

**Staff's Preliminary Assessment of the Need for Clarification
for the Reporting of Covered Product Data for Petroleum and Natural Gas
Systems**

DISCLAIMER: This report has been prepared by the staff of the Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board.

1. Purpose

Each year, Air Resources Board (ARB or Board) staff, including staff from the Regulation for the Mandatory Reporting of Greenhouse Gases (Mandatory Reporting Regulation, or MRR)¹ and the Cap-and-Trade Program work with reporting entities and verification bodies to ensure that data are being reported in conformance with MRR and in alignment with how data were reported to Cap-and-Trade Program staff in the benchmarking process. ARB staff has determined that variability exists in the reporting and metering methods used for thermal enhanced oil recovery (EOR) and non-thermal EOR covered product data. ARB staff intends to work with industry and other stakeholders to determine whether it is appropriate to establish additional criteria by which covered product data may be classified as either thermal EOR or non-thermal EOR. ARB staff is soliciting feedback from covered entities in this sector on the contents of this white paper, including the questions contained in Section 4. Staff anticipates that the most likely outcome of this assessment will be clarifications to the definitions of thermal EOR and non-thermal EOR.

Please note that by explaining the hypothetical scenarios presented in Section 3, ARB is in no way endorsing the reporting or metering methods described as being in conformance with the Cap-and-Trade Regulation or MRR. The intent of the hypothetical scenarios is to describe the way reporters may be submitting data to ARB, and to gather information to determine whether clarifications to the allowable reporting methods should be considered to support accurate and consistent reporting in this sector.

Input on this white paper should be emailed no later than February 11, 2016, to ogwhitepaper@arb.ca.gov. Please note that input emailed to this address will be available to the public and posted at the following link:

<http://www.arb.ca.gov/cc/capandtrade/allowanceallocation/ogcomments.htm>.

¹ <http://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/mrr-2014-unofficial-02042015.pdf>

Entities that wish to supplement their publicly available submissions with data or information that they regard as trade secrets may direct supplemental submissions containing this data or information to Sara Nichols at sara.nichols@arb.ca.gov. These supplemental submissions must be submitted in the manner prescribed by ARB's regulations concerning the submission of trade secrets and other information exempt from disclosure under the California Public Records Act (Government Code section 6250 et seq. ["Act"]), as found at 17 California Code of Regulations sections 91000 to 91022, including but not limited to identifying in writing as "confidential" the specific portions of these supplemental submissions regarded as trade secrets, or otherwise exempt from disclosure under the Act. ARB will maintain these supplemental submissions in the manner prescribed under the Act, ARB regulations, and other relevant law.

2. Introduction

a. What are the current reporting requirements for thermal EOR and non-thermal EOR covered product data?

Entities in the upstream oil and gas extraction sector (North American Industry Classification System² code 211111) are eligible to report their production of thermal EOR crude oil and associated gas and non-thermal EOR crude oil and associated gas as covered product data³ pursuant to MRR. These covered product data are used for the calculation of industrial allowance allocation pursuant to sections 95870, 95890, and 95891 of the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms (Cap-and-Trade Regulation).⁴ ARB allocates allowances to this sector under the product-based allocation methodology for the purposes of emissions leakage prevention and transition assistance. Entities must report covered product data to be eligible for allocation. These covered product data are defined as follows:

- "Thermal enhanced oil recovery' or 'thermal EOR' means the process of using injected steam to increase the recovery of crude oil from a reservoir."
- "Non-thermal enhanced oil recovery' or 'non-thermal EOR' means the process of using methods other than thermal EOR, which may include water flooding or CO₂ injection, to increase the recovery of crude oil from a reservoir."

² The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

³ "Covered product data' means all product data included in the allocation of allowances under sections 95870, 95890, and 95891 of the cap-and-trade regulation, regardless of whether the cap-and-trade regulation imposes a compliance obligation for the data year" (MRR section 95102(a)(109)).

⁴ http://www.arb.ca.gov/cc/capandtrade/capandtrade/unofficial_c&t_012015.pdf

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Pursuant to MRR section 95156, reporting entities subject to a compliance obligation under the Cap-and-Trade Regulation are required to report their total annual production of thermal EOR and non-thermal EOR covered product data. Section 95103(l) of MRR requires reporting entities to exclude inaccurate covered product data, and also allows reporters to elect to exclude accurate covered product data. When reporting covered product data, the quantification method(s) must meet the criteria in section 95103(k). MRR section 95103(k) states that all meters that measure covered emissions or covered product data must meet the full measurement accuracy requirements (+/-5 percent accurate) and must be calibrated according to the frequency specified in MRR. For additional guidance on the reporting of upstream oil and gas covered product data, please refer to the Petroleum and Natural Gas Systems Covered Product Data Reporting and Verification Guidance. For additional guidance on MRR accuracy standards, please refer to the Measurement Accuracy and Missing Data Provisions Guidance.

b. Why is staff considering clarifications to the reporting of thermal EOR and non-thermal EOR covered product data?

Each year, ARB staff, including staff from MRR and the Cap-and-Trade Program, work with reporting entities and verification bodies to ensure that data are being reported in conformance with MRR and in alignment with how data were reported to Cap-and-Trade Program staff in the benchmarking process. In this process, it has come to ARB's attention that variation exists in the methods that entities are using to report thermal EOR and non-thermal EOR covered product data.

ARB recognizes that upstream oil and gas operations can be unique and depend on many site-specific geological characteristics and circumstances. However, if entities define and report covered product data differently, it is difficult to ensure that allowance allocation for oil and gas production is done consistently and equitably. ARB staff is interested in understanding the current variability in the reporting and metering methods used for thermal EOR and non-thermal EOR covered product data by entities subject to both MRR and the Cap-and-Trade Regulation. ARB staff will work with industry and other stakeholders to determine whether it is appropriate to more specifically define the criteria by which reported covered product data might or might not be classified as thermal EOR or non-thermal EOR production.

Different entities might use different techniques to thermally enhance their reservoirs, and as a result might define "thermally enhanced production" differently. For example, some entities that use the "steam-soak" technique might define thermal production as crude oil and associated gas produced only from those wells that receive direct steam

injection (i.e., steam injection at the well head). Conversely, entities that use the “steam-flood” technique (i.e., a single steam injection well, with many surrounding production wells) might define thermal production based on a steam-to-oil ratio for entire fields or lease areas, or based on any amount of steam injected within a defined surface area and within a specified time period. For entities that use the steam-flood approach, production from a specific group of wells within the area might be reported as thermal EOR covered product data, even if specific wells did not receive direct steam injection.

Sometimes, entities may define thermal EOR vs. non-thermal EOR covered product data in certain ways because of how meters⁵ are set up. In straightforward cases, points-of-sale data would quantify covered product that is solely thermal or solely non-thermal. However, sales locations sometimes represent a combination of both types of crude oil covered product data. If a point of sale measures a mixture of both thermal EOR and non-thermal EOR covered product, the reporting entity must split the sales amount between thermal EOR and non-thermal EOR production. That split is sometimes accomplished using upstream intermediate production meters, which may not meet the accuracy requirements of MRR. The split might also be accomplished using data from periodic well tests that determine the rate of production from individual wells. The well tests may last only a few days, and then the relative rates of production (e.g., barrels per day) for various wells might be compared to calculate the relative contribution from each well towards the total amount of covered product data measured at the point of sale. Other techniques may also exist.

c. How might clarifying the reporting requirements affect the product-based benchmarks contained in Table 9-1 of the Cap-and-Trade Regulation for oil and gas extraction?

ARB staff does not anticipate a need to revise the current benchmarks for the upstream oil and gas extraction sector. If the information that ARB gains from this assessment warrants revisiting the benchmark, staff will propose amendments to the Cap-and-Trade Regulation through a full public process in accordance with the Administrative Procedure Act. Staff anticipates that one potential outcome of this assessment may be clarifications to the definitions of thermal EOR and non-thermal EOR. If adopted by the Board, any such amendments would most likely become effective beginning on January

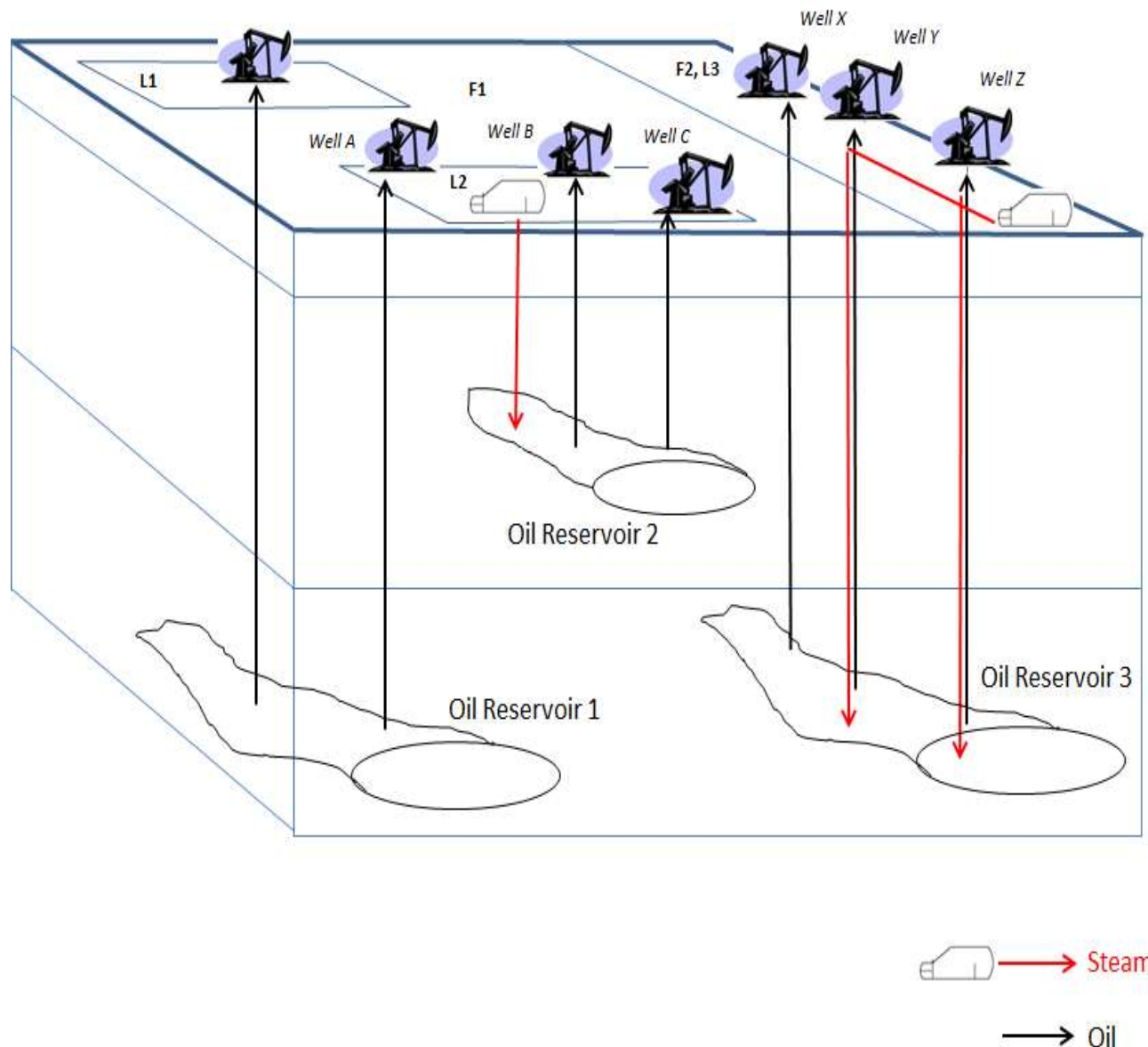
⁵ Under MRR, reporting entities are permitted to use Lease Automatic Custody Transfer (LACT, or sales-quality) meters, or LACT meters with an inventory adjustment, to quantify the total amount of covered product data. Reporting entities are also permitted to use other point-of-sale data (e.g., truck load-out financial transaction data from individual tanks) or calibrated production meters to quantify the total covered product data.

1, 2018. Therefore 2017 calendar year data (reported in fall 2018) would be the first year reporting entities would be required to conform to any new requirements.

3. Hypothetical Examples of Reporting of Thermal EOR and Non-Thermal EOR Covered Product Data and Associated Metering Methods

The following section provides more specific information via hypothetical examples on the variation that might exist among entities that report thermal EOR and non-thermal EOR covered product data, as well as the variation that might exist in how metering is performed. These examples are presented so that entities can understand the variation in methods for reporting thermal EOR and non-thermal EOR covered product data and metering methods that are already known by ARB, and provide a starting point for discussions. Please refer to Figure 1 for additional information on the hypothetical scenarios presented for the reporting of thermal EOR and non-thermal EOR covered product data. Examples of metering methods are discussed in the hypothetical scenarios presented for Reporters C and D.

Figure 1. Hypothetical Reporting Scenarios for Thermal EOR and Non-Thermal EOR Covered Product Data



Reporter A Approach (Oil Reservoir): Lease 1 is reported as non-thermal. Wells B and C on Lease 2 are reported as thermal; Well A on Lease 2 is reported as non-thermal. The situation at Field 2 is not applicable to Reporter A.

Reporter B Approach (Field): All production in Field 1 (Leases 1 & 2) is reported as thermal. The situation at Field 2 is not applicable to Reporter B.

Reporter C Approach (Lease): Lease 1 is reported as non-thermal. Leases 2 and 3 are reported as thermal.

Reporter D Approach (Well): Well X on Lease 3 is reported as non-thermal. Wells Y and Z on Lease 3 are reported as thermal. The situation at Field 1 is not applicable to Reporter D.

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Please note that all of the hypothetical scenarios for Reporters A through D illustrate examples of the reporting methods that might exist for thermal EOR and non-thermal EOR covered product data. Only Reporter C and D hypothetical scenarios illustrate examples of how metering might be performed.

Reporter A. Thermal EOR/Non-Thermal EOR Scenario. Reporter A uses the “steam flood” approach to periodically inject steam into Oil Reservoir 2, below the sub-surface of Field 1. Reporter A only produces from Field 1; the situation at Field 2 does not apply to Reporter A. Steam injection into one well enhances the oil recovery rate of some of the surrounding wells for many months at a time (i.e., cyclic steam injection). Specifically, Reporter A injects steam into Lease 2, which directly corresponds to Oil Reservoir 2. Reporter A does not inject steam into Lease 1, which directly corresponds to Oil Reservoir 1. Reporter A defines thermal production by oil reservoir. Therefore, Reporter A reports production from Wells B and C on Lease 2 as thermal EOR; production from Well A on Lease 2 is reported as non-thermal EOR production because that well produces from a reservoir that has not had steam injected into it. Production from Lease 1 is reported as non-thermal EOR.

Reporter B. Thermal EOR/Non-Thermal EOR Scenario. Reporter B has the same configuration as Reporter A. However, unlike Reporter A, Reporter B defines thermal EOR production by Division of Oil, Gas, and Geothermal Resources field area. Therefore, Reporter A reports all production from Field 1 (Lease 1 and Lease 2) as thermal EOR. Reporter B only produces from Field 1; the situation at Field 2 does not apply to Reporter B.

Reporter C.

Thermal EOR/Non-Thermal EOR Scenario. Reporter C draws from Oil Reservoirs 1, 2, and 3. Steam is periodically injected into Oil Reservoirs 2 and 3 using the “steam flood” and “steam soak” approaches, respectively. Reporter C defines thermal production by lease area. Therefore, Reporter C reports all production from Leases 2 and 3 as thermal EOR. Lease 1 is reported as non-thermal EOR.

Metering Scenario. Reporter C has some LACT meters that measure and deliver only thermal EOR covered product, while some measure and deliver a mix of thermal EOR and non-thermal EOR covered product. If a LACT meter at this facility measures a mix of thermal EOR and non-thermal EOR covered product, Reporter C uses a system of upstream internal production meters to determine how much was produced from a “thermal EOR” lease, and how much was produced from a “non-thermal EOR” lease.

The intermediate production meters used to determine the disaggregation of LACT meter data do not meet MRR accuracy requirements; however, the LACT meters do.

Reporter D.

Thermal EOR/Non-Thermal EOR Scenario. Reporter D utilizes the “steam soak approach,” and runs steam pipes to each individual well head in Field 2 (Lease 3). Reporter D only produces from Field 2; the situation at Field 1 does not apply to Reporter D. If a well head has a steam pipe running to it and receives steam for any portion of the year, it is defined as “thermal EOR” production. Reporter D defines thermal production by well. Therefore, Reporter D defines production from Field 2 (Lease 3) as a mixture of thermal EOR and non-thermal EOR. Specifically, production from Well X is considered non-thermal, while production from Wells Y and Z is considered thermal.

Metering Scenario. Reporter D has on-site storage tanks that receive a combination of thermal EOR (Wells Y and Z) and non-thermal EOR (Well X) production. Crude oil production from the on-site storage tanks is loaded out on trucks. The truck load-out tickets are considered financial transactions that demonstrate accuracy for total covered product data pursuant to MRR. Reporter D disaggregates the thermal EOR and non-thermal EOR production from these tanks by using the well-test data, and applying the relative well production rate proportionately. For example, if a thermal well was tested for 2 days and was found to be producing 6 barrels per day, and a non-thermal well was tested for 2 days and was found to be producing 4 barrels per day, and those were the only two wells flowing to a tank, the annual covered product from that tank would be reported as 60% thermal EOR and 40% non-thermal EOR.

4. Staff Discussion and Need for Additional Information Regarding the Reporting and Metering of Thermal EOR and Non-Thermal EOR Covered Product Data

As mentioned above, ARB staff intends to work with industry and other stakeholders to determine whether it is appropriate to establish additional criteria by which covered product data may be more accurately classified as either thermal EOR or non-thermal EOR, and/or additional criteria for metering methods. Staff is seeking input on these areas:

1. Definition of “thermal enhanced oil recovery” or “thermal EOR”: ARB is looking for the best way to clarify the definition of “thermal EOR.” What is an appropriate way to clarify what is meant by “thermal EOR” as it pertains to covered product data? What additional and/or more specific information should ARB provide

regarding this definition?

2. Hypothetical Examples and Other Considerations: In Section 3 above, staff presents hypothetical examples of the variation that might exist among entities that report thermal EOR and non-thermal EOR covered product data and the associated metering methods. Staff is seeking input on the following questions related to the reporting of upstream oil and associated gas covered product data:
 - a. How does your facility define and quantify thermal EOR and non-thermal EOR production? What criteria are used, and what assumptions are made? If applicable, use the examples presented in Section 3 (above) to assist you in describing definitions and quantification.
 - b. Does your facility define and report covered product data at the reservoir, field, lease, or well-head level? If applicable, use the examples presented in Section 3 (above) to assist you in this description.
 - c. If ARB were to define thermal EOR as the production of oil from a reservoir that has had steam injected into it, would that cause any issues in the reporting of covered product data at your facility?
 - d. What subsurface monitoring and surface metering technologies does your facility have in place and how do they relate to the quantification of covered product data?
 - e. What evidence does your facility provide to verifiers to demonstrate conformance to the MRR definitions of thermal EOR and non-thermal EOR covered product data?
 - f. What additional guidance should ARB provide to verifiers when verifying the reporting of covered product data for the sector?
 - g. Do you use calibrated meters to determine the split between thermal EOR and non-thermal EOR covered product data, if applicable? If not, what methods do you use? If applicable, please refer to the hypothetical metering scenarios presented in Section 3 (above) for Reporters C and D.
 - h. Did you report voluntary survey data as part of the most recent oil and gas benchmarking data collection process? Emails containing the survey spreadsheets and instructions were sent to existing covered entities on December 21, 2012. If you did report benchmark survey data, are you currently using the same approach for MRR reporting as you did for the benchmark survey data? If not, please explain any differences in reporting methods.

5. Stakeholder Input Regarding Reporting of Thermal EOR and Non-Thermal EOR Covered Product Data

Input on the hypothetical examples in Section 3, and on the questions in Section 4 (above), should be emailed no later than February 11, 2016, to ogwhitepaper@arb.ca.gov. Please note that input emailed to this address will be available to the public and posted at the following link: <http://www.arb.ca.gov/cc/capandtrade/allowanceallocation/ogcomments.htm>. Entities that wish to supplement their publicly available submissions with data or information that they regard as trade secrets may direct supplemental submissions containing this data or information to Sara Nichols at sara.nichols@arb.ca.gov. These supplemental submissions must be submitted in the manner prescribed by ARB's regulations concerning the submission of trade secrets and other information exempt from disclosure under the California Public Records Act (Government Code section 6250 et seq. ["Act"]), as found at 17 California Code of Regulations sections 91000 to 91022, including but not limited to identifying in writing as "confidential" the specific portions of these supplemental submissions regarded as trade secrets, or otherwise exempt from disclosure under the Act. ARB will maintain these supplemental submissions in the manner prescribed under the Act, ARB regulations, and other relevant law.