Petroleum and Natural Gas Systems (Subarticle 5):
Emissions Reporting Guidance
For the regulation of California's mandatory greenhouse gas reporting regulation

This document provides guidance for reporting to the petroleum and natural gas systems sector as specified by the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (reporting regulation or MRR), title 17, California Code of Regulations, sections 95100-95158. Specifically, this guidance focuses on clarifications needed for the reporting and verification of emissions data.

The petroleum and natural gas systems sector consists of eight industry segments as defined in section 95150 of the MRR. The California Air Resources Board (ARB) first approved the mandatory reporting regulation in 2007, with revisions in 2010, 2012, and 2013. The 2013 MRR revisions became effective on January 1, 2014.

1. California Geologic Provinces (Basins)

Regulatory section: 95102(a)(29)

Applicable industry segment(s): Onshore petroleum and natural gas production.

Onshore petroleum and natural gas production facilities in California are required to aggregate and report applicable greenhouse gas (GHG) emissions using the "basin" footprint as defined in the following publication:

AAPG-CSD Geologic Provinces Code Map, R.F. Meyer, L.G. Wallace, and F. J. Wagner, Jr., *The American Association of Petroleum Geologists Bulletin*, V. *75*, No. *10* (October 1991), pgs., 1644 – 1651, 1991.

This journal article is copyright protected and cannot be freely distributed by the California Air Resources Board (ARB). Reporters may access the complete article free of charge at many California Public Libraries. To aid reporters in the determination of their reporting footprint, and correct basin name and number, ARB staff have constructed a Table that lists each California county or counties included in each basin by name and number (as defined in the reference publication). Note that in many cases a basin may contain multiple California counties. Offshore basins do not necessarily correspond to individual onshore California counties.

Table – Basin IDs defining Oil and Natural Gas Production facility reporting footprint

Basin name	Basin number	California County(ies)
Onshore Basins		
Southern Oregon	620	Lassen, Modoc
Great Basin	625	Inyo, Mono
Mojave	640	San Bernardino
Salton	645	Imperial, Riverside
Sierra	650	Alpine, Amador, Calaveras, El Dorado, Mariposa, Placer, Plumas, Nevada, Sierra, Tuolumne, Yuba
Klamath Mountain	715	Del Norte, Trinity, Shasta, Siskiyou
Eel River	720	Humboldt
Northern Coast Range	725	Alameda, Lake, Mendocino, Napa, Santa Clara, Sonoma
Sacramento	730	Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehama, Yolo
Santa Cruz	735	Marin, Santa Clara, Santa Cruz, San Francisco, San Mateo
Coastal	740	Monterey, San Luis Obispo
San Joaquin	745	Fresno, Kern, Kings, Madera, Merced, San Benito, Stanislaus, Tulare
Santa Maria	750	Santa Barbara
Ventura	755	Ventura
Los Angeles	760	Los Angeles, Orange
Capistrano	765	San Diego
Offshore Basins		
Eel River	945	Not applicable
Point Arena	948	
Santa Cruz (Bodega)	950	
Santa Maria	953	
Santa Barbara Channel	955	
Pacific Coast (Outer)	956	
Southern California borderlands	957	

2. Onshore Production Storage Tanks

Regulatory section: Section 95152(c)(8)

Applicable industry segments: Onshore petroleum and natural gas production

With the addition of the Crude Oil, Condensate, and Produced Water Dissolved CO_2 and CH_4 methodology found in Section 95153(v), emissions from onshore production tanks are reported based on the results of flash liberation testing using section 95153(v) methodology, to fulfill the requirement in section 95152(c)(8). Reporters are required to use the ARB test procedure found in Appendix B of the MRR for 2014 year emissions data reported in 2015.

3. Reporting Zero Emissions

Regulatory section: Section 95153 (applicable to all sections within 95153)

Applicable industry segment(s): All industry segments.

ARB staff has received questions concerning reporting requirements in cases where emissions are zero. Where individual source emissions can be demonstrated to be zero (i.e., no emissions occurred from the source in question for the entire reporting period) reporters should enter zero (0) in the appropriate location of the Cal e-GGRT reporting tool to clear the validation messages. The reporter must demonstrate to the satisfaction of its verification body that no emissions occurred.

Additionally, in cases where the emissions are less than one-thousandth of a ton, the user should enter '0' into Cal e-GGRT. As mentioned above, the user should retain the records of the actual emissions for verification purposes.

4. Equipment and Pipeline blowdowns

Regulatory section: Section 95153(g)

Effective Date: Beginning with 2013 data reported in 2014.

Applicable industry segment(s): All industry segments, except offshore

Subarticle 5 requires reporters to report emissions related to equipment and pipeline blowdowns. This reporting requirement covers emissions resulting from the depressurization of equipment and pipelines caused by human intervention or taking equipment out of service for maintenance (excluding depressurizing to a flare, overpressure relief, operating pressure control and venting and blowdown of non-GHG gases, and desiccant dehydrator blowdown venting before reloading).

ARB staff has received questions concerning acceptable methods for determining variables required by this calculation methodology (as detailed in section 95153(g)). Reporters must calculate the unique physical volume for each blowdown incident. Section 95153(g)(1) states that this volume shall be determined by engineering estimates based on best available data. Actual measurements of variables such as tubing diameter and pipe length would also be acceptable.

In addition to physical blowdown volume, the following variables must also be determined:

N = number of occurrences of blowdowns for each unique physical volume in the calendar year. Reporters should maintain a list and record the number of blowdowns per calendar year.

T_a = Temperature at actual conditions. Reporters should be able to determine this variable from any number of sources: SCADA (System Control and Data Acquisition system) systems, thermometer, etc.

P_a = Absolute pressure at actual conditions in the unique physical volume. Reporters should be able to determine this value from a SCADA system or via an engineering estimate based on system standard operating parameters when actual pressure measurements are not available.

Reporters should always use the most accurate data available when deriving the variables required as input to this emissions calculation methodology. Data sources should be examined by the facility verifier during the verification process to ensure that the input data meets accuracy requirements.

5. Compressor leak measurements – operating modes

Regulatory section(s): 95153(m) and (n)

Effective Date: Beginning with 2013 data reported in 2014.[2]

Applicable industry segment(s): All industry segments (except offshore and natural gas distribution)

Sections 95153(m)(1) and 95153(n)(1) require an annual measurement to be conducted for operating modes that are active for greater than 200 hours per year. Reporters have expressed the need for clarification with regards to the reporting requirements for the operating mode and the not operating depressurized mode. The clarification below applies to sections 95153(m)-(n) of the MRR.

The MRR lists the operational modes in sections 95153(m)(1)(A) and (B). Subsection (C) addresses the non-operational modes where the compressor either does or does not have blind flanges, or does not operate more than 200 hours total in a calendar year. Since subsections (A) and (B) are true operational modes, measurement requirements listed in the section still apply. Sub-section (C) is not considered an active operational mode; therefore it is acceptable to utilize best available methods to calculate these emissions.

Additionally, the emissions may be reported as *de minimis* if the emissions in (m)(1)(C) and (n)(1)(C) satisfy the conditions of section 95103(i).

Finally, in order to alleviate resource issues, ARB staff recommends that reporters measure and record the emissions of the not-operating depressurized compressors in a staggered fashion, completing approximately one-third of them during every reporting year. It is imperative for reporters to document this information in their GHG monitoring plan and for verifiers to check this documentation during the verification process.

6. Compressor leak measurement – safety concerns

Regulatory section(s): 95153(m) and (n)

Effective Date: Beginning with 2013 data reported in 2014.[2]

Applicable industry segment(s): All industry segments (except offshore production and natural gas distribution)

Sections 95153(m) and 95153(n) describe emissions measurement and quantification methodologies for centrifugal and reciprocating compressors, respectively. These two sections specify that one of two methods be used to quantify vent emissions: calibrated bagging or high volume sampler. Reporters have raised concerns that in some instances required sampling may expose personnel to hazardous concentrations of H_2S in compressor emissions. Reporting should never be conducted in a manner which puts personnel at risk, and ARB staff believes that the reporting requirements include sufficient safeguards to prevent harm to personnel involved in sampling of compressor emissions. Reporters are directed to sections 95154(c) and 95154(d) where these two sampling methods are discussed.

Reporters should also refer to Section 95154(a)(4) of the *Monitoring and QA/QC Requirements* where they are directed to use an optical gas imaging instrument "for all source types that are inaccessible and cannot be monitored without elevating the monitoring personnel more than 2 meters above a support surface." ARB staff believes this text covers sources which are inaccessible due to safety concerns.

In situations where there are valid concerns for personnel safety, reporters are directed to use the provisions in section 95154(a)(4) such that emissions can be quantified without exposing personnel to hazardous substances and dangerous conditions when sampling.

7. Leak surveys

Regulatory section: 95153(o)(8)(A)

Applicable industry segment(s): Natural gas distribution.

ARB has received questions regarding the timing of leak surveys required in section 95153(o). Reporters have requested clarification concerning how they might apportion sampling efforts if they elect to sample a subset of emission sources each year across a five year period as specified in section 95153(o)(8)(A). U.S. EPA has issued guidance concerning this issue and this guidance is reproduced below. Reporters are directed to follow this guidance in quantifying and reporting emissions covered in section 95153(o).

Reporter inquiry to U.S. EPA:

> *Q651. Under Section 98.233(q)(8)(i), a company may elect to conduct leak detection on a multiple year cycle, up to a maximum of five years, with the number of stations monitored "approximately equal across all years in the cycle." The preamble to the final rule says "a minimum of 20%" per year (76 FR 80569). Would a monitoring plan that results in 10% of stations being monitored in each of the first two years, followed by 40% of stations in year 3, 20% in year 4 and 20% in year five, be consistent with the rule language of "approximately equal across all years in the cycle."*

U.S.EPA response:

> *A651. Yes. According to 98.233(q)(8)(i), "Natural gas distribution facilities may choose to conduct leak detection at T-D transfer stations over multiple years, not exceeding a five year period to cover all T-D transfer stations. If the facility chooses to use the multiple year option, then the number of T-D transfer stations monitored in each year should be approximately equal across all years in the cycle without monitoring the same station twice during the multiple year survey." EPA confirms that an approach of conducting monitoring at 10% of the facilities in each of the first two years, followed by 40%, 20% and 20% in years three, four and five would be consistent with the rule language that the number of stations monitored be "approximately equal" over the number of years surveyed.*

This text can be found at the following web-link:
http://www.ccdsupport.com/confluence/pages/viewpage.action?pageId=118587545

8. Onshore Petroleum and Natural Gas Production and Natural Gas Distribution Combustion Emissions

Regulatory section: Section 95153(y)

Effective date: Beginning with 2013 data reported in 2014.[2]

Applicable industry segment(s): Onshore petroleum and natural gas production and natural gas distribution.

Prior to the 2012 amendments to the MRR, a "common pipe" method, as described in section 95115 of the MRR, was allowed for the petroleum and natural gas systems sector. Following the 2012 amendments, this method is still applicable for most fuels as described in section 95153(y)(1)(A).

For combustion units that combust field gas, process vent gas, non-pipeline quality natural gas or a blend of field and process vent gas, the "common pipe" method, as described in section 95115 also applies. Section 95153(y)(2)(A) indicates that company records may be used to determine the volume of fuel combusted, and for purposes of the fuels listed in section 95153(y)(2), company records may include records related to the common pipe that transfers fuel to particular units. For reporting emissions from units downstream of the common pipe, please follow the unit aggregation guidance, http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/unit_aggregation.pdf.

9. Use of Best Available Monitoring Methods

Regulatory section: Sections 95103(h), 95152, 95153, 95156, and 95157

Applicable industry segment(s): Onshore Petroleum and Natural Gas Production and Onshore Natural Gas Processing

For reporting of 2013 data (in 2014), petroleum and natural gas systems reporters may use Best Available Methods (BAM) for certain data inputs required in the MRR as stated in section 95103(h). These data inputs are listed in the table below.

Subarticle 5 BAM for 2014

MRR Section	*Affected Emission source	Affected Industry Segment(s)
95152 – GHGs to report		
95152(i)(9)	Reporting Pipeline Main Equipment Leaks	Natural Gas Distribution
95153 – Calculating GHG emissions		
95153(y)(2)(C)	Combustion emissions –Summation of monthly volumetric emissions to obtain annual value	Onshore Petroleum and Natural Gas Production Natural Gas Distribution
95153(y)(2)(D)	Reporting N_2O emissions – use of quarterly HHV measurement in lieu of default	Onshore Petroleum and Natural Gas Production Natural Gas Distribution
95156 – Additional data reporting requirements		
95156(a)(7)-(10) 95150(a)(2)	Inclusion of emulsion fraction when reporting barrels of crude produced and MMBtu associated gas produced by both thermal and non-thermal production processes	Onshore Petroleum and Natural Gas Production

MRR Section	*Affected Emission source	Affected Industry Segment(s)
95156(c)	Onshore oil and gas production with a gas processing plant with throughput <25 MMscf/d must report production of NGLs in barrels	Onshore Petroleum and Natural Gas Production
95156(d)	Facilities >25 MMscf/d throughput must report MMBtu of associated gas, waste gas, and natural gas processed	Onshore Natural Gas Processing
95157 – Activity data reporting requirements		
95157(c)(6)(A)	Well completions – report total count of completions by average depth (1000ft) and number of completions using hydraulic fracturing	Onshore Petroleum and Natural Gas Production
95157(c)(6)(B)	Well workovers report total count of workovers by average depth (1000 ft) and number of workovers using hydraulic fracturing	Onshore petroleum and Natural Gas Production
95157(c)(6)(G)	Reporting of casing diameter, tubing diameter, pressure, producing temperature, and time to complete gas and oil well workovers using hydraulic fracturing	Onshore petroleum and Natural Gas Production
95157(c)(18)	Reporting data for dissolved CH_4 data in addition to existing CO_2 reporting requirement	Onshore Petroleum and Natural Gas Production
95157(c)(18)(B)	Reporting of dissolved CH_4 data at basin level in addition to existing CO_2 reporting requirement	Onshore Petroleum and Natural Gas Production
95157(c)(19(H)	Reporting MMBtu of associated gas produced using thermal and non-thermal enhanced oil recovery	Onshore Petroleum and Natural Gas Production

*BAM - Best Available Methods may be used for the reporting of these data elements for 2014 data reported in 2015.

10. Verification of Reported Activity Data

Regulatory section: Section 95157

Applicable industry segment(s): All industry segments

Reporters are required to report activity data as detailed in section 95157 of the MRR. ARB has received questions concerning the verification requirements for this activity data. Every industry segment must report activity data (section 95157(a)), and the activity data reported under section 95157 must be verified for conformance by a third-party verification body employed by the reporting facility as part of the verification process as stated in section 95131(b)(10). The activity data reported in section 95157 are not part of a facilities covered emissions, and as such, are not subject to verification for material misstatement.