

**PG&E Response to August 21, 2013 Request from Gurbux Kahlon regarding LAUF Gas**

**QUESTION 4204.01:** Provide the annual volume of lost-and-unaccounted-for gas on the utility pipeline system for the last ten years. Provide these volumes for distribution pipelines and transmission pipelines separately, as well as total volumes.

**RESPONSE 4204.01:** PG&E does not track LUAF separately for distribution and transmission pipelines. LUAF is calculated on a systemwide, mass-balance basis. The sum of all metered usage (i.e., sendouts to customers plus Gas Department Use (GDU)) is subtracted from gross system receipts, net of changes in storage inventory and pipeline linepack.

The history of LUAF for the last ten years is as follows:

PG&E LUAF	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Decatherms	13,353,552	13,764,356	13,512,992	16,010,875	14,403,172	13,415,248	10,665,295	9,256,485	11,759,922	11,160,677
% of Delivered Volume	1.58%	1.51%	1.65%	1.93%	1.65%	1.60%	1.25%	1.10%	1.43%	1.17%

**QUESTION 4204.02:** Provide the annual LUAF factors (as a percentage of delivered volumes) for the utility pipeline system for the last ten years. Provide the LUAF percentage for distribution and transmission pipelines separately, as well as the overall system LUAF percentage.

**RESPONSE 4204.02:** See Response 4202.01.

**QUESTION 4204.03:** Provide a breakdown of the LUAF volumes by the different causes, e.g. leakage, dispersing in storage, measurement and accounting problems, etc. If you are unable to determine a breakdown accurately, please explain.

**RESPONSE 4204.03:** As stated in Response 4202.01, PG&E does not track LUAF separately for distribution and transmission pipelines, but tracks it on a systemwide, mass-balance basis. This is because the gas system does not have the extensive internal metering and other resources that would be required to determine LUAF by type of facility or by cause. By definition, lost and unaccounted-for is the gas that comes onto the system whose disposition or usage cannot be accounted for through metering or other routine activity.

PG&E has conducted several studies of the sources of LUAF since 1990. Below is a summary of the major contributors to LUAF for 2005-2007, as estimated in the most recent LUAF study, conducted in 2008.

The 2005-2007 totals in the table below do not match those provided in response to Question

4204.01 for two main reasons. First, sendout data are subject to continuous revision for several years after the sendout date. Second, some of the sources of LUAF identified in 2008 (e.g., “Omission of natural gas vehicle data,” “Storage Gas Department Use error,” and “Under-reporting of core transport agent sendouts”) were determined to be data or arithmetic errors in the calculation of LUAF itself and were subsequently corrected.

<b>Major Contributors to LUAF (MMDth) (as of 2008)</b>			
<b>LUAF Source</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Border meter error	0.7	0.7	0.4
Customer meter error	0.8	0.8	0.9
Core meter elevation error	3.0	3.0	3.0
Core meter temperature error	2.2	2.4	2.8
Therm rounding on customer bills	0.3	0.3	0.2
Distribution pipeline and residential meter leakage	0.8	0.7	0.8
Omission of natural gas vehicle data	1.5	1.6	1.6
Storage Gas Department Use error	0.4	0.4	0.4
Under-reporting of core transport agent sendouts	0.0	0.1	0.5
Other identified LUAF	2.2	2.2	2.2
Unfound LUAF	1.9	5.5	3.6
<b>TOTAL</b>	<b>13.7</b>	<b>17.8</b>	<b>16.5</b>

“Other identified LUAF” in the above table includes, among other components:

- Gas vented to atmosphere during routine construction and maintenance operations
- Gas vented to atmosphere during compressor station operations
- Gas leaks from the transmission system
- Theft of gas
- Broken locks (gas usage not billed between a change of occupants)

**QUESTION 4204.04:** In the absence of an accurate breakdown of LUAF, have you made an estimate of the amounts of gas lost from your pipeline system (expressed either in volumes or as a percentage) due to leaks? If so, please provide that estimate.

**RESPONSE 4204.04:** See Response 4204.05.

**QUESTION 4204.05:** As LUAF is generally a positive amount, do LUAF volumes generally represent amounts of gas that are lost from the utility pipeline system to the atmosphere? Please explain your response.

**RESPONSE 4204.05:** As shown in Response 4204.03, only a portion of LUAF is attributable to gas lost to atmosphere. Data errors, meter errors, and other factors also contribute. Based on our voluntary greenhouse gas (GHG) reporting to The Climate Registry (TCR), these are the volumes estimated to have been lost to atmosphere for the past three years:

<b>Estimates of Process and Fugitive Methane (CH<sub>4</sub>) in LUAF (Mcf)</b>				
<b>Year</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2010-2012</b>
Total LUAF	9,074,985	11,529,335	10,941,841	31,546,161
CH <sub>4</sub> Volume (est.)	3,659,949	1,753,723	3,426,333	8,840,005
CH <sub>4</sub> Percent (est.)	40%	15%	31%	28%

As shown in the table above, the TCR estimating protocol indicates that process and fugitive methane accounts for an estimated 28 percent of LUAF for the period 2010-2012. (Note that the TCR term “process” is similar in meaning to the California Air Resource Board term “vented.” Also note that 2012 TCR data has not yet been verified.)

Estimates for process and fugitive emissions from natural gas systems exhibit a high level of uncertainty. Also, the estimating protocols from source to source differ, and have evolved over time, which may yield different results. PG&E is working with Washington State University, the Environmental Defense Fund, and the American Gas Association to develop better methods of estimating the leakage from gas distribution systems. Results are expected to be released in a peer-reviewed journal in early 2014.

**QUESTION 4204.06:** Can LUAF volumes be used as a proxy to determine the amount of gas lost to the atmosphere from utility pipeline systems, for determining LUAF’s contribution to GHG emissions? Please explain your response.

**RESPONSE 4204.06:** As can be seen in PG&E’s responses to Questions 4204.03 and 4204.05, LUAF cannot be used as a direct proxy to determine the amount of gas lost to the atmosphere from utility pipeline systems, since process and fugitive methane is only a portion of total LUAF, and that portion fluctuates from year to year.