Dear Ms. Weitz:

The American Gas Association (AGA) appreciates the opportunity to comment on the U.S. Environmental Protection Agency’s (EPA) proposed approaches for incorporating new data on emissions from the natural gas distribution segment into the Agency’s Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI).

AGA member companies have made concerted efforts to upgrade and modernize our nation’s pipeline infrastructure, which has contributed significantly to a declining trend in emissions from the natural gas distribution system. Since 1990, natural gas emissions from distribution systems have declined by over 17%, even as miles of the distribution mains expanded 30% to serve nearly twice as many customers. AGA appreciates EPA’s proposal to recognize and incorporate these reductions in the GHGI.

The American Gas Association, founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 72 million residential, commercial and industrial natural gas customers in the U.S., of which 95% – just under 69 million customers – receive their gas from AGA members. AGA is an advocate for natural gas utility companies and their customers and provides a broad range of programs and services for member natural gas pipelines, marketers, gatherers, international natural gas companies and industry associates. Today, natural gas meets more than one-fourth of the United States’ energy needs.

A. AGA’s Comments on EPA’s Proposed Approaches to Incorporate New Data for Distribution Emissions Sources

AGA appreciates EPA’s efforts to identify, evaluate, and assess new data on emissions from the natural gas distribution segment. Where the data is found to be accurate and representative of the national landscape, AGA supports the incorporation of this data into emissions estimates for the GHGI. AGA has provided specific comments for each emission source below. In general, AGA
supports the inclusion of emission factors (EF) calculated from data collected through the Lamb et al. study.\(^1\)

The Lamb et al. study provides the most comprehensive set of direct measurements of emissions from the natural gas distribution system. As part of the study, the research team carefully measured numerous sites selected from lists of known leaks provided by the thirteen participating utilities in geographically diverse regions around the country that met specific criteria to ensure a comprehensive and representative dataset. The researchers took direct emissions measurements of 230 randomly selected, representative leaks from underground pipelines as well as at 229 metering and regulating (M&R) stations where natural gas is measured and regulated from higher pressure pipelines to lower pressure distribution pipelines. The researchers found dramatically lower emissions, particularly, at M&R stations. In fact, because of the significant differences they saw from data collected in 1992 by the Gas Research Institute (GRI) and used by the GHGI, the researchers double checked to ensure these low emissions were not anomalous to the 13 participating companies, but in fact were representative of M&Rs across the industry. First, they revisited nine sites that were measured in the previous 1992 study. They found an average of one-twelfth fewer emissions than 20 years ago from those M&R stations, and that nearly all the M&Rs had been upgraded since 1992. Second, the research team contacted AGA to request a survey asking AGA member gas utilities the extent to which M&Rs have been upgraded since the 1990s, for example by replacing high bleed pneumatic devices. Each of the forty responding companies confirmed that they had completed some sort of upgrade to their 12,788 M&R stations, with 41% of those upgrades being significant.

The Lamb et al. study confirms the significant reductions in emissions from distribution systems that have occurred in the last 20 years. AGA supports the inclusion of EFs calculated from Lamb et al. robust data set into the GHGI. For some emissions sources, the Lamb et al. study either did not calculate an EF, or the EF was not based on the same type of robust measured data set. As discussed in more detail below, AGA supports EPA’s continued efforts in developing emission factors for these sources, and is interested in partnering with EPA on this research.

**Meter/Regulator Stations**

AGA supports EPA’s proposal to incorporate updated station counts and the Lamb et al. emission factors to calculate emissions from M&R stations for the GHGI.

In regard to the station counts, AGA believes that EPA’s proposal to use the above grade and below grade station counts reported to Subpart W and scaled for national representation results in an accurate estimate of the actual number of M&R stations. AGA also supports EPA’s proposal to assume the same split of station subcategories (e.g., by inlet pressure) as used in the current GHGI.

AGA strongly supports EPA’s proposal to incorporate EFs from the Lamb et al. study for M&R stations. The Lamb et al. study provides a more robust data set than the 1992 GRI study and represents the most current data for this source. The reduction in emissions from these sources found by the Lamb et al. study is supported by and consistent with the fact that distribution system operators have been upgrading their M&R stations. In the past 20 years, operators have made significant upgrades to the equipment at M&R stations. In addition, they have increased leak surveys due to the Department of Transportation’s (DOT) Pipeline and Hazardous Materials Safety Administration’s (PHMSA) integrity management requirements for gas distribution pipeline systems (DIMP rule) over the past five years, and they have implemented voluntary measures under the EPA Natural Gas STAR program. All three trends have contributed to the decreased emissions found by Lamb et al.

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Since it would be difficult to pick any one year as the time when all these trends converged, AGA suggests using (1) the 1992 GRI M&R emission factors for years prior to 2000 (i.e. the same emission factors EPA has been using in the GHGI), (2) the recent Lamb et al. data to estimate M&R emissions beginning after 2010, and a linear extrapolation for interim years.\(^2\)

**Pipeline Leaks**

AGA supports EPA’s proposal to apply Lamb et al. pipeline EFs for recent years, current GHGI EFs based on the 1992 GRI data for earlier years, and a linear interpolation between each EF for intermediate years’ EFs. Regulatory developments, including the PHMSA’s DIMP Rule, have formalized the inspection and assessment of natural gas distribution pipelines, resulting in a trend of lowered leak rates and leak incidents over time. In addition, operators have made significant headway voluntarily replacing cast iron and unprotected steel mains with state utility commission approval for recovering the costs of accelerated pipe replacement. These practices have resulted in significant reductions in leak rates and incidents, reflected in the overall lower emissions found in the Lamb et al. study. In addition, in the current GHGI, the EF for plastic mains is significantly higher than the EF for protected steel mains. As distribution operators replace aging protected bare steel pipe with new plastic pipe, the inventory of emissions actually increases. Incorporating the Lamb et al. study EFs will address this inaccuracy.\(^3\)

Since it would be difficult to pick any one year as the time when all these trends converged, AGA suggests using (1) the 1992 GRI pipeline emission factors for years prior to 2000 (i.e. the same emission factors EPA has been using in the GHGI), (2) the recent Lamb et al. data to estimate pipeline emissions beginning after 2010, and a linear extrapolation for interim years.\(^4\)

**Customer Meters**

EPA has proposed to update customer meter AD to incorporate customer meter data from AGA’s annual publication of Gas Facts. Although AGA appreciates EPA’s support of Gas Facts, AGA encourages EPA to update the AD for customer meters to incorporate customer data reported to the U.S. Energy Information Administration (EIA). This is the source of the customer data reported in AGA’s annual Gas Facts publication and therefore renders Gas Facts as an intermediary and not a primary source of data. AGA recommends EPA source customer data directly to EIA.

The customer data is reported to EIA on its Form EIA-176. EIA does not collect data on meters specifically. Rather, EIA instructs respondents to report the average number of consumers served directly from facilities during the year. For residential this includes master-metered apartments, mobile homes, multi-family dwellings (individually metered), and single-family dwellings. Commercial customers include churches and hospitals, government agencies, hotels, non-manufacturing military installations, restaurants, retail stores, schools and universities, and wholesale stores. Industrial customers include agriculture, forestry, and fisheries, mining (including oil and gas extraction), and manufacturing. Electric power customers include regulated electric utilities and nonregulated electricity generators. The size of an operation does not affect consumer classification. Large commercial operations are classified as commercial, not industrial. Small industrial operations are classified as industrial, not commercial. There may be significant variance in equipment types and

\(^2\) AGA would support EPA’s revisions to its Greenhouse Gas Reporting Rule that would allow companies to develop subcategory company-specific emission factors. This would provide a more accurate reporting of data, and would provide EPA with a national dataset to incorporate into the GHGI.

\(^3\) This also is a concern of AGA members reporting under the Greenhouse Gas Reporting Rule. AGA encourages EPA to make similar changes to the EFs under the Reporting Rule.

\(^4\) AGA would support EPA’s revisions to its Greenhouse Gas Reporting Rule that would allow companies to develop subcategory company-specific emission factors. This would provide a more accurate reporting of data, and would provide EPA with a national dataset to incorporate into the GHGI.
sizes within the same customer category. Consumers are defined in Form EIA-176 as “any individually-metered dwelling, building, establishment, or location using natural gas, synthetic natural gas, and/or mixtures of natural and supplemental gas for feedstock or as a fuel for any purpose other than in oil or gas lease operations; natural gas treating or processing, plans; or pipeline, distribution, or storage compressors.” Furthermore, the form instructions specify that “[e]ach dwelling, building, plant, establishment, or location is to be counted as a separate customer.”

In regard to EFs for customer meters, EPA is considering incorporating the results from a 2009 Gas Technology Institute (GTI) study. AGA cautions EPA’s full reliance on the results from the GTI study. For residential meters and commercial meters, a relatively large number of measurements was taken. However, the GTI study only took industrial meter measurements from a limited number of sites (46 meters). Due to limited resources, measurements of industrial meters were intended to represent the broad range of meters in this sector, but do not provide a statistical sampling indicative of the industrial meter national inventory. For this reason, the industrial meter data should not be used because it is a limited data set. It shows the range of meter types and emissions that can occur for industrial meters, but does not support a single value for an industrial meter emission factor, nor does it provide insight into the activity data needed to support multiple emission factors for industrial meters. Additional details follow, reflecting information AGA collected from the 2009 study research team and study authors.

The 2009 GTI study was designed to provide an update to the distribution sector emission factors for M&R stations and customer meters that were developed in the GRI/EPA study, and to identify those sources that required more investigation to improve emission estimates. The study strove to survey a wide variety of sources within each source type, but resource limitations did not support “statistical sampling” indicative of source prevalence in the national inventory. The 2009 GTI study found that some of the source categories used in the GRI/EPA study contained a wide variety of sources that could have widely differing GHG emissions and that the current categories did not represent the actual equipment in use. As an example, this was the case for industrial meters, where the range of equipment used for metering varies depending on the size (i.e., gas demand) for the industrial site. This range encompasses metering that resembles commercial meters to metering more akin to a large M&R station such as a custody transfer station between an interstate pipeline and a gas utility. For the latter case, metering may include pneumatic controllers, which are a source of greater emissions than other metering & pressure regulating sites.

For residential meters, the 2009 GTI study surveyed 2,400 residential customer meters at six different local distribution companies throughout the U.S. The survey included single family houses, duplexes, townhouses, and apartment buildings, but in each case the gas used by each housing unit had its own meter. The survey found that the residential meters had a very uniform configuration with a service pipe leading to a shutoff valve, then to a pressure regulator which in turn supplied gas to the residential meter or meters. These were all small diaphragm meters. Residential meters showed very low incidences of leaks or venting regulators. The leaks and vents found were small, often at the lower limit of the Hi-Flow detection range. Given the homogeneity of the residential meters found at all the distribution companies, the 2009 GTI residential meter factor could be used as an update to the existing emission factor used for residential meters in the GHGI, or the data could be added

to other studies to increase the size of the dataset used to develop a residential meter emission factor.

Each study participant also was asked to provide access to a range of commercial and industrial meters. Unlike residential meters, these meters were found to have a large variety in equipment sizes, types, supply pressures and emissions. In fact, there was so much difference that the 2009 GTI study separated commercial meters from industrial meters and then provided further guidance on ways to estimate GHG emissions from industrial meters based on what equipment was present at a site.

Commercial meters generally resembled the residential meters, with the same configuration of riser pipe leading to a regulator and then to a meter. The meters were either diaphragm or rotary meters, which are more compact when flow demands increase. Commercial customers surveyed included strip mall stores, restaurants, stand-alone stores, big-box retail establishments, and sports arenas. The meters ranged from small diaphragm meters to large diaphragm meters to rotary meters. 395 commercial meters were surveyed with one vented emissions accounting for 84% of the total GHG emissions.

Industrial meters included configurations that varied significantly. The goal of the study was to evaluate the large range of natural gas throughput, supply pressure, and equipment used at industrial meters. Some larger sites included pneumatic controls. Small industrial customers surveyed included a textile factory, greenhouses, light industrial manufacturing and hospitals. The meters for these customers were the same as a common commercial meter, with a regulator feeding a rotary meter. Large industrial meters included steel mills, carbon plants, municipal waste incineration, and electrical generation facilities. The gas equipment for these customers could have higher inlet pressures, multiple meter runs, pneumatic valves, and pipe diameters of 6 inches or more. The largest industrial meter resembled a large custody transfer station (sometimes called a “city gate”) rather than a commercial meter. Only 46 industrial meters were surveyed. The study was designed to survey a range of industrial meters, but not to determine the prevalence of each industrial meter type operated by the distribution company. The GTI 2009 report discusses this in more detail, including how site equipment affects emissions. This discussion could be considered if trying to provide an improved site-specific estimate as compared to applying a single emission factor.

The results of the GTI study ultimately identify a data gap in emissions from commercial and industrial meters. To provide a better estimate for nationwide emissions from these subcategories, there is a need to further consider the type of equipment use at the facility. For example, it appears that a separate emission factor is warranted for very large industrial meters. However, not enough data is available to develop that emission factor from the 2009 GTI study, and activity data is not available for the calculation even if an emission factor were available.

AGA encourages EPA to update the residential meter emission factor based on the 2009 GTI study, perhaps in conjunction with other data sets, such as the Clearstone data. However, the current EF in the GHGI should be retained for commercial/industrial meters. Additional studies are needed to better define how to segregate commercial and industrial meters, and further subcategorization of these sources. Any effort to segregate commercial and industrial meters also requires an effort to develop the associated activity data for different metering configurations.

Although AGA has concerns regarding the use of both the commercial and the industrial meter EFs from the GTI study, if EPA were to move forward with incorporating portions of these EFs, AGA would encourage EPA only to use the commercial EFs. AGA feels that the dataset associated with the commercial meters is more representative of the national population than the industrial meters. Of course, this would lead to a likely nonsensical result where the updated EF for commercial meters, based on the GTI study, was significantly higher than the EF for industrial meters, retained from the current GHGI, which is why AGA suggests that neither be incorporated.
Comments on Proposed GHGI Revisions for Natural Gas Distribution

January 14, 2016

Pipeline Blowdowns and Mishaps/Dig-Ins

Although AGA appreciates EPA's attempt to update the methodology used to calculate emissions from pipeline blowdowns and mishaps/dig-ins, AGA does not believe that EPA's proposed approaches would provide an accurate representation of the emissions from these sources.

For both pipeline blowdowns and mishaps/dig-ins, EPA is proposing to revise the AD to use annual data on total distribution main and service miles available from PHMSA. As EPA recognizes, the current approach taken in the GHGI for both sources, which relies on 1992 distribution main and service miles and is scaled by residential gas consumption, results in a mileage estimate that is influenced by factors that would impact natural gas usage, but are unrelated to pipeline miles. AGA agrees with EPA that PHMSA data is a more accurate data source of pipeline miles. Pipeline operators are required to report data directly to the Department of Transportation on an annual basis, which renders the PHMSA data on pipeline mileage an accurate representation of installed pipeline mileage and is superior to the current methodology of estimating pipeline mileage.

However, AGA is concerned with EPA's use of pipeline miles to estimate emissions from blowdowns and mishaps/dig-ins. These sources of emissions are discrete events and there is no available data that suggests a correlation between the number of miles in a pipeline system and the number of mishap events on that system. The number of reported pipeline incidents on gas distribution systems has been flat or down during the past five years; during that time, from 2010 to 2014, the number of miles of installed distribution main in the U.S. has increased by nearly 60,000 miles or 5%.

AGA encourages EPA to use AD that reflects the reality that an emission blowdown or mishap-dig-in is a discrete event that is not correlated to the number of miles in a pipeline system. AGA recognizes the difficulty in obtaining a comprehensive set of data for these sources of emissions. However, because data associated with both will be reported through EPA's proposed Methane Challenge for companies selecting this best practice, EPA will have more data for possible use in the future to generate activity data for the GHGI. In addition, for mishaps/dig-ins, AGA notes that significant incidents are reported to PHMSA, where significant is defined as an incident above a certain size or impact threshold. AGA recommends consideration of incident data reported to PHMSA and data collected through the Methane Challenge as possible alternative data sources for development of more representative AD for mishaps/dig-ins.

AGA also has concerns with the incorporation for the Lamb et al. EFs for pipeline blowdowns and mishaps/dig-ins. Although AGA strongly supports the incorporation of the other EFs from the Lamb et al. study, the EFs for blowdowns and mishaps/dig-ins are not based on the same type of robust sampled data as the other EFs. The EFs for these sources instead were based on a limited, voluntary survey conducted by AGA that produced four responses. This survey was conducted in order to arrive at a new estimate of emissions for these subcategories so that the measurements from other subcategories could be incorporated into a comparison with the Greenhouse Gas Inventory. From these four responses, Lamb et al. generated an unweighted average EF. There is no reason to believe these four responses constitute a representative sample of emissions for this subcategory. Therefore, AGA does not believe that an EF from such limited data warrants incorporation into the GHGI.

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7 Incidents on natural gas distribution systems are defined as an event that involves a resale of gas from a pipeline that results in a death or significant personal injury, property damage of $50,000 or more, or 3 million cubic feet of lost gas. 49 C.F.R. § 191.3.
Because of AGA’s concerns with both the proposed ADs and EFs for pipeline blowdowns and mishaps/dig-ins, AGA respectfully requests that EPA retain the current ADs and EFs for these sources in the GHGI and work with AGA to develop a study that would collect data that would be representative of the national population of pipeline blowdowns. As previously mentioned, reporting through the Methane Challenge could provide a source of data for AD. AGA also believes that the Methane Challenge could be used to generate data to support a nationally representative and robust EF if companies were allowed to inventory and measure their own sources of emissions and provide EPA with their company-specific EFs. These are just preliminary suggestions and AGA looks forward to continuing a conversation with EPA to develop robust AD and EF data for this source category.

B. AGA’s Responses to EPA’s Request for Stakeholder Feedback

M&R Stations

1. As noted above, the Lamb et al. study discussed changes in M&R stations that contributed to decreased emissions. The EPA seeks stakeholder feedback on the time frame of upgrades to M&R stations and information on whether the upgrades occurred as a gradual transition. The EPA seeks available data that would allow for activity and/or emission factors to be developed and applied as appropriate across the time series in order to calculate net M&R station emissions in each year. The Lamb et al. EF for two station categories (R-Vault 100-300 psi and R-Vault 40-100 psi) increased compared to the findings of the GRI study. The EPA seeks feedback on changes that took place at these subcategories of stations that resulted in increased emissions and over what time frame they occurred.

AGA Response: Emissions from M&R stations have decreased significantly as a result of equipment replacements/facility rebuilds, improved leak surveys and modern station designs. Equipment upgrades that have the effect of decreasing emissions include converting pneumatic equipment from high bleed to low or no bleed equipment; changing from relief valves for over pressure protection to the use of closed systems that have regulators in a series, and moving from orifice metering to rotary, turbine and ultrasonic metering. Based on a survey of AGA member gas utilities, between 1990 and 2014, each of the forty responding companies confirmed that they had completed some sort of upgrade to their 12,788 M&R stations, with 41% of those upgrades being significant.

2. The EPA seeks feedback on the potential update to the GHGI for this source. The EPA seeks stakeholder feedback on whether the Lamb et al. M&R station EFs can be considered representative of the U.S. population in recent years, in both reflecting station upgrades and reflecting the subpopulation of superemitters.

AGA Response: As discussed above, AGA strongly supports the incorporation of the Lamb et al. EF into the GHGI for M&R stations. The Lamb et al. study data set should be considered representative of the national population. The Lamb et al. study completed measurements at 229 different M&R facilities at 13 local distribution companies across the United States. These 13 local distribution companies (LDC) operate 19% of the distribution, 26% of the services, and deliver 16% of the total gas delivered to customers in 2011. In comparison, the GRI/EPA study only measured 55 M&R stations.

The population of leaks measured in Lamb et. al. generally showed marked asymmetry, with a few high emitters accounting for a large fraction of the total measured emissions—so-called “superemitters.” To develop mean estimates of emissions for the different subcategories, the study authors used highly skewed probability distributions as models. The authors considered eight different probabilistic models and compared them using a Bayesian Information Criterion. Once a model was selected, sample data sets drawn from the fitted model and the averages were computed. This bootstrap procedure produced the estimated mean and 95th percentile of the distribution of the sample.
Pipeline Leaks

3. The EPA seeks information on factors that might impact a change in the leak rate and/or leak incidence over time. For example, based on the Lamb et al. study, the EF for two pipeline categories (protected steel mains and plastic services) increased compared to the findings of the GRI study. EPA seeks feedback on changes that took place at these subcategories of pipes that resulted in increased emissions and over what time frame they occurred.

AGA Response: Regulatory developments affecting distribution pipelines have formalized the inspection and assessment of natural gas distribution pipelines, resulting in a trend of lowered leak rates and leak incidents over time. Specifically, PHMSA has established integrity management requirements for gas distribution pipeline systems (DIMP rule). The DIMP rule requires operators to develop, write, and implement a distribution integrity management program that contains elements such as identifying threats and risks to pipelines and implementing measures to address risks. Although the stated purpose of the DIMP Rule is to improve pipeline safety, the requirements of the rule have the effect of decreasing leak rates and incidents. PHMSA finalized the DIMP rule in late 2009. Operators were given until August 2011 to write their plans and implement the program. The DIMP Rule, as well as other voluntary initiatives aimed at improving the safety of gas distribution systems, have been successful in improving the distribution network infrastructure, and have had the effect of lowering leak rates and leak incidents over time. In fact, data submitted by operators in annual reports to PHMSA demonstrate that the leak rate per mile has decreased by about 15% since 2005.

In regard to protected steel mains and plastic service pipelines, AGA would expect these same factors to result in a trend of decreasing leak rate and/or leak incidence over time. However, as EPA notes, the Lamb et al. EFs for these pipeline categories increased as compared to the GRI/EPA EFs. AGA believes that the higher EFs are driven by one extremely high-emitting sample in each category. In fact, the Lamb et al. study notes that three large leaks, one being from protected steel mains, accounted for 50% of the total methane emissions from pipeline leaks, and that a distribution where a few leaks account for a large fraction of the total methane emission is not unexpected.

Although much has been made regarding the relationship between the GRI/EPA emissions and the more recent Lamb et al. emissions, there are concerns regarding the direct comparison of these numbers. First, as EPA points out, the GRI/EPA emission estimates were intended to represent “potential” emissions that would subsequently be offset by subtracting emission reductions reported to the EPA’s Natural Gas STAR program due to system upgrades over the past 20 years. Because the Lamb et al. study reported “measured” emissions 20 years later after significant system upgrades, it is not surprising that the Lamb et al. emissions are lower than the GRI/EPA potential emissions.

4. Stakeholders have suggested that the EPA treat newer plastic pipeline and vintage plastic pipeline as two distinct categories in the GHGI. The EPA seeks available data that could be used to provide a time series of activity data for each category, and emissions data that could be used to develop emission factors for each category.

AGA Response: AGA appreciates EPA’s interest in treating newer plastic pipeline and vintage plastic pipeline as two distinct categories in the GHGI. The data indicate that some of the early plastic piping products manufactured in the 1960s to early 1980s are more

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8 49 C.F.R. § 192.1001, et seq.
susceptible to brittle-like cracking than newer materials. Plastic materials, standards and manufacturing practices have steadily improved over the years. These enhancements have led to an improved ability to withstand stress intensification and have benefited long-term plastic gas piping system performance.

In the mid-1980s, ASTM standards were revised to include improved material designations and eliminate older types of plastic resins. In the mid-1990s, ASTM standards again were revised to include high performance materials. As a result of these changes and the data collected by industry groups, the inventory of vintage plastic pipe in the ground has decreased, while the inventory of newer plastic pipe has increased. However, numerous company-specific factors affect the timing of the replacement of plastic pipe, including inventory of installed plastic pipe, geography, and approval from local regulators. These factors make it difficult to identify a more specific time series of activity data.

5. The EPA seeks information on whether Lamb et al. estimates, from measurements conducted during May through November (no measurements were collected during winter conditions), may over- or under-estimate average annual emissions, which may fluctuate based on temperature and resulting increases or decreases in throughput.

AGA’s Response: There is no direct correlation between temperature/throughput and emissions from pipelines that would lead to the Lamb et al. emissions estimates over or under estimating average annual emissions. Generally, during times of lower temperatures natural gas consumption and system throughput increases. Increased throughput could lead to lower system pressures as more gas is consumed from the distribution system to meet higher loads. In fact, during times of higher throughput, operators sometimes have difficulty maintaining pressure in the lines. Lower pressures on the distribution system would suggest lower emissions relative to times when the system is operating at higher pressures. Lamb et al. study did not take measurements during winter conditions, suggesting that the emission estimates could be biased to be an over-estimate of average annual emissions, given that systems may be operating at higher pressures during these months of lower throughput and consumption. Ultimately, the impact that throughput would have on pressure is expected to be minimal; it likely would not significantly impact the Lamb et al. emissions estimates.

Customer Meters

6. Residential customer meters – The EPA seeks stakeholder information on trends in the industry over time that would result in lower customer meter emissions (scf/meter) in recent years compared to the early 1990’s timeframe.

AGA’s Response: The lower trend in residential meter emissions may be attributed to the increased vigilance to control emissions from meters through more frequent inspection and timely replacement of leaking fittings.

7. Commercial/Industrial customer meters – The EPA seeks stakeholder feedback on potential approaches to incorporate GTI 2009 factors. For example, the EPA could replace the current GHGI EF for commercial and industrial meters. The EPA could apply the GTI 2009 commercial meter EF to the combined population of commercial and industrial meters, or could develop separate EFs. Alternatively, GTI 2009 and Clearstone study data could be used in conjunction with the GRI/EPA study data to recalculate EFs for use across all GHGI years). The EPA seeks information on trends over time that should be reflected in EF or AD in the time series.

AGA’s Response: AGA cautions EPA’s reliance on the results from the GTI study for commercial and industrial meters. The GTI study strove to survey a wide variety of sources within each source type, but resource limitations did not support “statistical sampling” indicative of source prevalence in the national inventory. For commercial meters, a relatively
large number of measurements was taken. Commercial customers surveyed included strip mall stores, restaurants, stand-alone stores, big-box retail establishments, and sports arenas. The meters ranged from small diaphragm meters to large diaphragm meters to rotary meters. Although 395 commercial meters were surveyed, one vented emissions accounting for 84% of the total GHG emissions. Given the sample size, it is not clear how to consider the frequency of such a large emitter within a larger, national inventory.

For industrial meters, the GTI study only took measurements from a limited number of sites (46 meters). Due to limited resources, measurements of industrial meters were intended to represent the broad range of meters in this sector, but do not provide a statistical sampling indicative of the industrial meter national inventory. For this reason, the industrial meter data should not be used because it is a limited and unrepresentative data set. It shows the range of meter types and emissions that can occur for industrial meters, but does not support a single value for an industrial meter emission factor, nor does it provide insight into the activity data needed to support multiple emission factors for industrial meters.

The results of the GTI study ultimately identify a data gap in emissions from commercial and industrial meters. To provide a better estimate for nationwide emissions from these subcategories, there is a need to further consider the type of equipment in use at the facility. For example, it appears that a separate emission factor is warranted for very large industrial meters. However, not enough data is available to develop that emission factor from the 2009 GTI study, and activity data is not available for the calculation even if an emission factor were available. For these reasons, AGA encourages EPA to retain the current EF in the GHGI for commercial/industrial meters.

Other Issues and Revisions Under Consideration

8. Pipeline blowdowns – The EPA seeks feedback on the Lamb et al. pipeline blowdown EF (which is lower than the GRI/EPA EF currently used in the GHGI). Is the new Lamb et al. EF representative of emissions in recent years but not earlier years (i.e., have there been industry advances that would result in lower Mscf/mile average pipeline blowdown emissions in recent years)?

AGA's Response: AGA member companies are taking steps to reduce emission from pipeline blowdowns that result in lower Mscf/mile average pipeline blowdown emissions. As part of EPA's Natural Gas Star Program, many distribution system operators have implemented best practices to limit blowdown emissions from high pressure distribution and intrastate transmission piping. As recognized by EPA, operators of natural gas pipeline systems have started using "pump-down" techniques, in-line compressors, and ejectors to lower gas line pressure before performing maintenance and repair activities to reduce emissions. Implementing these and other best practices allows operators to reduce the emissions associated with blowdowns, and likely accounts for the lower EF found by Lamb, et al.

In addition to the reduction in blowdown emissions already realized, AGA would expect further reductions in the coming years. First, from EPA's recently proposed Methane Challenge, which specifically targets high-pressure distribution pipe blowdowns. Once finalized, AGA believes that a significant number of distribution companies will elect to participate in the Methane Challenge, thereby further decreasing emissions from blowdowns. In addition, there has been significant interest in developing technologies that would allow operators to evaluate and address the integrity of pipelines without having to conduct invasive measures that would require blowdowns. PHMSA is sponsoring several projects that would

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advance this technology and have the effect of decreasing the number of blowdowns, thus decreasing the emissions from blowdowns.\textsuperscript{11}

Despite the fact that AGA believes the Lamb et al. EF to be reflective of advancements made in the industry, AGA does not believe the Lamb et al. EF for pipeline blowdowns is representative and therefore should not be incorporated into the GHGI. As noted previously, the EF for blowdowns is not based on the same type of robust sampled data as the other EFs. The EF for this source instead was based on a limited, voluntary survey conducted by AGA that produced four responses. From these four responses, Lamb et al. generated an unweighted average EF. AGA believes the data that it collected on blowdowns through its voluntary survey to be accurate. However, the limited sample size and nature of the data collection from which the Lamb et al. EF was calculated could lead to uncertainty regarding the validity of the EF. For these reasons, AGA does not believe the Lamb et al. EF for pipeline blowdowns should be incorporated into the GHGI.

Because of AGA’s concerns with both the proposed EF, and the proposed AD, as noted above, AGA respectfully requests that EPA retain the current AD and EF in the GHGI and work with AGA to develop a study that would collect data that would be representative of the national population of pipeline blowdowns. As previously mentioned, the Methane Challenge could provide a source of data for AD. AGA also believes that the Methane Challenge could be used to generate data to support a nationally representative and robust EF if companies were allowed to inventory and measure their own sources of emissions and provide EPA with their company-specific EFs. These are just preliminary suggestions and AGA looks forward to continuing a conversation with EPA to develop a study that would develop robust AD and EF for this source category.

\textbf{9. Mishaps/dig-ins – Lamb et al. data show higher emissions compared to the current GHGI EF. The EPA seeks feedback on whether industry trends have led to a higher EF from this source over time or whether the more recent EF could be applied over all years in the time series. Another option would be to use Lamb et al. data in conjunction with the GRI/EPA study data to recalculate EFs for use across all GHGI years. The EPA seeks feedback on these approaches.}

\textbf{AGA Response:} The number of excavation damages for natural gas distribution pipelines has decreased significantly since the early 2000s. According to the Common Ground Alliance, a member-driven association co-founded by AGA and dedicated to excavation damage prevention, excavation damages for all underground facilities have decreased by approximately 50\% since 2004, due in large part to the work done by the pipeline industry in promoting the use of “Call 811,” the national number for people to call before they begin any excavation project.

In regard to the emissions released per incident, there is significant variability in the emissions released for a particular incident based on a number of factors, including the operating pressure of the pipe, the nature of the damage, and the size of the pipe. Although AGA would expect that the trend of emissions per incident would be on the decline as a result of improved response times and a more resilient pipeline infrastructure, as EPA notes, the data suggests that emissions are higher for mishaps/dig-ins as compared to older data. AGA believes that the higher emissions could be the result of better reporting of these incidents. There is a federal requirement to report the amount of gas lost through a natural gas incident.\textsuperscript{12} In addition, since 2006, there has been an additional federal obligation imposed on excavators

\textsuperscript{11} See PHMSA, Research & Development Program Awards, \url{https://primis.phmsa.dot.gov/matrix/}

\textsuperscript{12} 49 C.F.R. § 191.9.
to contact the LDC if they damage a natural gas pipeline. The additional attention paid to the amount of gas lost suggests that the recent emissions are not higher than in the past, rather, they are more accurately measured and reported than in the past. AGA would expect to see a continuous overall trend in decreasing emissions.

However, because AGA has the same concerns with using the Lamb et al. EF for mishaps/dig-ins as for pipeline blowdowns, we do not believe that the Lamb et al. EF for mishaps/dig-ins should be incorporated into the GHGI. The EF for mishaps/dig-ins is not based on the same type of robust sampled data as the other EFs. The EFs for this source instead was based on a limited, voluntary survey conducted by AGA that produced four responses. From these four responses, Lamb et al. generated an unweighted average EF. AGA believes the data that it collected on mishaps/dig-ins through its voluntary survey to be accurate. However, the limited sample size and nature of the data collection from which the Lamb et al. EF was calculated could lead to uncertainty regarding the validity of the EF. For these reasons, AGA does not believe the Lamb et al. EF for mishaps/dig-ins should be incorporated into the GHGI.

10. **Pressure Release Valves** – The EPA seeks stakeholder information on available new data for this source.

AGA Response: AGA is not aware of any new emission or activity data for pressure relief valves. Although historically these valves commonly were used in distribution, their use has decreased significantly in recent years. Because of this, AGA believes that obtaining more recent activity data will demonstrate that these valves are an insignificant source of emissions. AGA is interested in working with EPA to gather this information. In addition, participants in EPA's Methane Challenge that select the best practice option to replace high bleed pneumatic pressure relief valves will provide more data on this equipment.

11. **Top down/bottom up discrepancy** – The Lamb et al. study generally observed lower emissions than the GRI/EPA study. However, at least one top down study estimated that GRI/EPA factors underestimate emissions in distribution. The EPA is seeking stakeholder comment on potential causes for the discrepancy and how this information could be taken into account in the GHGI.

AGA Response: AGA is aware of the concerns related to discrepancies between bottom-up studies and certain top-down atmospheric studies. However, AGA believes that the discrepancies can be eliminated by measuring the emissions from a comprehensive inventory of sources in bottom-up studies and careful source attribution in top-down studies.

The Lamb et al. study is an example of measurements from a comprehensive inventory of sources. The high-flow sampling method was the primary measurement technique used to quantify leak rates on individual components in the Lamb et al. study. The high flow sampler uses a high flow rate of air and a modified enclosure to completely capture the gas leaking from a component. High-flow measurements were supplemented by downwind tracer-ratio measurements with instruments mounted in a van. Lamb et al. found moderate to excellent agreement between the downwind tracer-ratio method and high flow sampling methods.

A recent study published by Zavala-Araiza et al. has made important advances in reconciling the potential for divergent estimates from top-down and bottom-up measurements of oil and

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14 See, for example, McKain et al. *Methane emissions from natural gas infrastructure and use in the urban region of Boston, Massachusetts.* Proceedings of the National Academy of Sciences 112(7):1941–1946.
gas methane emissions. The Zavala-Araiza et al. study reduced uncertainty in top-down estimates by using repeated mass balance measurements, and by using ethane as a fingerprint for source attribution. Similarly, the bottom-up estimate incorporates a more complete count of facilities than past inventories, which omitted a significant number of major sources, and attempts to account for the potential influence of large emission sources. Using these methodologies, the Zavala-Araiza et al. study found that top-down and bottom-up estimates of both total and fossil methane emissions agree.

12. Hi-Flow Sampler— Much of the available measurement data on distribution 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. In some studies, sources measured with the Hi-Flow sampler were also measured using other methods, such as LFE and tracer methods. The EPA seeks stakeholder input on this issue.

AGA Response: The concerns raised in the Howard 2015 study relate to the “Bacharach Hi-Flow Sampler” (BHFS). The Hi-Flow sampler used in the Lamb et al. study did not use a BHFS, but instead used a Hi-Flow sampler designed by Touché Howard, which does not have the calibration issues identified in the Howard 2015 study. The BHFS manufacturer’s manual recommended calibrating the BHFS once per month, but the Howard 2015 study indicates a need for more frequent calibration. In addition, the Howard 2015 study evaluated the use of BHFS equipment in measuring methane emissions at production facilities where produced natural gas contained less than 91% methane and higher percentages of other potentially corrosive or damaging constituents that could compromise the equipment. In contrast, the pipeline quality natural gas in distribution systems measured by Lamb et al. typically contains 94% or more methane, which could reduce the need for frequent calibration. Finally, Lamb et al. took the precaution of calibrating their Howard Hi-Flow Samper on a daily basis.

13. Natural gas leaks at point of use – In addition to the sources covered in the current GHGI and discussed in this memorandum, methane emissions also occur downstream of customer meters due to leaks at the point of use (e.g., domestic heating boiler cycling and pre-ignition losses from domestic and commercial gas appliances). Limited data are available on this emission source. At least one country, the United Kingdom, includes an emission estimate for this source in its national greenhouse gas emissions inventory. The 2012 estimate for gas leakage at the point of use for domestic boilers, domestic cooking appliances, and commercial gas appliances in the U.K. is 2.7 kt CH4, or 0.1 MMTCO2e.

The U.K. calculation is based on U.K. specific data on boiler size, frequency of use, and other data. The EPA has not conducted a detailed analysis of boiler data to determine if U.K. emission factors are appropriate for the United States. The EPA has calculated a rough estimate of U.S. emissions using data on domestic and commercial gas consumption data for the U.S. and the U.K. In 2013, the U.S. residential and commercial gas consumption was around six times higher than that of the U.K. Scaling up the U.K. emissions based on relative consumption (and not factoring in differences between gas use in the two countries), emissions from natural gas leaks at point of customer use in the United States could be around 0.4 MMTCO2e.

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The EPA seeks stakeholder feedback on the addition of this emission source to the GHGI, including available U.S.-specific emissions data for this source.

AGA Response: Concerns related to point-of-use emissions historically have focused on safety concerns. PHMSA pipeline safety regulations require natural gas in distribution systems to be odorized. The threshold of natural gas that can be emitted below the odorization threshold is extremely minimal for safety reasons, suggesting that there is no expectation of more than negligible systemic leaks.

A small amount of methane can be emitted post combustion – in both natural gas and oil fired appliances and equipment. Combustion emission factors for all sources (which include natural gas appliance combustion) are spelled out in EPA’s reference database, AP-42. The current edition of AP-42 reports a methane emission rate of 2.3 pounds of methane per one million standard cubic feet (1 MMscf) of natural gas input to a combustion process.

Moreover, if EPA were to add an estimate of emissions behind the customer meter, AGA does not believe that an emission factor based on United Kingdom data would be appropriate. Appliances in the United Kingdom are subject to significantly different manufacturing requirements than in the United States. There is no reason to assume that the emissions from a United Kingdom appliance would be similar to appliances in the United States.

Work is underway to better understand emissions at point of use. AGA is aware of a study using smart gas meters to quickly detect and investigate incidents of unexpected increases of natural gas flows through customer meters. AGA also is evaluating a possible study to measure post-meter emissions. We would welcome EPA’s input to assist in study design.

AGA urges EPA not to add of point of use emissions to the GHGI at this time, given the lack of robust data sources to provide a reasonable basis for developing an accurate estimate.

14. Drive around studies – EDF has conducted a series of leak detection studies in cities across the United States, using measurement technologies mounted on cars. While it is not possible to attribute methane leaks to specific sources from these studies (i.e., the leaks would include any methane above the detection limit, not limited to pipelines, and not limited to oil and gas), the EPA seeks stakeholder feedback on whether and how findings from these studies may be used to improve or analyze the GHGI. In the EDF studies, the areas with the highest emissions rate were Boston and Staten Island with 1 leak per mile. The lowest leak rate was in Indianapolis, with 0.005 leaks per mile. Other cities studied (Los Angeles, Burlington, Chicago, and Syracuse) had leak rates ranging from 0.1-0.5 leaks per mile.

AGA Response: The use of mobile technology equipped with cavity ring down spectrometers to identify atmospheric concentrations of natural gas can be a good complement to the leak surveys and system monitoring that LDCs are currently undertaking. The mobile technology allows for a larger area to be monitored in a shorter amount of time than more traditional methodologies, though it is still necessary to use traditional leak detection equipment to identify the source of methane and to locate and measure leaks. While this mobile technology can be useful for detecting concentrations of natural gas – i.e. leak detection, – the same cannot be said for its use in measuring leak flow rates. We understand that studies are

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16 49 C.F.R. § 192.625. The regulations require that natural gas in distribution systems be odorized so that a person with a normal sense of smell can detect natural gas at concentrations as low as one fifth of the lower explosive level (LEL). The idea is to ensure that individuals can detect natural gas at very low levels and to prompt them to take action by calling their gas utility to report the leaks.

17 https://www.edf.org/climate/methanemaps/city-snapshots
underway attempting determine how to use this technology to quantify leak flow rates, but
this is still an aspirational goal rather than accomplished fact.

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AGA appreciates the opportunity to comment. If you have any questions, please contact me at (202)
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Respectfully Submitted,

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