenance event means that annual emissions would not be significant. The isolation valve leak is the only "super emitter" associated with regular operations. Thus, *very limited* data is available.
    - Use of these two data points, with only one indicative of regular operations, is statistically inappropriate to extrapolate across the national population of compressor stations and compressor equipment.
    - Subpart W measurements provide a larger dataset that can be reviewed to assess the frequency and size of large leaks associated with key sources: compressor seals and valves, and storage tank dump valves.
- Initial review of Subpart W data indicates the size and frequency of large leaks differ from CSU Study results:
    - Subpart W measurements provide a larger dataset that can be assessed to determine the size and frequency of large leaks. For example, the Subpart W measurements provide multiple years of data for hundreds of facilities. Measurement data shows more large leaks in the initial reporting year and fewer in subsequent years, which implies repairs were completed. Thus, different emission factors may be appropriate depending on whether the facility conducts regular leak surveys (e.g., if the compressor station is subject to Subpart W).
    - The CSU Studies categorized two locations where *facility* emissions exceed 200 SCFM as "super emitters." The vast majority of emissions for these facilities were associated with an individual leak. There were approximately 45 facilities measured in the CSU Studies. The related "super emitter" analysis concluded that, on average, approximately 4 percent of facilities include a "super emitter" at any point in time.

That frequency and the related leak size are *not* supported by Subpart W data analyzed by PRCI, where smaller and less frequent large leaks were measured.

- An overview of examples from PRCI analysis of Subpart W data follows. Additional details will be provided in the PRCI report.
- The CSU studies estimate that approximately *one in 25* facilities is a "super emitter" that includes a leak larger than 200 SCFM; the PRCI analysis of Subpart W data indicates that only *THREE out of thousands of measurements (conducted at hundreds of facilities over multiple years)* exceed 200 SCFM.
- One of the two CSU "super emitter" facilities indicated a very large leak much higher than 200 SCFM; the PRCI analysis of Subpart W measurement data found only one leak was similar in magnitude for a significantly larger dataset.
- Using a lower 100 SCFM threshold for a large leak (which is approximately 25,000 metric tons if emissions occur for an entire year); there are fewer than 10 such leaks in the PRCI Subpart W dataset.
- The Subpart W data indicates far fewer large leaks after the initial (2011) reporting year. This implies repairs were completed in at least some cases. For comparison, the Subpart W measurements can be used to develop EFs with data combined for all years or for each of the individual years. In this case, compressor EFs based solely on 2011 data are higher than EFs based on 2012 or 2013 data, because there were more large leaks measured in 2011. Comparing Subpart W based EFs to historical EFs, even the higher 2011 compressor EFs are lower than EPA historical EFs. EFs based on 2012 or 2013 data (or combining all measurement data from 2011 – 2013) are much lower than EPA historical EFs.
- The PRCI report will assess the implications of "large leaks" on the resulting EF by analyzing data with and without large leaks included. Since the first year of Subpart W measurements show more large leaks than surveys in subsequent years, this could imply that a different (lower) EF is appropriate for a facility that conducts regular leak surveys than for a facility without such a program.

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INGAA Response to 14 Items from EPA Memo

Transmission and Storage Station Fugitive Emissions

1. *As the EPA considers options for applying EFs for this source, EPA seeks stakeholder feedback on the timing of changes in transmission and storage station non-compressor fugitive sources that may result in different emissions in recent years from those in the GRI/EPA study. The EPA could use GRI/EPA factors for earlier years in the time series, and Zimmerle factors for more recent years. Alternatively, the EPA could apply the Zimmerle EF to all years of the GHGI time series. EPA seeks stakeholder feedback on these options.*

INGAA Response: EPA should use original emission factors for initial estimates in the time series, and updated emission factors for the current estimate. As noted above, the CSU EFs are an acceptable interim solution for the April 2016 GHGI, but additional analysis should be completed to utilize Subpart W measurement data for another EF update in the next GHGI scheduled for publication in April 2017. INGAA does not offer recommendations regarding how to estimate or interpolate emissions for the intervening years.

2. *The EPA seeks stakeholder feedback on trends in transmission station activity data that would result in more or fewer transmission stations per mile during any point in the GHGI time series. Current GHGI estimates include an activity factor of 0.0059 stations per mile. Zimmerle found 0.0057 stations per mile, and an analysis of recent FERC data found 0.0064 stations per mile. The EPA requests stakeholder feedback on how subpart W transmission station activity data could be used to inform the time series activity data to reflect ongoing trends.*

INGAA Response: As an interim step, EPA should use activity data from CSU (Zimmerle). Additional analysis is needed to assess alternative approaches that may be supported and/or supplemented by the GHGRP Subpart W data. For example, additional analysis of Subpart W data may provide the ability to update pneumatic device activity data and methodology assumptions (e.g., average number of devices per facility).

3. *The EPA seeks stakeholder feedback on how to incorporate information on superemitters into estimates for transmission and storage stations. For example, the Zimmerle study estimated a fraction of the population that may be superemitters at a given time, and estimated superemitter emissions from these sources (incremental to those estimated for the non-superemitter population). The EPA also seeks stakeholder feedback on which GHGI sources are more likely than others to act as superemitters and whether and how to apply a superemitter factor or other methodology to those sources.*

INGAA Response: As discussed above, the CSU dataset does not provide a sufficient sample size of super emitters to serve as the basis to develop new methods for estimating super emitter emissions. Subpart W measurement data provides an indication of the frequency and size of large leaks from key sources – compressors and leaking storage tank dump valves. Those measurement data should be assessed. The PRCI project report will provide related analysis. For example, it may be appropriate to integrate "large leaks" into compressor and tank emission factors.

4. *The EPA seeks stakeholder feedback on how to incorporate subpart W data into the GHGI methodology, such that the transmission station and storage station AD and/or EFs would be updated annually to reflect ongoing trends in the industry. For example, the EPA could consider combining the Zimmerle et al. data and subpart W data in some way.*

INGAA Response: The Subpart W program provides a larger dataset than CSU studies. In addition, the CSU Studies relied on measurements from the annual Subpart W survey at affected facilities. Thus, a dataset that combines measurements from the CSU studies and Subpart W data would double count some data. If merging the two datasets, significant scrutiny may be required to avoid including the same measurements (from the separate datasets) twice. .Such an

exercise may not be straightforward or may be very time consuming, so it may be preferable to rely on the larger, multi-year Subpart W dataset.

Regarding emissions data, EPA should integrate Subpart W-based emission factors into the next GHGI report, which is due in early 2017. The PRCI project can facilitate that process. On an ongoing basis, EPA can assess how best to update estimates based on Subpart W emissions data, but an annual reconciliation process may not be warranted.

Additional discussion on activity data from the CSU Studies is discussed below in item 6.

5. *In fall 2015, a well in a California storage field began leaking methane at an estimated rate of 50 Mt CH4 per day. The EPA is considering how to include this emission source in its 2017 GHGI (with estimates from 1990-2015). For example, the EPA could review and potentially incorporate estimates of the leak developed by the California Air Resources Board (CARB). For initial CARB estimates, see http://www.arb.ca.gov/research/aliso_canyon_natural_gas_leak.htm. The EPA seeks stakeholder feedback on incorporation of data on this event into the national GHGI.*

INGAA Response: INGAA is not completely clear on the question posed. If EPA is inquiring as to the specifics of the Aliso Canyon leak, INGAA recommends that EPA consider the leak estimates by California Air Resources Board (CARB). CARB has a website devoted to this topic. See CARB's website: http://www.arb.ca.gov/research/reports/aliso_canyon_natural_gas_leak.pdf

The California incident should be addressed as an isolated anomaly. EPA should not extrapolate those emissions across any other natural gas storage operations. INGAA is not aware of any similar natural gas storage leaks.

If EPA is inquiring about storage blowdown data, INGAA points out that the GHG Inventory will cover storage blowdown data beginning in reporting year 2017. If EPA is inquiring about storage leaks, INGAA observes that Pipeline and Hazardous Materials Safety Administration (PHMSA within the Department of Transportation) is expected to propose a regulation in the next few months to address storage leaks. INGAA believes it appropriate that this function is managed by PHMSA and sees no need for additional regulatory or data collection at EPA. The California incident should be addressed as an isolated anomaly and EPA should not extrapolate those emissions across any other all natural gas storage operations.

Reciprocating and Centrifugal Compressors

6. *The EPA is considering using the Zimmerle et al. AD for reciprocating and centrifugal compressors at transmission stations for 2012, maintaining the 1992 AD from GRI/EPA, and applying a linear correlation between 1992 and 2012 to estimate AD for intermediate years. The EPA requests feedback on other methods or data that could be used to show the transition in facilities using fewer reciprocating compressors and more centrifugal compressors at transmission stations between 1992 and 2012.*

INGAA Response: The activity data developed for the CSU Studies provides important updates regarding the number and type of reciprocating and centrifugal compressors. INGAA

recommends that EPA utilize the CSU activity data, or EPA data updated using a similar process, in the 2016 GHGI.

Similar to the response in item 1 above, INGAA is not providing recommendations at this time regarding how to estimate or interpolate emissions for the intervening years between this update and the use of historical activity data. Additional data gathering and analysis would be required to assess alternatives.

As discussed in item 9 regarding centrifugal compressors, EPA should use CSU and/or Subpart W data to categorize updated centrifugal compressor counts as wet seal or dry seal units. The percentage of wet seal units reflected in the historical inventory is outdated and incorrect.

7. *The EPA requests stakeholder feedback on how subpart W compressor activity data may be used to inform the time series activity data in order to reflect ongoing trends (e.g. in number of compressors per station).*

INGAA Response: Using Subpart W compressor activity data to assess the total population of compressors has limitations because only a subset of facilities report. Additional analysis would be required to understand better how to assimilate Subpart W activity data into estimates of total compressor counts. As discussed above in item 6, EPA should update activity data based on the CSU Studies and consider the related process described by Zimmerle as a method for preparing annual updates.

8. *The EPA seeks stakeholder feedback on the timing of changes in reciprocating and centrifugal compressors which may impact emissions (e.g., due to improvements in compressor maintenance and fugitive emissions detection and repair). For example, the EPA could use GRI/EPA factors for earlier years in the time series and Zimmerle factors for more recent years. Alternatively, the EPA could apply the Zimmerle EF to all years of the GHGI time series. The EPA seeks stakeholder feedback on these options.*

INGAA Response: Similar to the activity data response in item 6, linear interpolation is a reasonable approach at this time. Additional analysis would be needed to assess alternatives. Ultimately, the Subpart W data should be used for updating emission factors since it is the largest dataset of measurements and additional measurements are reported each year.

9. *The EPA is considering using the subpart W distribution of dry seal and wet seal centrifugal compressors for year 2011 and later. Using subpart W data would allow for continuous updates of the AD to reflect trends. The EPA seeks feedback on whether the subpart W dry seal and wet seal centrifugal compressor distribution could be considered representative for all centrifugal compressors in the United States, or whether transmission stations not reporting to subpart W (with potentially fewer compressors and lower emissions) would have a different fraction of dry seal compressors as the subpart W data, which includes larger transmission stations. The EPA is considering applying a linear correlation between 1992 and 2011 to estimate dry seal and wet seal centrifugal compressor AD. For this time frame, where subpart W data is not available, the EPA also requests feedback on other methods to account for an increased adoption of dry seal centrifugal compressors in the GHGI time series.*

INGAA Response: It is reasonable to apply the Subpart W distribution of seal types to non-Subpart W facilities. Other data is not available at this time. In addition, as additional data is integrated into EFs from Subpart W measurements, it may become evident that the difference between wet seal and dry seal emissions is less significant than indicated by EPA historical estimates.

10. *When evaluating centrifugal compressor EFs using subpart W data, the EPA averaged together data from all centrifugal compressors to calculate blowdown valve and isolation valve EFs. These EFs are then applied along with the seal-type specific EFs to compressors with wet seals and compressors with dry seals. Alternatively, the EPA could calculate separate blowdown valve and isolation valve EFs for compressors with wet seals and for compressors with dry seals. The EPA seeks stakeholder feedback on this approach.*

INGAA Response: Data analysis should consider both approaches and assess whether differences support different emission factors. The PRCI project report will include such an analysis to assess whether the same or different EFs are warranted for these emission sources.

Pneumatic Controllers

11. *The EPA seeks stakeholder feedback on use of the Zimmerle et al. estimates of pneumatic controller counts per transmission or storage station to develop national AD across the time series. For example, the EPA could use GRI/EPA pneumatic controller counts for earlier years in the time series and Zimmerle et al. counts for more recent years. Alternatively, the EPA could apply the Zimmerle et al. pneumatic controller counts to all years of the GHGI time series. The EPA seeks stakeholder feedback on these options.*

INGAA Response: Subpart W data is available for pneumatics. Issues such as compressor measurement data from Subpart W are more complicated, but pneumatic controller counts are relatively straightforward. EPA should apply pneumatic controller counts (and types) based on Subpart W reported data. Once new counts are defined and trends from the initial years of Subpart W reporting are reviewed, EPA can assess how to interpolate from current status to earlier years.

12. *The EPA seeks stakeholder feedback on the timing of changes in the mix of various types of pneumatic controllers which may impact emissions and how EFs can be used to reflect those changes. For example, the EPA could use GRI/EPA EFs for earlier years in the time series and Zimmerle et al. EFs for more recent years. Alternatively, the EPA could apply the Zimmerle et al. EF to all years of the GHGI time series. The EPA seeks stakeholder feedback on these options.*

INGAA Response: Subpart W reports and the CSU Studies indicate emissions from pneumatic controllers in the T&S segments are lower than historical estimates, and these emissions are a relatively minor source. Updating the 2016 GHGI using CSU results is a reasonable interim step, but Subpart W data should be utilized for subsequent reports. Additional review and analysis is needed to contrast and compare these methodologies better.

13. The EPA seeks stakeholder feedback on approaches to stratify pneumatic controller estimates into specific bleed rate categories (e.g., basing AD on the number of low-bleed, intermittent bleed, and high bleed devices and applying an EF specific to each type). For example, the EPA could use the subpart W data on the number of pneumatic controllers of specific controller types per station, and their associated specific EFs. In addition, the EPA seeks comment on use of GHGRP data to represent national transmission and storage station pneumatic controller activity and emissions.

INGAA Response: Subpart W is the most appropriate resource for assessing controller counts and types. If analysis can be completed to use Subpart W in the upcoming report, that should be implemented. If not, results from CSU Studies could be used as an interim step this year, with Subpart W data used in the next report. Since Subpart W facilities generally represent larger T&S facilities, additional analysis is warranted to assess the implications of applying these counts (e.g., pneumatics per compressor station) to all facilities.

Hi-Flow Sampler Measurements

14. Much of the available measurement data on transmission and storage segment emissions were developed using Hi-Flow Samplers. A recent study, Howard 2015, highlights potential malfunctions in certain Hi-Flow instruments under certain conditions that can lead to underestimates. The EPA is seeking stakeholder feedback on the impacts of the Hi-Flow sampler issue on the results of studies highlighted here and whether are there methods for recalculating some of the data points to correct for it.

INGAA Response: While a closer review of the analysis in the Howard paper is needed to understand better its relevance for transmission segment measurements, that review was not completed in time for these comments. INGAA or the PRCI report will provide additional feedback on this question. The phenomenon in question may be associated with certain gas quality attributes and flow regimes, and review of Subpart W measurement data compiled for the PRCI project can assess the potential implications (e.g., this issue may be more relevant for other segments with different gas quality or flowrates than those typical for the T&S segments).