Air Resources Board

Mary D. Nichols, Chair
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Matthew Rodriquez
Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

TO: Gerald W. Bowes, Ph.D.
Manager, Cal/EPA Scientific Peer Review Program
Office of Research, Planning and Performance
State Water Resources Control Board

FROM: Elizabeth Scheehle, Chief
Oil & Gas and GHG Mitigation Branch

DATE: August 10, 2016

SUBJECT: REQUEST FOR EXTERNAL PEER REVIEW OF THE TEST PROCEDURE FOR DETERMINING ANNUAL FLASH EMISSION RATE OF METHANE FROM CRUDE OIL, CONDENSATE, AND PRODUCED WATER TANK AND SEPARATOR SYSTEMS.

The California Air Resources Board (ARB) staff requests, by transmittal of this memorandum, that you initiate the process to identify reviewers to provide external scientific peer review of the subject above.

The Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities (Oil & Gas Regulation) was proposed at ARB's July 21, 2016 Board Hearing and will be considered for adoption at ARB's January 2017 Board Hearing. The staff report supporting the Oil & Gas Regulation, called the Initial Statement of Reasons (ISOR), is available for review at http://www.arb.ca.gov/cc/oil-gas/isor.htm. The Oil & Gas Regulation is included as Appendix A of the ISOR. The Test Procedure for Determining Annual Flash Emission Rate of Methane from Crude Oil, Condensate, and Produced Water Tank and Separator Systems (Test Procedure) can be found in Appendix C of the Oil & Gas Regulation, which is Appendix A of the ISOR. The summary and rationale for each section of the Test Procedure is described in detail on pages 78-83 of the ISOR. The staff of ARB requests that the Test Procedure be subject to scientific peer review consistent with Health and Safety Code (H&S) section 57004.

Due to the critical timeframe for adopting the Oil & Gas Regulation at the January 2017 Board Hearing, we must emphasize that the review must be **completed and comments from reviewer(s) received by October 21, 2016**. This will allow ARB staff

to review and address the comments prior to our submittal of the peer review results to the California Environmental Policy Council pursuant to H&S section 43830.8(e).

Reviewers should have expertise in the following areas: (1) oil and natural gas operations; (2) sampling and laboratory methods, preferably those of the Gas Processor Association (GPA), American Standards and Testing Materials (ASTM), and U.S. Environmental Protection Agency (EPA); and (3) emissions estimates from oil and natural gas operations.

There are four attachments to this memorandum:

1. Plain English Summary of the Test Procedure
2. Description of Scientific Bases of the Test Procedure to be Addressed by Peer Reviews
3. List of Participants Associated with the Development of the Test Procedure
4. List of References for the Test Procedure

If you have further questions regarding this request or just wish to discuss this matter further, please feel free to contact me at (916) 322-7630 or elizabeth.sheehle@arb.ca.gov, or Jim Nyarady, Manager of the Oil and Gas Section, at (916) 322-8273 or jim.nyarady@arb.ca.gov.

Thank you for your time and consideration of this request.

Attachments (4)

cc: Jim Nyarady, Manager
Oil and Gas Section
Industrial Strategies Division

Attachment 1

Plain English Summary of the Test Procedure

Air Resources Board (ARB) staff developed a proposed Test Procedure for Determining Annual Flash Emission Rate of Methane from Crude Oil, Condensate, and Produced Water.

The Test Procedure outlines how owners and operators at applicable oil and gas facilities will determine the flash emission rate of methane from tank and separator systems. The Test Procedure is included in Appendix C of the Proposed Regulation Order, Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities[1].

The determination of the flash emission rate of methane from tank and separator systems is fundamental to the compliance determination and reporting provisions of the Oil & Gas Regulation, sections 95668(a) and 95672.

The intended purpose of the Test Procedure is to quantify emissions from crude oil, condensate, and produced water separator and tank systems open to the atmosphere. Testing is conducted by gathering pressurized liquid samples upstream of a separator and tank system. Because the intent is to replicate flashing emissions from a separator and tank system open to the atmosphere, samples must be gathered upstream of the system before emissions can flash from the liquid. After the samples are gathered, they are taken to a laboratory for conducting liquid and gas analyses in accordance with specified testing methods and procedures. The laboratory results are used to calculate the annual methane emissions using a calculation methodology in the Test Procedure.

[1] The Test Procedure will also be proposed to support other ARB rules, such as the Mandatory Greenhouse Gas Reporting Regulation.

Attachment 2

Description of Scientific Bases of the Test Procedure to be Addressed by Peer Reviews

The statutory mandate for external scientific peer review (H&SC section 57004) states that the reviewer's responsibility is to determine whether the scientific basis or portion of the proposed rule is based upon sound scientific knowledge, methods, and practices.

We request your review to allow you to make this determination for each of the following conclusions that constitute the scientific basis of the Test Procedure.

1. The Test Procedure provides a sound approach for taking samples of oil, condensate, and produced water upstream from oil and gas production separator and tank systems. The approach is described in Sections 1-9 of the Test Procedure, Appendix C of the Oil & Gas Regulation. A summary and rationale for these sections can be found on pages 78-81 of the ISOR.

2. The Test Procedure provides a sound approach for preparing and analyzing samples of oil, condensate, and produced water from oil and gas production separator and tank systems for the constituents and properties needed to estimate emissions from flashed gases from such separator and tank systems, specifically as follows:

(a) For Sample Preparation:

1. GPA 2174-93, GPA 2177-03, or GPA 2261-00;

(b) For Sample Constituents:

1. GPA 2286-95, ASTM D-1945-03, ASTM D-3588-98, and ASTM D-2597-10 for Oxygen, Nitrogen, Carbon Dioxide, Methane, Ethane, Propane, i-Butane, n-Butane, i-Pentane, n-Pentane, Hexanes, Heptanes, Octanes, Nonanes, and Decanes+;
2. EPA 8021B , or ASTM D 3170-95, GPA 2286-95, EPA 8260B, EPA TO-14, or EPA TO-15 as alternate methods, for benzene, toluene, ethylbenzene, and xylenes;

(c) For Sample Physical Properties:

1. ASTM D-287-92, ASTM D-4052-09, ASTM D-5002-16, or ASTM D-70-09 for API Gravity of whole oil and for specific gravity of produced water;
2. ASTM D-3588-98 for molecular weight of gaseous phase; and
3. ASTM D-4007-08 for water and sediment in crude oil.

Description of sample preparation and analysis is in Sections 10 and 12-14 of the Test Procedure, Appendix C of the Oil & Gas Regulation. The summary and rationale for these sections are on pages 81-83 of the ISOR.

3. The Test Procedure provides a sound approach for calculating the emissions of methane and various other pollutants from flashed gases from oil and gas production separator and tank systems. The calculation methodology is in Section 11 of the Test Procedure, Appendix C of the Oil & Gas Regulation. A summary and rationale for this section is on page 82 of the ISOR.

4. Big Picture

Reviewers are not limited to addressing only the specific assumptions, conclusions, and findings presented above, and are also asked to contemplate the following questions:

(a) In reading the staff report and supporting documentation, are there any additional substantive scientific issues that were part of the scientific basis or conclusion of the proposed Oil & Gas Regulation but not described above? If so, please comment on them.

(b) Taken as a whole, are the conclusions and scientific portions of the proposed Oil & Gas Regulation based upon sound scientific knowledge, methods, and practices?

The preceding guidance will ensure that reviewers have an opportunity to comment on all aspects of the scientific basis of staff's assessments. At the same time, reviewers are encouraged to focus their feedback on scientific issues that are relevant to the central regulatory elements being proposed.

Attachment 3

List of Participants Associated with the Development of the Test Procedure

For the sake of completeness, identified below are the people involved in the development of the Test Procedure, including ARB staff.

Names and Affiliations of Participants Involved

Air Resources Board
- Jim Nyarady
- Joe Fischer
- Winardi Setiawan

BC Laboratories
- Robert Cortez

California State University, Fullerton
- Jeff Kuo
- Leroy Sanchez
- Dolores Kimball

California Energy Commission
- Guido Franco

City of Palo Alto
- Greg Scoby

FESCO Laboratories
- David Dannhaus
- David Vajdos

Natural Resource Group
- Tom Umenhofer (now with Western States Petroleum Association)

Oilfield Environmental and Compliance, Inc.
- Lisa Race

Pacific Gas and Electric
- Jack Dunlap (now retired)

Plotkin Zins & Associates
- Norman Plotkin

Sempra Utilities
Gregg Arney

Zalco Laboratories
Juan Magana

Attachment 4

List of References for the Test Procedure

ALL REFERENCES WILL BE PROVIDED TO REVIEWERS.

Initial Statement of Reasons (ISOR) Staff Report

ASTM D-70-09	*Standard Test Method for Density of Semi-Solid Bituminous Materials (Pycnometer Method)*
ASTM D-287-92	*Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)*
ASTM D-1945-03	*Standard Test Method for Analysis of Natural Gas by Gas Chromatography*
ASTM D-2597-10	*Standard Test Method for Analysis of Demethanized Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography*
ASTM D-3710-95	*Standard Test Method for Boiling Range Distribution of Gasoline and Gasoline Fractions by Gas Chromatography*
ASTM D-3588-98	*Standard Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels*
ASTM D-4007-08	*Standard Test Method for Water and Sediment in Crude Oil by the Centrifuge Method*
ASTM D-4052-09	*Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter*
ASTM D-5002-16	*Standard Test Method for Density and Relative Density of Crude Oils by Digital Density Analyzer*
EPA Method 8021B	*Aromatic and Halogenated Volatiles by Gas Chromatography Using Photoionization and/or Electrolytic Conductivity Detectors*
EPA Method 8260B	*Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)*

EPA Method TO-14	*Determination of Volatile Organic Compounds (VOCs) In Ambient Air Using Specially Prepared Canisters with Subsequent Analysis By Gas Chromatography*
EPA Method TO-15	*Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters and Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS)*
GPA 2174-93	*Analysis Obtaining Liquid Hydrocarbon Samples For Analysis by Gas Chromatography*
GPA 2177-03	*Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography*
GPA 2261-00	*Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography*
GPA 2286-95	*Method for the Extended Analysis of Natural Gas and Similar Gaseous Mixtures by Temperature Program Gas Chromatography*